



Programs, Policies & Courses

This online academic catalog provides the latest information on all graduate areas of study and degree programs at the University of Massachusetts Lowell and supersedes all previous versions of the catalog.

About the University

The University of Massachusetts Lowell is an Equal Opportunity/Affirmative Action University and does not discriminate in employment or access to programs or services on the basis of race, sex, sexual orientation, color, national origin, religion, handicap or veteran's status and is in compliance with Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973, and the Americans With Disabilities Act, 1990. Any inquiries and/or grievances may be referred to the Affirmative Action Officer, the Title IX Coordinator, the Disabilities Coordinator and/or to the Director, Office for Civil Rights, U.S. Department of Health and Human Services, Washington, DC.

The University of Massachusetts Lowell is not responsible for statements or agreements entered into or made by any University official or faculty member which do not conform to the rules and regulations in this catalog and/or which have not been approved by the Graduate Coordinator.

A member of the five campus system of the University of Massachusetts created by the Commonwealth of Massachusetts Legislature in July, 1991.

Accreditation & Professional Membership

The University of Massachusetts Lowell is accredited by the Commission on Institutions of Higher Education and New England Association of Schools and Colleges. Professional programs are also individually accredited by the following national associations which evaluate at the graduate level:

American Assembly of Collegiate Schools of Business

National Association of Schools of Music

National Council for the Accreditation of Teacher Education

(Elementary, Secondary, and Music Education)

National League for Nursing

The University of Massachusetts Lowell is also a member in good standing of the following associations of higher education:

Accreditation Board for Engineering and Technology

American Assembly of Collegiate Schools of Business

American Association of Colleges for Teacher Education

American Association of Colleges of Nursing

American Chemical Society

American Council on Education

American Physical Therapy Association

American Society for Engineering Education

American Society of Allied Health Professions

Association for Gerontology in Higher Education

Association for State Colleges and Universities

Association of University Programs in Health Administration

College Entrance Examination Board

Council of Colleges of Arts and Sciences

Council of Graduate Schools in the United States

Interstate Certification Compact

Massachusetts Association of Colleges of Nursing

National Association for Industrial Technology

National Association of Summer Sessions

National Association of State Directors of Teacher Education and Certification

National League for Nursing Council of Baccalaureate and Higher Degree Programs

National University Continuing Education Association

New England Board of Higher Education

Graduate Admissions

[Admissions Requirements](#)

[Departmental Requirements](#)

[The Office of Graduate Admissions \(www.uml.edu/grad\)](http://www.uml.edu/grad)

University of Massachusetts Lowell
883 Broadway Street - Dugan Hall
Lowell, MA 01854

978-934-2390 or 1-800-656-GRAD

Admission Requirements

The general requirements for admission to graduate study at the University are listed below.

1. The applicant must show official evidence of having earned a baccalaureate degree or its U.S. equivalent from an accredited college or university. If an international transcript does not adequately demonstrate that an applicant has the equivalent of an American bachelor's or master's degree, the Office of Graduate Admissions will require such verification by an independent service such as the [Center for Educational Documentation](http://www.cedevaluations.com), (www.cedevaluations.com) Boston, MA (617-338-7171).
2. The degree must have been earned with a satisfactory scholastic average to demonstrate that the applicant has had adequate preparation for the field in which graduate studies are to be undertaken.
3. The applicant must have obtained a satisfactory score on the appropriate entrance examination required for admission by the program or department to which admission is sought. The official score report must be submitted; a photocopy of the examinee's report is unacceptable. Unless otherwise stated under a specific program description, the required examination is the Graduate Record Examination General Test.
4. The Commonwealth of Massachusetts requires that all full-time graduate students (9 or more credits) must be immunized against measles, mumps, rubella, tetanus, and diphtheria. In addition, all students in programs in the health professions, regardless of age or enrollment status, must show proof of immunization. Students will not be permitted to register for courses at the University unless proof of immunization has been sent directly to the Director of [Health Services](http://www.uml.edu/student-services/health/), (www.uml.edu/student-services/health/) University of Massachusetts Lowell, Lowell, MA 01854 (978-934-4991).

Departmental Requirements

The rules, regulations, and policies delineated by the University constitute only the minimum requirements for admission, retention, and graduation. Each department may have additional requirements mandated by the unique nature of its programs. It is the responsibility of the graduate student to be aware of the minimum requirements of the University and, in addition, to fulfill the special requirements of the particular program in which he or she is enrolled.

Application Procedure

- [Departmental Requirements](#)
- [Application Procedure for Graduate Admissions](#)
- [Conventional Application](#)
- [Application Deadline](#)
- [Types of Admission](#)
- [Status as a Graduate Certificate Candidate](#)
- [Non Degree Status](#)
- [Graduate Readmission/Deferral Policy](#)

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Application Procedure for Graduate Admission

Applicants to graduate programs are encouraged to apply online. Apply now: [OnLine Application](#)

- [Conventional Application](#)
- [Application Deadline](#)
- [Types of Admission](#)
- [Status as a Graduate Certificate Candidate](#)
- [Non-Degree Status](#)
- [Graduate Readmission/Deferral Policy](#)
- Acceptance of Foreign or American Master's Degree Toward Doctoral Requirement
- Transfer Credit
- Graduate Equivalency Credit

Conventional Application

Application forms and materials may be obtained from:

The Office of Graduate Admissions

University of Massachusetts Lowell
820 Broadway Street
Lowell, MA 01854

978-934-2390 or 1-800-656-GRAD

www.uml.edu/grad

A non-waivable and non-refundable application fee must be received before the application is processed. Each applicant must file the following documents:

1. A completed application form.
2. Official transcripts of all undergraduate and graduate records.
3. Three letters of recommendation written by individuals qualified to judge the ability of the applicant to carry on graduate work and research.
4. Official scholastic test scores specified for various degree programs at the University (see individual departmental requirements). An applicant who has earned a graduate degree from an accredited university may petition the department graduate coordinator to waive the scholastic test requirements (e.g. GRE).
5. The official score report for the "Test of English as a Foreign Language" (TOEFL) for students from countries where English is not the national language. If the TOEFL bulletin cannot be obtained locally, students should write well in advance to:

Test of English as a Foreign Language
Box 6151
Princeton, NJ 08541-6151, U.S.A.

All test scores must be official and sent directly by the testing agency.

Application Deadline

The University of Massachusetts Lowell Graduate Admissions Office has a "rolling admissions" policy. However, some programs have early, fixed application deadlines. Consequently, the applicant is strongly urged to contact the department of interest to determine the last date on which applications may be received. In general, early applications will ensure that all materials are processed on time and that a student who wishes to apply for a teaching assistantship will be given due consideration. Many programs will fill available openings several months before the beginning of the semester. A student who has been accepted into a graduate program must attend within a year of acceptance or may, at the discretion of the department, be required to submit a new application. Application files for individuals who do not matriculate will be retained for only two years from the date of application.

Types of Admission

A student may be admitted to graduate study at the University of Massachusetts Lowell under one of the two classifications listed below.

1. **Matriculated status:** A student who has met all requirements for admission to a degree program and who has been recommended by the department in which he or she proposes to study as a degree candidate.
2. **Matriculated with conditions:** A student who has not fully met the requirements stipulated by the program may be admitted as a prospective candidate for a degree with specified conditions to be met in the future. Such a student must have as an initial objective the satisfactory completion of all requirements for full matriculation.

Status as a Graduate Certificate Candidate

Graduate certificate programs are designed for students holding a baccalaureate degree in a field related to the certificate program. A student who wishes to apply to a certificate program must complete the [Graduate Certificate Application](#), submit the appropriate application fee, and submit an official transcript indicating the conferral of a Bachelor's degree. The graduate record exam (GRE) is not required.

A student in a certificate program who wishes to enroll in a master's or doctoral program is ineligible to receive credit towards a degree until he or she files a formal application and is then admitted as a matriculated student.

The maximum number of graduate credits a student may complete while enrolled in a graduate certificate is 12 credits.

Non-Degree Status

An individual without advanced degree objectives may take courses in certain programs with non-degree status. A student who wishes to take courses as a non-degree student must submit an official transcript indicating the conferral of a Bachelor's degree. A student in non-degree status is ineligible to receive credit towards a degree until he or she files a formal application and is then admitted as a matriculated student.

The maximum number of graduate credits a student may complete with non-degree status is 12 credits.

NOTE: International students are not eligible for non-degree status.

Graduate Readmission/Deferral Policy

1. A matriculated student who formally withdraws in good standing from the university may request readmission within two years by completing only the cover page of the graduate application.
2. A newly accepted student dropped from a graduate program for failure to register may be re-admitted by submitting a new application cover page and fee within two years of acceptance date.
3. A matriculated student who fails to maintain continuous enrollment and has not formally withdrawn may be readmitted by submitting a new application cover page and fee within two years of being dropped from the program.
4. A student may request a deferment of enrollment up to one year beyond the date when he or she was scheduled to begin his or her graduate program. If the one-year time period is exceeded, the student must submit a new application and fee. Deferral must be requested before the start of the semester for which the student is accepted.

Colleges & Degrees of Graduate Study

- [Manning School of Business](#)
- [Graduate School of Education](#)
- College of Engineering
- [College of Fine Arts, Humanities & Social Sciences](#)
- [School of Health & Environment](#)
- [College of Sciences](#)
- [UMass System Graduate Programs](#)

Educational Specialist (Ed.S.)

Degree options include:

- [Curriculum and Instruction - Education of Diverse Populations](#) (pdf)
- [Reading and Language - Teacher of Reading Licensure for Massachusetts Teachers](#) (pdf)

- [Reading and Language - on-line, non-licensure for teachers working in states other than Massachusetts](#) (pdf)
- [Administration, Planning and Policy with Principal/Assistant Principal Licensure for Massachusetts Teachers Only](#) (pdf)
- [Administration, Planning and Policy - on-line, non-licensure](#) (pdf)

Note: The Educational Specialist degree programs are offered either completely or partially online. Contact edoffice@uml.edu for further information.

Admission and Completion Requirements

Admission to a degree program at the Educational Specialist level requires that an applicant hold a master's degree in education from an accredited college or university or a master's degree in a closely related field of study, with a cumulative grade point average of not less than 3.0. Additionally, applicants should have at least three years of full-time experience in a K-12 school or a related setting. Full admission requirements can be found at Graduate Admissions, which include:

- Online application and fee
- Two-page statement in which you describe your educational philosophy and reasons for seeking entry to the degree
- Three letters of recommendation
- Proof of professional teaching status or GRE scores (general test)
- All official transcripts
- TOEFL scores if appropriate

In order to qualify for a Educational Specialist degree, each candidate must meet the following requirements:

1. Complete a minimum of 30 credits of course work in the specified degree program.
2. Complete all course requirements for the degree program at this university. A maximum of six credits of course work transferred from another accredited institution is the only exception granted.
3. Complete all course requirements with a cumulative grade point average of B or better. No additional course credits may be permitted in order to achieve the grade point average of B or better required for the degree.
4. Complete the program within five years of the date of admission.

Graduate Certificates

The Graduate School of Education at UMass Lowell offers the following 12 credit, certificate programs:

- [Teaching Children with Moderate Disabilities](#) (pdf)
- [Teaching English as a Second Language](#) (pdf)

Adviser: Dr. Vera Ossen (978-934-4604) Vera_Ossen@uml.edu

Graduate certificates require 12 credits of coursework designed to assist the candidate in gaining the content knowledge and practical experience for their work in classrooms. Candidates have the opportunity to apply for an add-on license in these high-need areas through a Massachusetts DESE competency review. Individuals interested in an additional Massachusetts license should seek advice from Dr. Vera Ossen about licensing (including teacher test requirements) in the Commonwealth of Massachusetts.

[Graduate Certificate Application Form](#) (pdf)

Admissions Requirements

- Proof of either a bachelor's or master's degree from an approved teacher-preparation program with a minimum GPA of 3.0.
- Must hold an initial or professional Massachusetts teacher license in the appropriate field required for the certificate.
- Graduate Certificate Admission Form.
- Application fee.
- **NO GRE IS REQUIRED FOR ADMISSION TO A GRADUATE CERTIFICATE PROGRAM**

The candidate should follow the procedures described on the [Graduate Admissions website](#) at www.uml.edu/grad.

Graduate School of Education

The Graduate School of Education offers graduate degree programs, which provide professional preparation for individuals who aspire to serve in the roles of teacher, curriculum specialist or director, school principal, higher education administrator, college faculty, planning consultant, and other positions of educational leadership. The School is led by [Dr. Anita Greenwood](#).

[Faculty in the Graduate School of Education](#) (pdf)

Graduate Programs Offered

Master of Education Degree (M.Ed.) is offered in:

- Curriculum and Instruction (Initial License)
- Curriculum and Instruction (Advanced)

- Educational Administration
- Reading and Language

Education Specialist Degree (Ed.S.) is offered in:

- Curriculum and Instruction
- Reading and Language
- Administration, Planning and Policy

Doctor of Education Degree (Ed.D.) is offered in:

- Mathematics and Science Education
- Leadership in Schooling
- Language Arts and Literacy

Graduate Certificates

- Teaching Children with Moderate Disabilities
- Teaching English as a Second Language

Bachelor's-Master's Program

Graduate School of Education Course Listings

Doctor of Education (Ed.D.)

In addition to the general requirements for admission to a program at the Graduate School of Education, to qualify for admission to a graduate program at the Doctor of Education level, an applicant must have earned a bachelor's degree from an accredited college as well as a master's degree appropriate to the intended field of specialization from an accredited college. A cumulative grade point average of no less than 3.0 is expected. The Graduate Record Exam is also required for admission.

Degree Requirements

Complete a minimum of forty-eight (48) credits in the specified doctoral program, of which a minimum of twelve (12) credits must be dissertation research. A maximum of six (6) credits of Advanced Research Seminar work may be counted toward dissertation research. Students may request for transfer a maximum of twelve (12) credits of course work taken prior to matriculation at another institution accredited to award the doctoral degree.

1. Complete the stipulated course requirements for the degree program at this university.
2. Complete all course requirements for the degree with a cumulative grade point average of B or better.
3. Complete all course requirements for the degree with a cumulative grade point average of B or better.
4. Pass comprehensive examinations as determined by the specific program prior to beginning dissertation work.
5. Satisfactorily complete and defend a dissertation based upon the results of original research as approved by the candidate's dissertation committee.
6. Complete the program within eight years from the date of admission.

The three Ed.D. programs offered are:

- [Mathematics and Science Education](#) (pdf)
- [Leadership in Schooling](#) (pdf)
- [Language Arts and Literacy](#) (pdf)

Bachelor's-Master's Program in Education

The B.A. or B.S./M.Ed. Fast Track Program to Teaching is designed for high achieving University of Massachusetts Lowell undergraduates who seek to pursue a career in teaching at the middle/secondary levels. The program leads to a master of education degree in curriculum and instruction, including initial Massachusetts teacher licensure. The program may be completed in one or two years.

Advantages

- two degrees plus teacher licensure in five years;
- six graduate credits may be taken in the senior year, provided the student has been accepted to the program and all other undergraduate requirements have been fulfilled;
- scholarship opportunities;
- early advisement;

Requirements

University of Massachusetts Lowell undergraduate students may apply to the program during the fall semester of their senior year.

1. Successful applicants must have an undergraduate major in the specialization field in which they are seeking licensure as follows:

Biology 36 cr. in biology + 18 cr. in other sciences

Chemistry 36 cr. in chemistry + 18 cr. in other sciences
Physics 36 cr. in physics + 18 cr. in other sciences
Earth Science 36 cr. in earth science + 18 cr. in other sciences
English 36 cr. in English
General Science 36 cr. in a major field of science + 18 cr. in other sciences
Mathematics 36 cr. in mathematics
History 36 cr. in History

2. Applicants are expected to have a minimum grade point average of 3.0 in undergraduate work.

3. Applicants to the Fast Track Program must pass the MTEL-Massachusetts Tests for Educator Licensure (Communication and Literacy Skills and Subject Area Test are required).

For more information, contact:

Dr. Patricia Fontaine
Graduate School of Education
O'Leary Library 510 - UML South
Phone: (978) 934-4622
E-mail: Patricia_Fontaine@uml.edu

[Degree requirements for Bachelor's/Master's Program](#)

Master of Education (M.Ed.)

Degree Requirements

Each graduate student is personally responsible for complying with all rules and regulations of Graduate Admissions and the Graduate School of Education, and for fulfilling all degree requirements.

Master of Education (M.Ed.)

1. To qualify for admission to a graduate degree program at the Master of Education level, an applicant must have completed a bachelor's degree program with a scholastic record that gives evidence of ability to succeed in graduate work. Specific requirements are listed with each program.
2. In order to qualify for a Master of Education degree, each candidate must meet the following requirements:
 - Complete a minimum of thirty (30) credits of required course work in a specific degree program with a cumulative GPA of B or better.
 - Complete satisfactorily the specified internship and/or field practicum, and appropriate seminar, under supervision of a designated faculty member in the Graduate School of Education. Practica are open only to matriculated students who have completed all other degree requirements.
 - Complete the degree within five years of the date of admission.

A. Curriculum and Instruction (M.Ed.)

Designed for individuals who seek initial licensure in the Commonwealth of Massachusetts. Certification opportunities are available in the following areas: Elementary Education, Middle School General Science, High School or Middle School Biology, Chemistry, Earth Science, English, History, Mathematics and Physics.

Requirements

Successful applicants for the elementary program must have an undergraduate major, or a minimum of 24 credits, in an arts or science academic content area. In addition, the applicant must meet prerequisite requirements in mathematics, science, history, English (two courses with grades of B or better in each area) and one course in art or music, and health.

Applicants for the secondary program must have a degree, or equivalent, in the content area they wish to teach together with supporting general education requirements.

Applicants are expected to achieve a minimum grade point average of 3.0 in undergraduate work, and satisfactory scores on each subtest on the Graduate Record Exam or passing scores on the Massachusetts Tests for Educator Licensure.

All candidates must pass the Communication and Literacy Test and a Subject Test of the Massachusetts Educator Certification Tests to qualify for Massachusetts licensure.

Curriculum and Instruction (M.Ed.) - Initial License Program

A list of program areas and degree requirements include:

- [Elementary Education](#) (pdf)
- [Elementary and Moderate Disabilities](#) (pdf)
- [Middle/High School English](#) (pdf)
- [Middle/High School History](#) (pdf)

- [Middle/High School Mathematics](#) (pdf)
- [Middle/High School Science](#) (pdf)
- [Fast Track to Teaching](#) (pdf)

Curriculum and Instruction (including Science Education Option) (M.Ed.) - Advanced Program

This program is designed to meet the needs of experienced practitioners, who seek to broaden and deepen their professional knowledge and to expand the contributions they can make to education. Candidates must hold an initial or professional teaching license. This program does not lead to licensure. Candidates may choose to specialize in science education by taking six (18 credits) courses in science and science education. The core of the degree consists of distribution requirements in the following areas: Foundations of Education, Research and Evaluation, and Specialization.

Degree requirements: [Curriculum and Instruction](#) (pdf)*

Degree Requirements: [Curriculum and Instruction - Science Education Option](#) (pdf)*

Curriculum and Instruction: Mathematics Education Concentration (M.Ed.) - Advanced Program

This M.Ed. degree concentration requires thirty credits of graduate study. The program is blended with education courses offered online and mathematics courses, taken in the mathematics department, generally on campus. Candidates must hold an initial license in mathematics to be admitted to this degree program. Those seeking professional licensure in Massachusetts should confirm the degree meets their requirements by contacting the Massachusetts Department of Elementary and Secondary Education.

Degree requirements: [Curriculum and Instruction - Math](#) (pdf)

Curriculum and Instruction-Option: Autism Studies (M.Ed.) - Advanced Program

Candidates seeking this option must first complete the Graduate Certificate in Behavioral Intervention in Autism (BIA). Upon completion of the certificate, candidates may apply to the M.Ed. degree and have their certificate courses included as part of the thirty required credits. The remainder of the degree does not focus on Autism, but examines general issues in Curriculum and Instruction; as such, it is most appropriate for candidates who work in school settings and/or have relevant experience in Curriculum and Instruction. Several of the courses require assignments that assume that the candidate is in an instructional setting. If you are not a licensed teacher you may still apply to the degree, but you must be aware that it is your responsibility to fulfill the assignments as required. The M.Ed - Autism Studies option does not lead to teacher licensure.

Degree requirements: [Curriculum and Instruction - Autism Studies](#) (pdf)

Curriculum and Instruction-Option: Special Education (M.Ed.) - Advanced Program

The M.Ed. in Curriculum and Instruction: Special Education Option is a 30-credit degree program. The program is blended with some courses taught online and some on campus. This program does not lead to a teaching license in any state. Candidates must already hold a teaching license (initial or professional) in their state. Additionally, they must be working as a classroom teacher of record or they will be unable to complete course assignments, particularly the Action Research Capstone or Internship in Teaching Students with Moderate Disabilities.

Coursework in this program focuses on fulfilling the subject matter knowledge requirements for teaching students with moderate disabilities in grades PreK-8 and 5-12. Successful completion of the program provides qualified Massachusetts teachers the **OPPORTUNITY TO ADD ON A LICENSE** in this high need area through a Massachusetts Department of Elementary and Secondary Education Competency Review and passing the appropriate MTEL tests.

Degree Requirements: Curriculum and Instruction-Special Education: [C and I Special Education Advanced](#) (pdf)

B. Educational Administration (M.Ed.)

The purpose of the Educational Administration Program is to develop individuals and teams who will guide educational opportunities in our region in the 21st century. The program is designed to meet the needs of experienced practitioners who seek to broaden and deepen their professional knowledge and to expand the contributions they can make to education.

NOTE: Massachusetts' regulations for "Principal" licensure are changing effective summer of 2013.

Every institution in Massachusetts which offers a Principal licensure degree program will need to seek approval for a newly aligned program. Educators seeking to apply to begin an administrative degree should be aware that course work will be subject to change pending approval of the new program. Please check back for updates.

Massachusetts educators currently admitted to the program who complete their degree and other requirements by December 2013 will be licensed under the old regulations.

Professional Experience

Each candidate for the degree in Educational Administration is required to complete at least three years full time, successful employment in a Pre-K-12 setting.

Massachusetts teachers seeking licensure as School Principal or Supervisor/Director must complete all courses required for licensure, hold a current professional teaching license, and pass the Communication and Literacy portion of the Massachusetts Test for Educator License.

Degree requirements: [Principal](#) (pdf)*

Degree requirements: [Non-Licensure](#) (pdf)*

Degree requirements: [Higher Education Option](#) (pdf)

C. Reading and Language (M.Ed.)

The Master of Education Degree in Reading and Language is a thirty credit program designed to provide the necessary course work to continue the education of licensed teachers.

Massachusetts teachers seeking **licensure** as a Teacher of Reading in the Commonwealth of Massachusetts complete two practica (6 credits) as part of the thirty credit degree. Candidates for this degree must hold either an initial or professional Massachusetts teaching license in Elementary Education, Middle/Secondary English, English Language Learners, Moderate Disabilities or Early Childhood Education and should be employed as a teacher in a Massachusetts public K-12 setting.

Degree requirements: [Reading and Language -Teacher of Reading](#) (pdf)*

A **non-licensure concentration** is available for teachers who do not hold a Massachusetts license and/or do not work in a Massachusetts school. Candidates who seek to enroll in this degree program should hold a teaching license in their own state in Elementary Education, Middle/Secondary English, English Language Learners, Moderate Disabilities or Early Childhood Education and be employed as teacher in a public or private K-12 school setting. This degree program is offered on line.

Degree requirements: [Reading and Language - Non-Licensure](#) (pdf)*

*These programs may be taken online.

College of Fine Arts, Humanities & Social Sciences

The College of Fine Arts, Humanities and Social Sciences, led by [Dr. Luis Falcón](#), offers five programs of graduate study in Master of Arts and Master of Music. These degree programs are part of the University's commitment to develop regional and national economies by providing state-of-the-art educational programs beyond the bachelor's degree. A wide range of ongoing research and project opportunities exist within the various degree programs, and interdisciplinary study is emphasized. Graduates of these programs are heavily recruited both regionally and nationally by industry and governmental agencies.

[Faculty in College of Fine Arts, Humanities and Social Sciences](#) (pdf)

Graduate Programs Offered

Doctor of Philosophy (Ph.D.)

- Criminal Justice
- Global Studies

Master of Arts (MA) - degree awarded in the following fields:

- Community Social Psychology
- Criminal Justice
- Economic & Social Development of Regions
- Security Studies
- Peace and Conflict Studies

Master of Science (MS)

- Autism Studies
- Security Studies

Master of Music (MM) - degree awarded in the following fields:

- Music Education
- Sound Recording Technology

Current undergraduate students may be qualified for [bachelor/master degree programs](#).

Criminal Justice

School of Criminology and Justice Studies

Objectives of the Graduate Programs

The School of Criminology and Justice Studies offers three graduate programs. These distinct programs provide students with an educational experience designed to meet the diverse needs of graduates across a wide range of career venues, from positions in higher education, to research in private sector firms, to research, policy-making, and administrative positions in the public sector. Each of our graduate programs has been designed to accomplish a number of important objectives.

Please follow these program-specific links for more information:

- [Doctor of Philosophy](#)
- [Master of Arts](#)
- [Graduate Certificates](#)

Certificate Program

Graduate Certificates in Criminal Justice

The graduate program also offers six 12-credit certificates that are designed to meet the diverse needs of criminal justice professionals:

- [Criminal Justice Informatics](#)
- [Domestic Violence Prevention](#)
- [Forensic Criminology](#)
- [Leadership & Policy Development](#)
- [Security Studies](#)
- [Victim Studies](#)

Admission Requirements

In addition to the university's requirements for [graduate admission](#), applicants should have the ability to pursue graduate education, as demonstrated by:

1. Graduation from an accredited four-year institution.
2. Minimum undergraduate grade point average of 2.8 or higher.
3. Two copies of a complete and official transcript from each undergraduate and graduate institution attended.
4. An interview may be requested by the Graduate Admissions Committee.

[Graduate Certificate Application Form](#) (pdf)

Certificate Requirements

- University regulations do not allow transfer of class(es) from another institution for the graduate certificate program.
- Classes may count for both the Masters degree and one certificate program. The same class can not be used for two different certificates.
- Once the requirements for a certificate have been completed you must submit a Graduate Certificate Clearance Form. This form may be found on the Registrar's website under forms.
- Four courses must be completed within a five year period with a minimum of a 3.00 Grade Point Average and with no more than three credits below an earned grade of B (3.00).

Please note: The CRIM prefix refers to on-campus courses, while the 44 prefix identifies the online course.

Graduate Certificate in Criminal Justice Informatics

Graduate Coordinator:

Dr. Paul Tracy

CJGradAdvisor@uml.edu

978-934-4106

Criminal justice agencies are increasingly relying on computer/information technology for many tasks including administration, allocation of resources, criminal investigation, and research. This change has created a growing demand for criminal justice students with computer information technology (IT) skills. The certificate program is designed to provide students with the skills necessary to meet the growing technology demands in this field by emphasizing courses in computer applications, information management, and quantitative research. The certificate courses come from a variety of disciplines within the university to provide students with varied experiences.

Students who develop IT skills emphasized in these courses will be very marketable to prospective employers.

Required Courses (total of 6 credits):

- CRIM 590/44.580 Quantitative Research
- CRIM 576/44.599 Criminal Justice Intelligence and Information Sharing

Plus one of the following (one 3-credit course):

- CRIM 694/44.594 Crime Analysis and Mapping
- 57.514 Community Mapping
- 87.504 Geographic Information Systems

Plus one of the following (one 3-credit course):

- 32.633 Healthcare Database Design
- CRIM 658/44.642 Issues in Computer Crime and Cyber-Security

Graduate Certificate in Domestic Violence Prevention

Departments of the School of Criminology and Justice Studies and Psychology

Coordinators:

Dr. Paul Tracy

CJGradAdvisor@uml.edu

978-934-4106

Domestic violence is one of the major social and public health problems in the Commonwealth. The existing degree programs in Criminal Justice, Community Social Psychology, and the College of Health Sciences each offer relevant courses that greatly assist their graduates working with agencies and clients affected by domestic violence. The certificate provides a focused program for those working in settings where domestic violence is an issue. Courses may be applied to the relevant department's Master's degree program with the approval of the department's graduate coordinator.

Required Courses (one of the 3-credit courses in each of the four groups):

Group 1:

- CRIM 631/44.622 Intimate Partner Violence (cross-listed as 47.622)
- CRIM 632/44.623 Responding to Child Abuse and Mistreatment

Group 2:

- 32.625 Health Policy
- CRIM 520/44.503 Administration of Justice
- CRIM 630/44.522 Victimology
- 47.504 The Family System
- 47.511 Principles of Helping

Group 3:

- 32.613 Research Methods in PL and Environment
- CRIM 591/44.590 Research Design
- CRIM 695/44.595 Program Evaluation Methods
- 47.512 Applied Research Methods
- 47.611 Program Evaluation

Group 4:

- 32.616 Legal Issues in Health Services Administration
- 32.625 Health Policy
- CRIM 652/44.520 Social Ecology of Crime
- CRIM 603/44.560 Gender, Race, and Crime
- CRIM 631/44.622 Intimate Partner Violence (cross-listed as 47.622)
- CRIM 632/44.623 Responding to Child Abuse and Mistreatment
- CRIM 650/44.624 Violence in America
- CRIM 651/44.575 Criminal Homicide
- CRIM 655/44.563 Substance Abuse and Crime (cross-listed as 47.531)
- 47.500 Introduction to Community Social Psychology
- 47.523 Women in the Community
- 47.542 Working with Groups
- 47.551 Psychosocial Aspects of Maturity and Aging

Graduate Certificate in Forensic Criminology

Graduate Coordinator:

Dr. Paul Tracy
CJGradAdvisor@uml.edu
978-934-4106

The certificate is designed for students with current or potential careers in the fields of criminal justice, nursing/public health, law and paralegal studies, psychology, and social work who wish to expand their expertise in forensic criminology including mental health applications. Students in this program focus on populations being served by state and federal court systems, state and federal correctional systems, law enforcement agencies, mental health facilities, and juvenile facilities and are able to choose from a variety of courses appropriate for their own specific professional needs.

Required Courses: (Choose two of the following courses - 6 credits)

- CRIM 540/44.542 Criminal Profiling
- CRIM 541/44.543 Forensic Psychology
- CRIM 640/44.545 Criminal Mind and Criminal Behavior
- CRIM 641/44.546 Mental Health and Criminal Justice
- CRIM 650/44.624 Violence in America

Plus two of the following (two 3-credit courses for a total of 6 credits):

- CRIM 501/44.521 Criminological Theory
- CRIM 651/44.575 Criminal Homicide
- CRIM 630/44.522 Victimology
- CRIM 571/44.526 Domestic Terrorism and Hate Crimes
- CRIM 655/44.563 Substance Abuse and Crime (cross-listed as 47.531)
- CRIM 631/44.622 Intimate Partner Violence
- CRIM 632/44.623 Responding to Child Abuse and Mistreatment
- CRIM 642/44.646 Sex Crimes and Offenders

Graduate Certificate in Leadership & Policy Development**Graduate Coordinator:**

Dr. Paul Tracy
CJGradAdvisor@uml.edu
978-934-4106

The graduate certificate provides a focused program for criminal justice managers and administrators. This specialized education will increase the knowledge and skills necessary to administer delivery of high quality and cost effective services. This program is designed to respond to the changes taking place in the criminal justice field which require up-to-date management skills.

Required Courses (total of 6 credits):

- CRIM 521/44.570 Managing Criminal Justice Organizations
- CRIM 613/44.573 Law and Public Policy

Plus two of the following (total of 6 credits):

- CRIM 652/44.520 Social Ecology of Crime
- CRIM 522/44.541 Issues in Policing
- CRIM 524/44.550 Issues in Corrections
- CRIM 526/44.574 Economic Crime
- CRIM 591/44.590 Research Design
- CRIM 695/44.595 Program Evaluation Methods
- 47.546 Grant Writing
- 57.515 Politics and Economics of Public Policy

Graduate Certificate in Security Studies**Graduate Coordinator:**

Dr. Paul Tracy
CJGradAdvisor@uml.edu
978-934-4106

This graduate-level certificate program addresses the increasing global and local concern involving security issues. The program consists of three required courses plus one elective course that can be chosen from a list of courses in the student's particular area of interest.

After the tragedies of September 11, 2001, national policymakers called upon state and local law enforcement agencies to work together in strengthening our national defense. The formulation of the Homeland Security Act was a legislative effort to implement a "total" security infrastructure composed of federal, state, local, and private law enforcement agencies as well as a vast range of organizations that historically did not interface with one another.

Because of these recent changes in government, there is a growing need to understand the type of information gathering that occurs in these agencies, strategies for sharing the information while maintaining data quality, and ways to use the information for strategic planning, policy development and analysis. There are also concerns about how to go about gathering and analyzing this critical information without infringing upon the public's civil liberties and privacy rights.

In response to the demand for knowledge in this area, UMass Lowell's School of Criminology and Justice Studies has developed a graduate-level program designed to educate students in the complex nature of threats and how to manage them. Students can focus their studies in areas such as risk management and analysis; organizational and systems integration; legal and political policy and ethical issues in responding to threats; policy development and analysis; and the use of technology in implementing national security.

Intended Audience

The program is appropriate for students with a general interest in homeland security, professionals who are currently employed in security-related jobs, and for those interested in pursuing careers in security.

Required Courses (9 credits):

- CRIM 574/44.567 Overview of Homeland Security
- CRIM 572/44.549 Terrorism and Counter-Terrorism
- CRIM 575/44.568 Contemporary Security Studies

Plus one of the following (3 credits):

- CRIM 570/44.513 Crisis and Emergency Management
- CRIM 571/44.526 Domestic Terrorism and Hate Crimes
- CRIM 573/44.554 Threat Assessment and Risk Management
- CRIM 526/44.574 Economic Crime
- CRIM 694/44.594 Crime Analysis and Mapping
- CRIM 576/44.599 Criminal Justice Intelligence and Information Sharing

Graduate Certificate in Victim Studies

Graduate Coordinator:

Dr. Paul Tracy

CJGradAdvisor@uml.edu

978-934-4106

The Graduate Certificate in Victim Studies is a 12-credit program consisting of one required course (3 credits), one Victimization elective (3 credits), and two Skills and Knowledge electives (6 credits).

The purpose of the proposed Graduate Certificate in Victims' Studies is to provide multidisciplinary specialized knowledge of crime victim issues, crime victims' rights, and formal responses to victims so that students may apply that knowledge within their own professional context. Completion of the certificate will provide students with the background to understand strengths and limitations of current responses to crime victims so they can be a part of initiatives and programs to prevent crime victimization, be prepared to engage in research and evaluation focused on crime victims' issues, and respond effectively to victims of crime in a culturally appropriate manner.

Unlike many graduate certificates which are designed to provide specialized knowledge within a particular field, the Graduate Certificate in Victims' Studies is designed to provide specialized knowledge on crime victims that can be applied in a broad range of fields. The courses offered draw from programs in Criminal Justice and Criminology, Education, Psychology, and Regional Economics and Social Development. All students will take a core overview course in Victimology, one course about a specific type of victimization, and two courses pertaining to skills, theory and/or evaluation.

Elective courses are organized in clusters according to skills and knowledge content. These options are intended to guide students as to how they can tailor their education to their particular interests and/or professional needs. For example, a program director in a human services agency might take Program Evaluation or Grant Writing.

In recent semesters, a number of graduate students enrolled in the Criminal Justice Masters and certificate programs, who are working in victim services, have expressed an interest in taking more courses in that field through UML. In addition, many of our students who have completed our Domestic Violence Prevention Certificate have expressed interest in further course work which addresses the diverse range of victims of other types of crimes, e.g. identify theft, economic crime, and cyber stalking. Therefore, the proposed certificate is distinct from the Domestic Violence Prevention Certificate and will focus on crime victims more broadly and also include victims of crimes committed by non-family members and strangers.

Target Audience

The target audience for the proposed certificate includes professionals or potential professionals in fields that come in direct contact with victims of crime, as well as those who simply seek to better understand victimization. Some of the professionals this would include are those who provide direct services to victims, those who supervise victim programs, and those who come in contact with victims as a part of their professional lives. Some examples include victim advocates, prosecutors, health services workers, law enforcement and corrections personnel, youth services workers, social workers, journalists, and first responders.

Required course: (3 credits)

- CRIM 630/44.522 Victimology

Elective Courses:

Victimization Electives (choose one of the following 3 credit courses):

- CRIM 603/44.560 Gender, Race and Crime
- CRIM 631/44.622 Intimate Partner Violence (cross-listed as 47.622)
- CRIM 632/44.623 Responding to Child Abuse and Mistreatment
- 47.509 Psychological Approaches to Child Maltreatment (available online)

Skills and Knowledge Electives (Choose two of the following 3 credit courses):

Please note that clusters are suggested groupings based on student interest and their utility for application to current or potential employment. However, students are free to choose any two courses from the list.

Criminal Justice Cluster:

- CRIM 520/44.503 Administration of Justice
- CRIM 603/44.560 Gender, Race, and Crime
- CRIM 631/44.622 Intimate Partner Violence (cross-listed as 47.622)
- CRIM 632/44.623 Responding to Child Abuse and Mistreatment
- CRIM 650/44.624 Violence in America
- CRIM 651/44.575 Criminal Homicide

Policy Cluster:

- CRIM 613/44.573 Law and Public Policy
- 57.515 Politics and Economics of Public Policy

Program Director Skills Cluster:

- 47.546 or 57.546 Grantwriting
- 47.611 or 07.642 Program Evaluation

Psychology & Helping Cluster:

- 47.500 Introduction to Community Social Psychology
- 47.509 Psychological Approaches to Child Maltreatment (available online)
- 47.522 Psychology of Diversity
- 47.527 Immigrant Psychology and Communities
- 47.542 Working with Groups

Research & Evaluation Cluster:

44.590	Research Methods in Criminal Justice
OR	
47.512	Applied Research Methods
OR	
57.506	Research Methods
AND	
47.611	Program Evaluation
OR	
07.642	Program Evaluation
AND	
57.592	Qualitative Research Methods

PhD Program

Doctor of Philosophy in Criminology and Criminal Justice

- [Expected Academic/ Professional/Occupational Results](#)
- [Admission Requirements](#)
- [Degree Requirements](#)
- [Degree Program](#)
- [Doctoral Qualifying Exam](#)

- [Doctoral Dissertation](#)
- [Course of Study](#)

Expected Academic, Professional, or Occupational Results

The doctoral program is designed to achieve particular outcomes - to produce graduates who:

1. Will conduct interdisciplinary research and teach at both the graduate and undergraduate levels in aspects of criminology and/or criminal justice depending upon their specific areas of specialty.
2. Will be well prepared for analytical and administrative leadership posts in international and domestic research and policy institutions.
3. Can become policy analysts, managers, and administrators in criminal justice and community venues to help prevent crime in the first place, or alternatively, respond effectively to those who violate the law or who come into contact with the justice system.
4. Will be at the forefront of the expanding frontier of criminology and an ever evolving criminal justice system, and consequently, will more effectively be able to address crime control and criminal justice policy problems through sophisticated research than would be the case otherwise.

Admission Requirements

In addition to the general UMass Lowell requirements for admission, doctoral program applicants must demonstrate their ability to pursue doctoral level education as evidenced by:

1. Minimum undergraduate GPA of 3.25; or graduate GPA of 3.5 (for at least 24 credit hours).
2. Satisfactory Verbal and Quantitative scores on the Graduate Record Examination as demonstrated by an official score report.
3. Three letters of reference from individuals familiar with the educational (two letters minimum) and/or professional performance (maximum of one letter) of the applicant.
4. Two copies of complete and official transcript from undergraduate and graduate institutions.
5. A personal statement which indicates why the applicant wishes to pursue a doctoral degree in Criminology and Criminal Justice.
6. A writing sample: theoretical paper, research paper, or literature review.
7. An interview may be requested by the Graduate Admissions Committee.
8. International applicants must provide official TOEFL scores.
9. The Graduate Admissions Committee can accept transfer credit for graduate courses from an accredited university with a grade of ?B? or better. Transfer credit can be awarded:
 - up to 24 credit hours if applicant has not completed a Master's degree
 - 30 hours for a completed Master's.

Transfer credit will only be awarded for graduate courses that are substantially similar to ours. Applicants are required to submit Course Descriptions and Course Syllabi for each course.

Degree Requirements

The doctoral degree in Criminology and Criminal Justice is a 60 credit-hour doctoral program. The curriculum has been developed to incorporate a theoretically grounded and methodologically sophisticated set of courses as a highly necessary foundation for the evidence driven and "best practices" approaches to the substantive concentration areas. In order to deliver this curriculum effectively, the course work contains three progressive tiers. The three tiers are hierarchical and build upon one another. There are multiple measures to assess student learning throughout the three tiers. The basic layout of the doctoral program is depicted below. Please download the [Graduate Programs Guide](#) for further information on the three tiers of course work and complete descriptions of all degree requirements and procedures.

Degree Program

During the first year of full-time study, students will enroll in the Tier I courses. Tier I provides for 33 credit hours of study and encompasses 27 credit hours for 9 courses in four core areas that provide crucial foundation knowledge on which the rest of the doctoral curriculum is based. These core areas are: (A) Theory; (B) Methodology and Statistical Analysis; (C) Crime & Justice Policy; (D) Extent and Correlates of Crime. Tier I also includes 2 courses, 6 credit hours, in Electives.

Program Component	Courses	Credit Hours
Tier I: Core Courses		
Eight Required Courses; 3 choices = 11 total		
A. Theory - two required courses	2	6
B. Methodology - three required courses	3	9
3C. Crime and Justice Policy - one required; one choice	2	6
D. Extent and Correlates - two required courses	2	6
E. Electives - two choices	2	6
Total Tier I	11	33
Tier II: Advanced Methods and Concentrations		
One Required Core Course; 4 choices = 5 total		
A. Methods - one required; two choices	3	9

B. Concentration - two courses chosen by student	2	6
Total Tier II	5	15
Tier III: Dissertation Research		
Four Required Core Courses		
A. Dissertation Seminar - two required courses	2	6
B. Concentration - two courses chosen by student	2	6
Total Tier III	5	12
Program Total	20	60

During the second year of full-time study students are involved in the Tier II component of the doctoral program. Tier II contains advanced work in methodology and statistical analysis as well as the five areas of research and teaching concentration or specialization: (A) Justice System and Policy; (B) Crime, Criminals, and Community; (C) Victims, Crime and Justice; (D) Global Perspectives on Crime and Justice; and (E) Technology and Criminal Justice. A student will choose one of the five areas and then a minimum of two courses in the specialty area.

Doctoral Qualifying Exam

Students are required to sit for the doctoral qualifying exam after completing the 36 hours of course work in Tier I. The qualifying exam will test students' knowledge in the four core areas: (A) Theory; (B) Methodology and Statistical Analysis; (C) Crime & Justice Policy; and (D) Extent and Correlates of Crime. The exam will be constructed and graded by the Doctoral Examination Committee.

Doctoral Dissertation

The dissertation is a manuscript-length original work initiated and completed independently by the doctoral candidate. This work typically includes an introduction, literature review, outline of hypotheses, discussion of data and methodology, a series of analytical chapters, and a conclusion/discussion chapter of results and implications. There is a rigorous process at all stages of the doctoral dissertation. The steps in this process are as follows:

1. Prepare a proposal draft that outlines the project that the student intends to undertake.
2. Selection of a formal dissertation committee consisting of four department faculty. The Chair of the committee must be a tenured faculty member.
3. Defense of the proposal by the student before the committee and such other members of the faculty and the public who choose to attend the defense. The proposal is announced publicly throughout the university at least two weeks before the scheduled defense.
4. After successful defense of the proposal, the student is advanced to doctoral candidacy and begins preparing the dissertation under the guidance of the dissertation committee.
5. Once the committee has approved the work as ready for the final defense, a doctoral candidate proceeds to a formal oral defense of the dissertation before the committee, other faculty, and members of the public. The final dissertation defense is announced at least two weeks prior to the defense date. The committee may accept, accept subject to minor changes, require major changes, or reject the dissertation.
6. Upon acceptance by the committee, the work(s) must meet all requirements by the Graduate Dean's office for formatting and processing. Both the traditional dissertation and the three-paper option must be in compliance with university requirements. Students must provide bound copies of this work to their committee as well as any university offices set forth by the Vice Provost for Graduate Education.

Course of Study

In addition to the two Tier I electives, students are allowed to choose the Tier II area of specialization in which they will concentrate their independent courses and research that will lead to the dissertation. Students should meet with their advisor to develop an individualized course of study that best meets their interests and needs.

Master's Program

Master of Arts in Criminal Justice

- [Expected Academic/ Professional/Occupational Results](#)
- [Admission Requirements](#)
- [Degree Requirements](#)
- [Bachelor's/Master's \(BS/MA\) Option](#)
- [Degree Program](#)
- [Master's Thesis](#)
- [Course of Study](#)

Expected Academic/ Professional/Occupational Results

It is anticipated that the master's and certificate programs will serve four types of students:

1. Those seeking a terminal master's degree as a prerequisite for entry into the criminal justice field.
2. Those currently in service in the criminal justice system who seek to broaden their skills and obtain job-related knowledge and

expertise.

3. Those currently in the criminal justice system seeking to specialize and/or work in some other area of the system.
4. Those currently in the system or pre-service who wish to obtain the training and expertise necessary to meet the growing need for teaching criminal justice at the community college level. In addition, the program will meet the needs of students preparing for doctoral work in criminal justice or related fields. Off-campus graduate courses have been offered in Boston, Woburn, and Bedford, and varied with each semester. Selected courses are also offered via the Internet.

Admission Requirements

In addition to the university requirements for graduate admissions, applicants should have the ability to pursue graduate education, as demonstrated by:

1. Graduation from an accredited four-year institution.
2. Minimum undergraduate grade point average of 2.8 or higher.
3. Acceptable scores on the Graduate Record Examination Aptitude Test or Millers Analogy Test.
4. Three letters of reference from individuals familiar with the educational and/or professional performance of the applicant.
5. Two copies of a complete and official transcript from each undergraduate and graduate institution attended.
6. An interview may be requested by the Graduate Admissions Committee.
7. Subject to departmental approval, a maximum of 12 credits of graduate level coursework taken at an accredited university outside of UMass Lowell with a grade of B or better may be transferred into the Criminal Justice master's degree program.
8. Prospective applicants may take a maximum of two classes at UMass Lowell as a non-degree student which may be transferred into the master's program.

Students with a Bachelor's degree from an accredited program who have an undergraduate grade point average between 2.5 and 2.8 may, with the permission of the Graduate Coordinator, take limited courses as non-degree students. These non-degree students should take CRIM 580/44.501 Foundations of Criminal Justice Scholarship and CRIM 520/44.503 Criminal Justice System or other courses with approval. If they successfully complete these two courses with a grade of B or better, they may then make formal application to the program, submitting all required credentials. The Graduate Committee of the School of Criminology and Justice Studies then will review all relevant information and make a decision regarding admission to the program.

A maximum 6 credits of graduate level course work taken at an accredited university outside of UMass Lowell with a grade of B or better may be transferred into the Criminal Justice master's degree program.

Degree Requirements

You must complete a minimum of thirty-three (33) credits for the Master of Arts Degree, including a Core Course Sequence of fifteen (15) credits, which includes the following required courses:

Please note: The CRIM prefix refers to on-campus courses, while the 44 prefix identifies on-line courses.

1. CRIM 501/44.521 Criminological Theory: Foundations
2. CRIM 520/44.503 Criminal Justice System
3. CRIM 590/44.580 Quantitative Analysis in Criminal Justice
4. CRIM 591/44.590 Research Design
5. CRIM 580/44.501 Criminal Justice Scholarship **OR**
6. CRIM 613/44.573 Law and Public Policy **OR** CRIM 521/44.570

In addition, all students may choose to complete CRIM 583/586/44.743/44.746 Master's Thesis (6 credits). If you do not undertake the thesis option, two additional classes must be taken to complete the six credit hours.

You should meet with your academic advisor to develop an individualized course of study to meet your degree requirements.

Bachelor's/Master's (BS/MA) OPTION

Outstanding undergraduate Criminal Justice majors at the University of Massachusetts Lowell may enroll in a B.S./M.A. program that allows students to complete both degrees in five years (in many cases).

[Additional information and how to apply](#)

Degree Program

During the first year of full-time study, students emphasize the five core courses. The decision to complete a thesis should be made before the completion of 24 credits. Full time students will enroll in thesis during the second year of study. Selected specialty courses will be taken during the second or subsequent year. With the approval of the academic advisor, students may select up to nine credits of graduate level courses in other programs at the university. Students will be assigned an academic advisor, usually the Graduate Coordinator, when entering the program. Students will be required to maintain a 3.0 cumulative average. If a student should receive a grade below a B, the academic advisor will meet with the student to discuss methods of improving performance. No more than six credits below a B may be counted toward the degree. If a student should receive a second grade below a B, there will be a review by the Graduate Committee for such actions as a warning, probation, or loss of degree candidacy. Such action will be subject to the approval of the Graduate Dean. All requirements for the degree must be completed within five years of the time the student was first admitted as a matriculated student.

Master's Thesis

The thesis will be completed under the direction of a mutually acceptable thesis advisor. The thesis proposal must be approved by the thesis committee. An approved copy of the proposal will be filed with the Graduate Coordinator. The thesis will represent the student's ability to formulate, carry out, and present a significant research project. A defense of thesis will be conducted before a panel including the thesis advisor (chair), and the committee members chosen by the student and approved by the Graduate Coordinator. Thesis forms and guidelines are available.

Course of Study

Once the majority of the required core courses are completed, students are free to choose the remaining courses in their program of study. Students should meet with their advisor to develop an individualized course of study that best meets their interests and needs.

Economic & Social Development of Regions

Economic and Social Development of Regions Program

Graduate programs offered:

- [Master of Arts in Economic and Social Development of Regions](#)
- [Graduate Certificate: Economic & Social Development of Regions](#)
- [Bachelor's-Master's Program](#)

Program Objectives

The College of Fine Arts, Humanities, and Social Sciences offers an interdisciplinary, advanced certificate and Master's programs to prepare students to understand, analyze, and intervene in the economic development of regions. By development, we mean strengthening people's ability to meet their varied needs. This includes expanding the capacity to produce, but also includes strengthening the capacity to carry out constructive social activity (such as democratic decision-making) it is both economic and social. The regions involved can range from a single neighborhood to an entire continent.

The degree program has three main objectives. The first is to provide students with a profound and practical understanding of the dynamics of development processes. Second, the program trains students in research skills that are useful for analyzing and tackling development problems. Third, students learn practitioners' tools for solving such development problems - tools that can be useful in a variety of settings including businesses, government agencies, and nonprofit organizations. The program offers students flexibility in choosing the appropriate mix of research and practitioner skills to meet their needs and interests.

Graduate Certificate Program

Economic & Social Development of Regions

Contact:

[Dr. Philip Moss](#)

978-935-2787

[Dr. Robert Forrant](#)

978-934-2904

The 12 credit certificate offers graduate level instruction to students interested in understanding, analyzing, and intervening to enhance the economic and social development of regions. It provides students with a strong grounding in the conceptual tools and the information needed to participate effectively in the development of neighborhoods, states, or nations.

Required Courses (all students):

- 57.513 Foundations of Comparative Regional Development (3 credits)

Plus two of the following seven core courses (Total of six credits):

- 57.503 Work, Technology, and Training (3 credits)
- 57.506 Research Methods in Economic and Social Development (3 credits)
- 57.511 Dynamics of Power and Authority, Diversity, and Inequality (3 credits)
- 57.537 Developing Economies
- 57.592 Qualitative Research Methods
- 57.593 Advanced Quantitative Methods
- 57.598 Organizational Dynamics in Regional Development

AND One Approved Elective (3 credits)

[About Graduate Certificates](#)

Focus Areas

Master's Program Focus Areas

The Master of Arts in Economic and Social Development of Regions allows students to focus their elective courses in a particular topic or policy area of personal or professional interest. Students are not obligated to follow any of these focus areas but may take any elective courses he or she prefers and build their own curriculum. However concentrating on a specific focus area may better suit the student's interests or better further their career or educational goals.

Below are the six focus areas in which students may direct their studies:

[Policy at the National, State, and Local Level](#)
[Global Development and International Policy](#)
[Community Development, Social Policy, and Non-Profit Management](#)
[Innovation, Technology, and Policy](#)
[Environment and Sustainability](#)
[Research Methods](#)

Policy at the National, State, and Local Levels

This area is largely focused on US policy. Courses in this area explore public policy in terms of labor, gender, social welfare, as well as sustainable housing, and municipal management.

Suggested Courses:

57.511 Dynamics of Power & Authority
57.515 Politics & Economics of Public Policy
57.520 Inequality & Organization
57.527 Sustainable Housing Development & Land Use
57.525 Gender, Work and Public Policy
57.545 Political Economy of Employment
57.507 Municipal Management

Courses in other programs:

32.625 Health Policy
44.573 Law and Public Policy
44.503 Administration of Criminal Justice
44.546 Mental Health & Criminal Justice

Global Development and International Policy

This focus area addresses globalization, links between local, regional and national policy issues and the impact of international politics, trade and development on domestic policy. Students study development strategies, migration, gender roles, poverty, patterns of trade, the major institutions that influence trade finance and development, and the changing international division of labor and capital.

Suggested Courses:

57.513 Foundation of Comp. Reg. Dev.
57.520 Inequality & Organization
57.537 Developing Economies
57.539 Justice & Trade in the Global Economy
57.540 China & India/Global Economy
57.552 Enterprise in Latin America
57.605 Social Movements

Courses in other programs:

49.410 Economic Growth and Development
49.403 Topics in International Economics and Trade
57.558 Peace & Conflict Field Exp
47.527 Immigrant Psychology and Communities
43.304 European Social and Economic History
66.511 Global Enterprise and Competition (2 credits)
19.653 Globalization, Work, and Health

Community Development, Social Policy, and Non-Profit Management

Understanding sustainable development strategies requires a deep comprehension of the dynamics of community economic development, community politics and community practice. Students who focus in this area address urban development strategies, sustainability, community inclusion in decision making, land use policy and planning, and management of non-profit organizations.

Suggested Courses:

57.598 Org. Dynamics & Regional Dev.

57.508 Budget/Policy, Plan, & Info Tool
57.512 Community Conflict Resolution
57.527 Sustainable Housing Dev & Land Use
57.532 Advanced Community Dynamics
57.535 Community-based Planning
57.546 Grant Writing
57.514 Community Mapping with GIS

Courses in other programs:

66.480 Special Topics: Nonprofit Management
62.496 Special Topics: Marketing for Nonprofits
32.627 Socioeconomic Inequalities in Health
47.527 Immigrant Psychology and Communities
47.500 Introduction to Community Social Psychology
47.502 Seminar in Community Social Psychology
47.503 Applied Social Psychology
47.505 Work and Family
47.523 Women in the Community
47.542 Working with Groups
47.545 Community and Organizational Change
47.625 Advanced Community Dynamics: Lowell
42.506 Writing in the Community
44.560 Gender, Race & Crime
44.622 Intimate Partner Violence
44.574 Economic Crime
05.630 Educating Diverse Populations
05.622 Financial Aspects of Educational Administration
05.652 Managing Change and Conflict
60.501 Financial Accounting (2 credits)
61.501 Business Financial Analysis (2 credits)
62.501 Marketing Fundamentals (2 credits)
63.501 Operations Fundamentals (2 credits)

Innovation, Technology, and Policy

Students who focus in this area study the sources of competitive leadership among countries and within industries. They become skilled at industry studies that involve the theory and sources of innovation, the path of technology design, competitive strategies, the role of financial strategies and skill development strategies in the innovative trajectory of industries and firms, and the impact of offshoring and global relocation on employment and on particular regions.

Suggested Courses:

57.503 Work and Technology
57.514 Community Mapping
57.545 Political Economy of Employment
57.520 Inequality & Organization
57.519 Science, Tech & Economy
57.540 China & India/Global Economy

Courses in other programs:

64.650 Innovation & Emerging Technology
66.480 Current Topics in Management: Business Ethics
66.501 Organizational Behavior (2 credits)
19.500 Analytic Context of Work Environment
19.643 Healthy Work Organization
47.526 Workplace Diversity

Environment and Sustainability

Environmental issues are some of the most important challenges facing communities at the local, national, and global level. This focus area introduces students to some of the most significant issues arising from the connections of economic activity and economic development to the quality and sustainability of the environment. Students learn skills in the economic and political analyses relevant to the design and implementation of policy alternatives that have emerged domestically and globally over the last 40 years or so. From global climate change to brownfields, concern about environmental damage has created a rich legacy of economic and political analysis, policy, and politics to which students are exposed through the courses in the focus area.

Suggested Courses:

57.518 Politics of Climate Change
57.567 Introduction to Environmental and Natural Resource Economics
57.527 Sustainable Housing and Land Use

Courses in other programs:

- 19.500 Analytic Context of the Work Environment
- 19.550 Environmental Law & Policy
- 19.651 Work Environment Policy and Practice
- 19.550 Environmental Law & Policy
- 32.616 Law and Ethics in Healthcare
- 44.547 Economic Crime
- 87.504 Geographic Information Systems
- 87.572 Energy and the Environment

Research Methods

Student can put together a set of courses that will develop qualitative or quantitative skills to support jobs or further education that is oriented to research.

Suggested Courses:

- 57.506 Research Methods
- 57.592 Qualitative Research Methods
- 57.522 Research Ethics with Underserved Groups
- 57.546 Grant Writing
- 57.515 Politics and Economics of Public Policy
- 57.514 Community Mapping with GIS

Courses in other programs:

- 19.680 Intro to SAS
- 19.674 Applied Biostatistical Methods
- 19.689 Advanced Regression Modeling
- 47.512 Applied Research Methods
- 46.611 Program Evaluation
- 92.570 Probability and Statistics
- 92.591 Statistical Modeling and Linear Regression Analysis
- 92.593 Experimental Design

Master's Program

Master of Arts in Economic and Social Development of Regions

The Master of Arts in Economic and Social Development of Regions is designed to serve students from a variety of backgrounds. It attracts recent undergraduates from liberal arts fields such as social sciences (Economics, Sociology, Psychology, Political Science) and History, and also from practice-oriented fields such as Management, Education, and Engineering.

For those already working in public or private sector fields related to economic and social development, it can enhance skills and provide opportunities for career advancement. It is specifically designed to speak to the interests of international students as well as domestic ones.

Graduates of the program will be prepared to assume professional roles in local, state, and national government agencies (in the United States and abroad); in research, consulting, and planning aspects of business; and in non-profit organizations working on economic or social development. Students who choose to do so will also be prepared to go on to doctoral programs in social sciences, history, public policy, planning, and management.

In the Master's program, courses can be selected to address the student's particular interests in one of six [Focus Areas](#):

1. Policy at the National, State, and Local level
2. Global Development and International Policy
3. Community Development, Social Policy, and Non-Profit Management
4. Innovation, Technology, and Policy
5. Environment and Sustainability
6. Research Methods

Admissions Requirements

The Economic and Social Development of Regions Master's program at the University of Massachusetts at Lowell is designed not only for recent college graduates, but also for older, non-traditional, and mid-career students with experience in a variety of work and community settings. The requirements for admission include:

1. Bachelor's degree from an accredited institution college or university.
2. An undergraduate grade point average of 3.0 or better. Applicants must submit an official transcript from their undergraduate

institution.

3. Acceptable scores on the Graduate Record Examination Aptitude Test. (Use of GMAT scores may be approved by the graduate coordinator.) Students for whom English is not a national language must also submit a score for the Test of English as a Foreign Language (TOEFL).
4. Three letters of reference from individuals familiar with the educational and/or professional performance of the applicant.
5. A personal letter including a statement about the applicant's professional interests, educational and work qualifications, and future goals.
6. A curriculum vitae summarizing education and work experience.
7. An interview may be requested by the Graduate Admissions Committee.
8. Proof of residency.

Students may be admitted in one of two categories:

1. Matriculated student. A fully accepted degree candidate who meets all criteria.
2. Matriculated with conditions. From time to time, a student may be accepted conditionally into the program. To become a fully matriculated student, the student must receive at least a 3.0 grade point average in nine credit hours of Economic and Social Development of Regions graduate level courses, while also completing any conditions established by the Graduate Admissions Committee. Conditional matriculation requires that students meet conditions 1 and 2 above.

Part-Time and Full-Time Study

MA students may attend either full-time or part-time. Most courses will be scheduled in the evening. Courses will be offered in fall and spring terms, and some courses may be available during the summer. Students taking a full-time load of 12 credits per semester can finish the program in three semesters. Students taking 9 or more credits in a semester will be considered full-time students.

Transfer Credit

Matriculated students in Economic and Social Development of Regions may transfer up to 12 credits of course work completed at other accredited universities, provided that such courses are within the content area of Regional Economic and Social Development, and do not involve credit for field experience or professional work. Such transfer credit is subject to the approval of the Department Graduate Curriculum Committee and the Registrar's Office, and all University policies governing graduate transfer credit.

Degree Requirements

A total of 30 (for project) or 33 (for thesis) academic credits, at least 18 of which must be taken at the University of Massachusetts at Lowell with a grade average of B or better, is required for completion of the degree.

The course of study includes two compulsory core courses (six credits):

- 57.506 Research Methods in Economic and Social Development
- 57.513 Foundations of Comparative Regional Development

The course of study must also include three of the following six courses (9 credits):

- 57.503 Work, Technology, and Training
- 57.511 Dynamics of Power and Authority, Diversity, and Inequality
- 57.537 Developing Economies
- 57.592 Qualitative Research Methods
- 57.593 Advanced Quantitative Methods
- 57.598 Organizational Dynamics in Regional Development

Students are also required to complete an additional 12 credits of course credits, and either six credits of thesis or three credits of project. The 12 credits of additional course requirements can be satisfied in a wide variety of ways. Students are encouraged to take advantage of six [focus areas](#) that specify additional course work in particular areas. However, students are also encouraged to tailor their program to achieve their own learning and career goals, by combining courses, independent study, and practica as appropriate.

Non-core course selections must be approved in advance by the student's graduate advisor.

Thesis or Project

The capstone to the degree program is a thesis or project demonstrating the student's mastery of the field. Typically, the thesis (6 credits) involves a substantial piece of research in economic and social development, whereas the project (3 credits) involves carrying out and documenting a professional problem-solving activity. In some cases, more in-depth problem-solving activities may qualify for thesis status. Thesis or project work is supervised on an ongoing basis by the student's thesis/project supervisor.

Graduate Advisor

Each newly matriculated student in the program will be assigned to an academic advisor from among the faculty of the graduate program. The student will meet with his/her academic advisor on a regular basis throughout the course of study to discuss course selections, planning for practica, and the development of the thesis or project. In particular, all non-core course selections require prior approval from the academic advisor. Each student will, in addition, select a faculty member to supervise his/her thesis or project. The student will retain his/her academic advisor to provide guidance on selection of remaining courses.

[BAMA and BS/MA Options](#)

Undergraduate majors in related fields at the University of Massachusetts at Lowell may enroll in a BA/MA or BS/MA program that allows eligible students to complete both degrees in five years. Application for this program typically occurs in the junior year and applicants must meet all eligibility requirements, including a minimum 3.0 cumulative GPA. Additional information is available from the Graduate Coordinator.

Graduate Certificates - Music

Graduate Certificates - Music Department

The Music Department offers the following graduate certificate:

School-Based Music Methods:

Contact:

Dr. Gena Greher
978-934-3893

Gena_Greher@uml.edu

This 15-credit graduate certificate consists of courses in Instrumental and/or Vocal Pedagogy; Choral and Instrumental Repertoire; General Music Methods. The courses are designed so that, upon successful completion, the candidate may apply for admittance into our Master of Music in Music Teaching (leading to initial licensure in Massachusetts).

Admissions Requirements:

- Proof of a baccalaureate degree from an approved music program with a minimum 3.0 GPA
- MTEL recommended
- Graduate Certificate Application Form
- Application Fee

PLEASE NOTE: There are no electives in this graduate certificate, though it is suggested that students also register for ensembles.

Instrumental/Vocal Pedagogy Courses: Choose 3 of the following one credit courses (total 3 credits):

- 73.501 Introduction to Brass Pedagogy
- 73.502 Introduction to Brass Pedagogy (cont. of 73.501)
- 73.503 Introduction to Guitar Pedagogy
- 73.504 Introduction to Woodwinds Pedagogy
- 73.505 Introduction to Woodwinds Pedagogy (cont. of 73.504)
- 73.506 Introduction to Percussion Pedagogy
- 73.507 Introduction to Strings Pedagogy
- 73.508 Introduction to Strings Pedagogy (cont. of 73.507)
- 73.516 Introduction to Voice Pedagogy
- 73.517 Introduction to Voice Pedagogy (cont. of 73.516)

Repertoire Courses: (6 credits)

- 73.542 Instrumental Repertoire and Rehearsal Techniques (3 credits)
- 73.563 Choral Repertoire and Rehearsal Techniques (3 credits)

Methods Courses: (Choose 2 - total of 6 credits)

- 73.544 General Music Methods 1 (3 credits)
- 73.545 General Music Methods 2 (3 credits)
- 73.500 Global Music for Classroom (3 credits)
- 73.583 Intro to Technology Applications for the Music Classroom (3 credits)

Master's Programs in Music

Master's Programs in Music

The Music Department offers the following graduate degrees:

- [Master of Music in Music Education](#)
- Teaching Option - [Master of Music in Music Education](#)
- [Master of Music in Sound Recording Technology](#)

The Music Department also offers the following graduate certificate:

- [School-Based Music Methods](#)

Master of Music in Music Education

Program Objectives

The Master of Music (M.M.) in Music Education degree program provides advanced study of music teaching and learning and professional preparation for those engaged in or aspiring to a career as a music teacher. The degree program consists of two options: a research-based thesis option for fully-certified music teachers and a teacher certification option for newly-certified music teachers who are in the process of earning their initial certification. The degree program is designed to facilitate students' growth and development as leaders in the profession of music education; as creative problem solvers and innovative thinkers; as individuals who love music and the arts and utilize their knowledge of and enthusiasm for music to inspire students; and as contributors, through research, to the profession and discipline of music education. The Music Education curriculum is based on the belief that music educators must have comprehensive knowledge of the subject matter of music, an awareness of current theory and practice in music education, and an understanding of recent curriculum developments and contemporary issues in general education.

Admission Requirements

In addition to the admission requirements for all applicants to the Master of Music programs, applicants to the music education program must submit:

1. Resume
2. For the thesis option:
 1. verification of initial certification in music and/or proof of music teaching experience
 2. a sample of your scholarly writing about music or music education. This may be a term paper or research paper written in any baccalaureate level music class, providing evidence of writing skills and potential for writing at the level of a graduate thesis.
3. For the certification option:
 1. verification of preliminary certification and proof of music teaching experience or provisional certification, with advanced standing
 2. an essay of at least three typewritten pages addressing the following:
 4. the applicant's purpose and specific objectives in pursuing graduate study in music education
 5. the applicant's philosophy of education in general and arts education in particular

Program Requirements - Certification Option

- Graduate Core Courses (71.510, 75.510, and program-specific research course)
- Research in Music Education
- Music Theory Elective
- Music Elective*
- Seminar in Music Education
- Music Education Elective
- Multicultural Music Education
- Clinical Experience
- Project Report
- Music History Elective
- Music Electives

*Music Electives may be applied music, ensembles, theory, history, or conducting in addition to music education.

Program Requirements - Research/Thesis Option

- Graduate Core Courses (71.510, 75.510, and program-specific research course)
- Research in Music Education
- Music Theory Elective
- Ensemble
- Applied Lessons
- Seminar in Music Education
- Music Education Elective
- Music Education Elective
- Thesis
- Ensemble
- Applied Lessons
- Music History Elective
- Music Electives*

*Music Electives may be applied music, ensembles, theory, history, or conducting in addition to music education.

Master of Music in Sound Recording Technology

Concentrations:

- Technical
- Production

Program Objectives

The Master of Music in Sound Recording Technology program is designed to provide graduates with in-depth knowledge of current and experimental audio technologies, sound recording technology, production practice, and research practices and techniques. The careers of the recording industry form the point of reference for the entire audio industry. They create a baseline of (1) the technical and creative skills required to execute production projects and (2) the technology requirements of the production process, the development of consumer products, and work in the media. The MM:SRT program is focused on providing this knowledge and the related creative abilities.

Admission Requirements -

First-Year Students

For first-year students to be accepted into the program, they must have

- completed an undergraduate degree comparable to UMass Lowell's Bachelor of Music: Sound Recording Technology program, containing course work equivalent to the following:
 - Sound Recording Technology Courses:
 - Critical & Analytical Listening
 - Recording Production (w/lab)
 - Audio Theory (w/lab)
 - Recording Industry
 - SRT Internship
 - Introduction to Recording
 - Multi-track Production
 - Recording Studio Repair and Maintenance
- Music Courses
- Music Theory 3 and 4
- Keyboard Skills
- Ensemble Experiences
- Aural Skills 4
- Applied Music 6
- Conducting 2
- Math and Science Courses:
 - Calculus 2
 - Intro to Physics (w/lab)
 - Acoustics & Psychoacoustics (78.390)
 - Computer Science for SRT Applications (91.211)
 - Fundamental Electronics for Sound Recording (16.214)
- shown suitable production skill and experience, as evidenced in a recording submitted with detailed documentation
- passed the MM:SRT Entrance Exam
- submitted a completed application to the Graduate Admissions Office, including an acceptable Statement of Career Objectives and Interests, and received acknowledgement of receipt
- submitted three letters of recommendation, which evidence the student's preparedness for graduate study in the MM:SRT program

Admission Requirements -

Transfer students

Transfer students must meet all of the requirements for admission to the MM:SRT program and the requirements listed in the Transfer Credit section of the UMass Lowell Graduate Catalog. Potential applicants for transfer are cautioned that, because of the uniqueness of the MM:SRT program, it is unlikely that courses from other institutions will be transferable.

A transfer applicant's transcript(s) will be evaluated by SRT faculty, and any deficiencies in the applicant's background will become "conditions" on full matriculation into the MM:SRT program. A condition is simply a course or courses required for entrance to the MM:SRT program. Conditions are listed on the acceptance letter from the Graduate Admissions Office. Ordinarily, a condition is removed by passing the course(s) listed on the acceptance letter with a grade of C or better. Conditions must be removed before a student can be cleared for the awarding of the degree. Students should file an academic petition for fully matriculated status with the Graduate Coordinator when they believe they have fulfilled all their conditions. Courses taken to fulfill conditions are above and beyond the requirements for the degree and do not count for graduate credit. In addition, passing the graduate level course for which the condition course is a prerequisite does not constitute fulfillment of the condition.

Program Requirements

The MM:SRT program requires the following:

1. Graduate Core Courses (71.610, 78.650, and 76.xxx ensemble participation)
2. a select group of three 3-credit required courses in SRT
3. either a thesis (six credits) or an SRT recording project (six credits), which will be carried out under the guidance of an SRT faculty member
4. elective studies in areas supporting a capstone project, and free electives

Program Concentrations

Students must select either a Technical or Production Concentration. These concentrations allow the student to specialize in the technical/research or the artistic/production sides of the audio industry. The capstone project (either the thesis or the recording project) is the principal distinguishing element of each specialization. It is supported by an elective course agreed upon with the student's faculty advisor, who will also often be the thesis or recording project advisor.

The Technical Concentration

The Technical Concentration requires the student to complete the SRT masters thesis and at least one technical elective course that is approved in advance by the student's faculty advisor. The course of study for Technical Concentration students will be as follows:

1. Major Field (15 credits)
 - 78.520 Recording Analysis (3)
 - 78.630 Technologies of Audio (3)
 - 78.640 Production Practicum (3)
 - 78.743 SRT Masters Thesis (6)
2. Music Core (9 credits)
 - 71.610 Structure, Context, and Style (3)
 - 78.650 Research in SRT (3)
 - 76.xxx Ensemble Participation (3)
3. Electives (6 credits)
 - Technical elective (3)
 - Free elective (approved by the faculty advisor) (3)

The Production Concentration

The Production Concentration requires the student to complete the masters recording project and at least one production elective related to their capstone project. Two other electives, approved in advance by the student's faculty advisor, are required. The course of study for Production Concentration students will be as follows:

1. Major Field (15 credits)
 - 78.520 Recording Analysis (3)
 - 78.630 Technologies of Audio (3)
 - 78.640 Production Practicum (3)
 - 78.740 Masters Recording Project (6)
2. Music Core (9 credits)
 - 71.610 Structure, Context, and Style (3)
 - 78.650 Research in SRT (3)
 - 76.xxx Ensemble Participation (3)
3. Electives (6 credits)
 - Production elective (3)
 - Free elective [approved by the faculty advisor] (3)

Master of Music in Music Education: Teaching Option

Objectives of the Master of Music in Music Education, Teaching Option

The Master of Music in Music Education, Teaching Option is the graduate segment of the music teacher preparation/certification program at the university. Graduates of the Music Studies program, upon the successful completion of the Massachusetts Tests for Educator Licensure (MTEL), apply directly for the Master of Music in Teaching degree. Upon completion of the M.M. degree program, students may file an application to the Massachusetts Department of Education for initial licensure and become fully certified teachers in Massachusetts.

Admission Requirements

1. Applicants must possess a bachelor's degree or its equivalent with a major in music. Applicants who possess an undergraduate degree in music education will not be considered for admission to the Master of Music in Teaching degree program, as these students will have completed their student teaching and obtained initial teacher certification. Those applicants will be considered for admission to the Master of Music in Music Education degree program.
2. Applicants for the MM in Teaching degree program must present evidence of having passed all parts of the Massachusetts Teachers' Test.
3. Official transcripts from each undergraduate and graduate school previously attended must be submitted directly to the Graduate Admissions Office.
4. An official copy of the applicant's scores obtained on the Graduate Record Examination must be mailed directly to the Graduate Admissions Office.
5. Three letters of recommendation from persons who are qualified to evaluate the applicant's academic and professional abilities.
6. Applicants must have taken course work equivalent to the University of Massachusetts Lowell Bachelor of Music in Music Studies degree.

Program Requirements

- Graduate Core Courses (71.510, 75.510, and program-specific research course)
- History/Theory Course
- Performance Course

- Music Education Elective
- Apprentice Teaching
- Diversity in the Classroom
- Child Development and Assessment for Learning
- Foundations of Music Education

Music

Department of Music

Graduate Programs Offered:

- [Master of Music in Music Education](#)
 - [Teaching Option](#)
- [Master of Music in Sound Recording Technology](#)
- [Bachelor's-Master's Program](#)

Graduate Certificate Offered:

[School-Based Music Methods](#)

Objectives of the Graduate Programs in Music

The graduate programs in Music are committed to the continued acquisition of musical knowledge and professional competence and the development of research skills. The specific objectives of the various degree programs are listed under the individual program descriptions.

General Requirements for Admission

Applicants for admission to the Master of Music degree program must possess a bachelor's degree or its equivalent with a major in music. Those holding degrees in other disciplines will be expected to take prerequisite undergraduate courses for no graduate credit to bring their skills to a level commensurate with that attained by an undergraduate music major in the area of the application. Some prerequisites may be waived at the discretion of the Department of Music through distinguished results on placement examinations and/or performance auditions.

All applicants are expected to present an undergraduate record of sufficient quality to assure a reasonable expectation of successful graduate achievement. Candidates for admission must submit the required Graduate School application forms, GRE scores, and official transcripts of previous post-secondary education. Applicants for admission to the Master of Music in Sound Recording Technology must pass the MM:SRT Entrance Exam. Applicants for admission to the Master of Music in Teaching and the Master of Music in Music Education must have passed the Massachusetts Tests for Educator Licensure (MTEL) test in Music within the last five years and must submit the results of this test. Each program requires additional materials or examinations which must be completed or filed by the applicant. Please review the materials for information on individual programs.

Advising

Successful candidates for admission will be assigned a faculty advisor and notified of registration dates and other pertinent information.

General Program Requirements

All Master of Music programs require a minimum of 30 credits. Each program has a required capstone component. Depending on the program, this will be apprentice teaching, a thesis, a project report, or a recital project. Students are required to participate in an ensemble during every semester in which they have full-time status. Specific requirements are listed under the individual program descriptions.

Comprehensive Examination

All Master of Music candidates must pass a comprehensive examination in their major field and in music theory and history. All candidates may expect to be examined in depth in their major area of concentration. Further information as to the nature and scope of the comprehensive examinations may be obtained from the student's advisor or the department chair.

Certificate Program

Certificate Programs in Psychology

- [Behavioral Intervention in Autism](#)
- [Diversity in the Workplace](#)
- [Domestic Violence Prevention \(Interdisciplinary\)](#)
- [Family Studies](#)

[Graduate Certificate Application Form](#) (pdf)

Behavioral Intervention in Autism

Psychology Department

Contact:

Dr. Richard Siegel

978-934-3961

richard_siegel@uml.edu

In partnership with the Eunice Kennedy Shriver Center, a pioneer in research, education, and service for people with developmental disabilities and their families for over three decades and a part of the University of Massachusetts Medical School, this certificate has been designed to provide professionals in psychology, education, child care, and human services with an understanding of autism and related developmental disorders. An introduction to behavioral methods and how and where such methods can be used and evaluated is included.

Interested students should have a background in the psychology of child development. Most courses will be available on-line.

*Professional Certification: This sequence of 5 courses (see courses with asterisks) has been designed to meet the Behavior Analyst Certification Board (BACB) educational requirements for certification as a Behavior Analyst. Note that full BACB certification also involves an experience requirement and an exam not administered by UMass Lowell (see details at www.bacb.com).

Required Courses:

47.561* Introduction to Behavioral Intervention in Autism#

47.562* Teaching and Positive Behavioral Support in Autism#

Elective Courses (Group I - choose one):

47.565* Measurement and Experimental Design#

-or-

47.566* Functional Analysis and Treatment of Challenging Behavior#

-or-

47.568* Behavioral Intervention Program Models in Autism#

[Note: No more than one of the five courses listed above may be transferred toward the Master's degree in Community Social Psychology.]

Elective Courses (Group II - choose one):

Any one other of the courses listed above, or....

44.623 Child Maltreatment#

-or-

47.501 Applied Developmental Psychology

-or-

47.504 The Family System

-or-

47.508 The Child in the Community,

-or-

Other electives in Psychology or from the Graduate School of Education (some of which will be available on-line) subject to approval by the Graduate Coordinator.

indicates an on-line course

Diversity in the Workplace

Psychology Department

[Dr. Michelle C. Haynes](mailto:Dr.Michelle.C.Haynes)

978-934-3925

Over the last 50 years, the workplace has changed dramatically in terms of its composition along various dimensions. Despite this inevitable diversity in the workplace, working with people from different backgrounds is challenging. Many people prefer to work with others who are "like them" in age, gender, race, education, and economic status. There is comfort in sharing the same background and culturally based traditions and ideals. Working with others who do not share similar interpersonal expectations or ways of communicating can contribute to tensions emanating from misattributions and conflicting values.

This certificate is for both future and current industry and organizational leaders who want to advance their theoretical knowledge as well as their hands on skills for working with and managing diverse employees. Certificate candidates will increase their awareness of communication and cultural differences, and be encouraged to develop strategies to effectively manage these differences. Candidates will be challenged to go beyond simply tolerating differences; rather the goal is to improve their work life, organizational culture, and organizational effectiveness by harnessing the value of these differences.

Students who complete this certificate will emerge better equipped to work within our increasingly diverse workplaces. They will acquire knowledge and skills that will enable them to take on leadership roles in both profit and nonprofit organizations.

The core course, Workplace Diversity, introduces students to the theoretical constructs surrounding diversity in the workplace as well as focuses on skill development for managing diversity in the work domain. Courses in the "Social Trends" cluster focus on the broader social, economic, and political forces that affect diversity in the workplace including the changing nature of work, globalization, and public policy. Offerings in the "Systems Dynamics" cluster are courses that enhance students' understanding of people from diverse backgrounds and explore the ways in which dynamics within workplaces (and other human systems) shape relations among diverse group.

Courses (12 credits):

Required Course:

- 47.526 Workplace Diversity (3 credits)

Social Trends - select one course:

- 57.542 Gender, Work and Public Policy (3 credits)
- 57.511 Dynamics of Power and Authority (3 credits)
- 57.516 Globalization, Work, and Family (3 credits)

System Dynamics Electives - select one:

- 47.500 Introduction to Community Social Psychology (3 credits)
- 47.505 Work and Family (3 credits)
- 47.522 Psychology of Diversity (3 credits)

Open Electives - select one additional course from either the preceding lists or the list below:

- 19.500 Introduction to Work Environment (3 credits)
- 19.542 Human Factors (3 credits)
- 19.643 Healthy Work Organization Design (3 credits)
- 47.523 Women in the Community (3 credits)
- 47.527 Immigrant Psychology and Communities (3 credits)
- 47.542 Working with Groups (3 credits)
- 47.545 Community & Organizational Change (3 credits)
- 57.503/19.654 Work and Technology (3 credits)
- 57.512 Community Conflict Resolution (3 credits)
- 57.537 Development Principles (3 credits)

Domestic Violence Prevention

Department of Psychology and School of Criminology and Justice Studies (Interdisciplinary)

Contact:

Dr. Andrew Hostetler
978-934-3979
csp@uml.edu

Dr. April Pattavina
978-934-4106
CJGradAdvisor@uml.edu

Domestic violence is one of the major social and public health problems in the Commonwealth. The existing degree programs in the School of Criminology and Justice Studies, Community Social Psychology, and programs in the College of Health Sciences each offer relevant courses that greatly assist their graduates working with agencies and clients affected by domestic violence. The certificate provides a focused program for those working in settings where domestic violence is an issue.

[Program Requirements](#)

Family Studies

Psychology Department

Contact:

Dr. Andrew Hostetler
978-934-3979
csp@uml.edu

The program is designed to provide professionals who work with families or with children, youth and elders within family systems, with a contemporary understanding of families through a community-based, culturally-sensitive perspective. It provides graduate level education in family support services and in family-community linkages, and exposure to the range of family support and education approaches in the Merrimack Valley.

Required Courses:

- 47.500 Introduction to Community Social Psychology (3 credits)
- 47.501 Applied Developmental Psychology (3 credits)
- 47.504 The Family System (3 credits)

Electives:

- *47.502 Seminar in Community Social Psychology (3 credits)
- 47.505 Work and Family (3 credits)
- 47.506 Psychosocial Aspects of Aging (3 credits)
- 47.508 The Child in the Community (3 credits)
- 47/44.622 Intimate Partner Violence (3 credits)

Other electives by approval of Graduate Coordinator.

*Focus of seminar varies; may be applied to certificate only when the focus of the seminar is family-centered.

Master's Program in Autism Studies

Master of Science in Autism Studies

[Admissions Requirements](#)

[Transfer Credit](#)

[Part-Time Study and Non-Degree Status](#)

[Graduate Advisor](#)

[Degree Requirements](#)

[Thesis Option](#)

[Bachelors to Master's Program](#)

[Resources](#)

Admission Requirements

The Autism Studies graduate program at the University of Massachusetts Lowell is designed not only for recent college graduates but also for older and non-traditional students with experience in a variety of educational and work settings.

In addition to the requirements for graduate admission, admission requirements for the Autism Studies graduate program include these factors:

1. A Bachelor's degree.
2. A grade point average of at least 3.0.
3. A minimum of 4 courses in psychology and one course in statistics in your undergraduate coursework. Students should have some background in the psychology of child development, and we are especially interested in students with coursework in some of the foundational areas of psychology (e.g., developmental, learning, behavior analysis, biological bases of behavior, research methods, cognitive psychology, etc.).
4. Work experience and other activities outside of school.
5. Official Graduate Record Examination (GRE) scores, on both verbal and quantitative sections. Alternatively, you may submit scores from the Miller Analogies Test (MAT). The GRE/MAT requirement is waived for (1) applicants who graduated from UMass Lowell within the past five years with a cumulative GPA of 3.0 or better or (2) those who have successfully completed the Behavioral Intervention in Autism certificate.
6. At least three letters of recommendation, including at least one, and preferably more than one, from recent or current professors.
7. A personal statement. This detailed statement should describe your background, explain your interests in our program, and tell us how you believe the program will help you meet your own career goals.
8. International students must submit official TOEFL scores.

These criteria may be applied or weighted differently for different students. For example, for students just receiving a Bachelor's degree, greater attention will be paid to recent grades. For students out of school for some time, work background and experience will count relatively more.

Transfer Credit

Matriculated students in Autism Studies who come to UMass Lowell with prior graduate work at other schools or who have completed the 4-course graduate certificate in Behavioral Intervention at UMass Lowell may transfer a maximum of 12 credit hours. An assessment will be conducted to determine how those courses proposed for transfer map onto our courses with respect to BACB requirements. Such transfer credit is subject to the approval of the Graduate Coordinator and the Registrar's Office and must meet the University's [Graduate Transfer Credit requirements](#).

Part-time Study and Non-Degree Status

While the program in Autism Studies provides for full-time study, part-time students are encouraged to apply. Many courses are offered online, while on-campus courses are usually offered at late afternoon and evening hours to accommodate students who are employed. Students not pursuing an advanced degree or who wish to begin their graduate study without first applying for matriculated status are

invited to register as non-degree students for specific graduate courses on a space-available basis. Such students need meet only the first two of the admissions requirements listed above.

If a non-degree student later applies for acceptance into the Master's program, his/her application will be treated equally with those of other new applicants, though performance in graduate courses taken on campus will be used as an additional admissions criterion. Non-degree students accepted as matriculated students may apply to transfer a maximum of 6 graduate credits earned at the University of Massachusetts Lowell with a grade of "B" or better toward the Master's degree.

Graduate Advisor

Each newly matriculated student in the program will be assigned to an advisor from among the faculty of the graduate program. The student will meet with his/her advisor on a regular basis throughout the years of study to discuss course selections, planning for practicum, and the development of the thesis or project (optional). Once a student selects a faculty supervisor for his/her thesis or project, this faculty member takes over as graduate academic advisor.

Degree Requirements

A total of 42 academic credits, at least 30 of which must be taken at the University of Massachusetts Lowell, is required for the completion of the degree. No more than two courses (6 credits) may have an earned grade of less than B (3.0). The 42 credits for the Master's degree are divided as follows:

Required Courses - 27 credits

Required Supervised Practicum - 6 credits

Electives, or Elective and Thesis - 9 credits

Students may select from any the eight elective courses in Psychology, almost all of which are offered at least once every two years. Students may also, when appropriate, request permission to take related courses from other graduate programs at UML. In their choice of electives, students have the option of completing a Master's Thesis, which typically involves original empirical research.

Total must equal 42 credits.

Required Courses (27 credits total):

Foundations (9 credits)

47.571 Autism and Developmental Psychopathology
47.500 Introduction to Community Social Psychology
47.572 Legal and Ethical Issues in Professional Practice

Methods (6 credits)

47.512 Applied Research Methods
47.565 Measurement and Experimental Design in Behavioral Intervention

Behavioral Interventions (12 credits)

47.561 Introduction to Behavioral Intervention in Autism
47.562 Teaching and Positive Behavioral Support in Autism
47.566 Functional Analysis and Treatment of Challenging Behaviors
47.568 Behavioral Intervention Program Models in Autism

Required Supervised Practicum (6 credits total; 2 credits each)

47.671 Introductory Supervised Practicum in BIA
47.672 Intermediate Supervised Practicum in BIA
47.673 Advanced Supervised Practicum in BIA

Electives (9 credits total; choose any three of the following):

47.501 Applied Developmental Psychology
47.504 The Family System
47.508 The Child in the Community
47.522 Psychology of Diversity
47.545 Community and Organizational Change
47.611 Program Evaluation
47.661 Social and Community Interventions in Autism
47.663 Experimental Analysis of Behavior

Thesis Option (6 credits)

47.743 Master's Thesis

To earn the 42 credits needed for the Master's degree, all matriculated students in Autism Studies have the option of completing a Thesis. The Thesis will always be a piece of quantitative and/or qualitative research, involving a review of literature, a clear statement of

a research question, the design of an appropriate method for collecting data, and the analysis of results as the basis for drawing conclusions. The Thesis must:

- be completed over the course of two semesters (usually consecutive), counting for 6 credits toward the degree,
- involve a Thesis Committee of three faculty,
- be written in accordance with University guidelines, and
- be defended by the student in front of the Thesis Committee at a public meeting.
- Students selecting the Thesis Option will complete 6 Thesis credits and 3 elective credits.

Bachelors to Master's Program

Undergraduate psychology majors at the University of Massachusetts Lowell who have a GPA of 3.0 or better are invited to apply to the BA/MA program, allowing students to begin graduate level coursework in our Autism Studies Master's program while still pursuing their bachelor's degree. Up to 6 credits of graduate (500 level or higher) courses completed with a B grade (3.0) or better may be used by the student to count toward both the Bachelor's and Master's degrees.

Application to the BA/MA Program

Application is typically submitted during the student's second semester of their **junior year** to allow adequate time for the student to take maximum advantage of the opportunity to take graduate courses and double-count these graduate credits, while still staying within the maximum of 45 psychology credits allowable for the undergraduate degree in psychology. Although it is highly recommended that students submit their application during their junior year, application materials can actually be submitted at any time prior to graduation. Applicants are requested to use the standard paper application form and submit requisite materials to the Office of Graduate Admissions (Dugan Hall - UML south). Application forms and details on applying to graduate school can be accessed from the [Graduate Admissions](#) website.

As additional advantages, students applying under the BA/MA option do not have to pay the standard application fee and do not have to take any of the standardized tests usually required of applicants. The decision to accept a BA/MA applicant is based on 3 factors:

1. A solid undergraduate record, with an overall GPA of 3.0 or better.
2. Strong letters of recommendation: three are required, and it is expected that at least two letters should be from psychology faculty at UMass Lowell.
3. A personal statement that clearly describes the student's interest in the Autism Studies program and how it fits with the students educational and professional goals.

Additional Information from Graduate Admissions for BA/MA Students:

1. Students admitted to the BA/MA program are accepted on a conditional basis with the requirement that students receive their bachelor's degree at the end of their senior year and graduate with a minimum cumulative GPA of 3.0. If students do not meet this requirement, their master's degree candidacy will be voided and they would be required to re-apply via the traditional application process.
2. BA/MA students must complete their bachelor's degree first before graduate admissions can change their status to that of a fully matriculated graduate student.
3. BA/MA students may defer their graduate matriculation for up to one year following their graduation for the bachelor's degree. A request for deferral must be made to the [Graduate Admissions Office](#) in writing. After one year of deferral, failure to register for graduate classes will invalidate their acceptance into the master's program.

Additional information on the Bachelor's/Master's Program.

Resources

? [The Center for Family, Work and Community](#)

The goal of The Center for Family, Work, and Community is to promote the mental health and well being of individuals, families, and communities through education, training, and consultation. Its aim is to provide opportunities for University of Massachusetts faculty, community members, and practicing professionals to work together to integrate theory, research, and practice. The Center sponsors community-based training, professional development workshops, consultation, and research.

? [Center for Women and Work](#)

The Center for Women and Work is an interdisciplinary center at the University of Massachusetts Lowell. Since the Center is designed to support a wide range of projects, there are exciting opportunities for student involvement in both research and community-based action projects relevant to the theme of women and work.

? [Laboratory for Autism Spectrum Disorders](#)

The Laboratory for Autism Spectrum Disorders focuses on two main avenues of research involving adolescents and young adults on the autism spectrum. The first avenue seeks to further our understanding of the processing of emotional stimuli among those with ASD by examining physiological responses and memory for emotion provoking stimuli. The lab's second main research avenue focuses on evaluating various intervention programs for those with ASD. A number of interdisciplinary programs specifically for high functioning adolescents and young adults on the autism spectrum are run through the lab in collaboration with other faculty at UMass Lowell. These include a social skills program, a music program, a fitness program and a movie club. These programs provide a critically needed service to members of our community and their families impacted by ASD.

? [Laboratory for Children and Families](#)

The Laboratory for Children and Families is located in the Department of Psychology at the University of Massachusetts Lowell. The Laboratory provides a site for research on the development of infants and children in the context of their families and communities.

? **The Laboratory for Immigrant Research**

The Lab is committed to research that investigates the impact of culture on the psychological, social, and health development of ethnic minority immigrant individuals, families, and communities. Both quantitative and qualitative methods and approaches are utilized to understand the immigrant experience. The ultimate aim of the Lab is to produce information that will be useful for intervention development in immigrant communities.

Master's Program in Community Social Psychology

Admission Requirements

The Community Social Psychology program at the University of Massachusetts Lowell is designed not only for recent college graduates but also for older and non-traditional students with experience in a variety of work and community settings.

In considering and reviewing applications, admission requirements include these six factors:

1. Your college grades - we look for a grade point average of at least 3.0.
2. Your background in psychology. Normally, we like to see at least 18 credits in psychology, including at least one course in statistics or research methods.
3. Your work experience and other activities outside of school.
4. Your Graduate Record Examination (GRE) scores, on both verbal and quantitative sections. Alternatively, you may submit scores from the Miller Analogies Test (MAT). The GRE/MAT requirement may be waived for current University of Massachusetts Lowell undergraduates who are enrolled in the BA/MA Program. The GRE/MAT requirement is also waived for applicants who graduated from UMass Lowell within the past five years with a cumulative GPA of 3.0 or better.
5. At least three letters of recommendation, including at least one, and preferably more than one, from recent or current professors.
6. A personal statement. This detailed statement should describe your background, explain your interests in our program, and tell us how you believe the program will help you meet your own career goals.

These criteria may be applied differently for different students. For students just receiving a Bachelor's degree, greater attention will be paid to recent grades. For students out of school for some time, work background and experience will count relatively more.

Transfer Credit

Matriculated students in Community Social Psychology are allowed to transfer up to 12 credits of graduate course work completed with a grade of B or better taken in other departments at UMass Lowell or at other accredited universities, provided that such courses are within the content area of community social psychology and do not involve credit for field experience or professional work. Such transfer credit is subject to the approval of the Graduate Coordinator and the Registrar's Office.

Part-time Study and Non-Degree Status

While the program in Community Social Psychology provides for full-time study, part-time students are encouraged to apply. Most courses are offered at late afternoon and evening hours to accommodate students who are employed. Students not pursuing an advanced degree or who wish to begin their graduate study without first applying for matriculated status are invited to register as non-degree students for specific graduate courses on a space-available basis. Such students need meet only the first two of the admissions requirements listed above.

If a non-degree student later applies for acceptance into the Master's program, his/her application will be treated equally with those of other new applicants, though performance in graduate courses taken on campus may be used as an additional admissions criterion. Non-degree students accepted as matriculated students may apply to transfer a maximum of 6 graduate credits earned at the University of Massachusetts Lowell with a grade of "B" or better toward the Master's degree.

Graduate Advisor

Each newly matriculated student in the program will be assigned to an advisor from among the faculty of the graduate program. The student will meet with his/her advisor on a regular basis throughout the years of study to discuss course selections, planning for practicum, and the development of the thesis or project (optional). Once a student selects a faculty supervisor for his/her thesis or project, this faculty member takes over as graduate academic advisor.

Degree Requirements: Credits

A total of 36 academic credits, at least 24 of which must be taken at the University of Massachusetts Lowell with a grade average of B or better, is required for the completion of the degree. The 36 credits for the Master's degree are divided as follows:

Required Coursework

9 credits (includes 47.500, 47.512, 47.625)

Required Practicum

6 credits

Electives 21 credits

The remaining degree credits consist of elective courses. Students may select from any of over 20 elective courses in Community Social Psychology, almost all of which are offered at least once every two years. Students may also, when appropriate, request permission to take related courses from other graduate programs at UML. In their choice of electives, students have the option of completing a Master's Project or Thesis, which are significant pieces of independent scholarship, under faculty supervision, designed to extend and integrate a student's learning. The Thesis is larger in scope, counts for 6 credits toward the degree over the course of two semesters, and typically involves original empirical research. The Project counts for 3 credits toward the degree completed in a single semester and typically involves a change-oriented activity under faculty supervision.

Total must equal 36 credits.

Clusters

Students are encouraged to participate actively in tailoring their program to achieve specific career and professional goals. Specialization within specific clusters is recommended; clusters include Family Studies, Diversity Studies, and Community and Organizational Change, and are completed through careful selection of electives. Each cluster consists of one required anchor course plus two additional cluster electives for a total of nine credits.

Why would I consider completing a Cluster?

Choosing to complete a Cluster provides you with a coherent basis for selecting and relating together some of your elective courses. This in turn will provide you with a greater degree of knowledge and competence within a specific sub-area of the broad field of community social psychology. Cluster completion could be attractive to some employers (not simply in a resume, but also emphasized in a cover letter), and also in some cases in applying for doctoral work.

Thesis and Project Options

To earn the 36 credits needed for the Master's degree, all matriculated students in Community Social Psychology have the option of completing either a Thesis or a Project. Both these options represent an integrative piece of significant scholarship. The Thesis will be larger in scope, more formal, and more rigorous than the Project, and it must involve empirical research. A brief summary is provided here:

Thesis -

- Be completed over the course of two semesters (usually consecutive), counting for 6 credits toward the degree
- Involve a Thesis Committee of three faculty
- Be written in accordance with University guidelines
- Be defended by the student in front of the Thesis Committee at a public meeting.

The Thesis will always be a piece of quantitative and/or qualitative research, involving a review of literature, a clear statement of a research question, the design of an appropriate method for collecting data, and the analysis of results as the basis for drawing conclusions.

Project -

- Typically be completed over the course of one academic semester, counting for 3 credits toward the degree
- Be carried out under the supervision of one faculty member
- Be written in accordance with guidelines established by the graduate program
- Involve an appropriate form of public presentation

The Project may also be a piece of research, though narrower in scope and more focused than a Thesis (e.g., a pilot study or a program evaluation). It may also involve the development, implementation and evaluation of an action-oriented intervention.

Some students will gain most from the program by earning all their credits through coursework, but many will benefit from the opportunity to engage in the more independent work of a Thesis or Project. A Thesis might be a good choice for students interested in enhancing their research skills, and it might also benefit those who are thinking of going on to a doctoral program and a possible career in university teaching and research. A Project might be a good choice for students interested in enhancing their program design, intervention and evaluation skills, and it might also benefit those students pursuing careers in human services and community development.

Detailed information may be found on the department [website](#) and from the graduate program coordinator.

Bachelor's-Master's (BAMA) Program

Undergraduate psychology majors at the University of Massachusetts Lowell who have a GPA of 3.0 or better are invited to apply to the BA/MA program, allowing students to begin graduate level coursework in our Community Social Psychology (CSP) Master's Program while still pursuing their bachelor's degree. Up to 6 credits of graduate (500 level or higher) courses completed with a B grade or better may be used by the student to count toward both the Bachelor's and Master's degrees.

Application to the BAMA Program

Application is typically submitted during the student's second semester of their **junior year** to allow adequate time for the student to take maximum advantage of the opportunity to take graduate courses and double-count these graduate credits, while still staying within the maximum of 45 psychology credits allowable for the undergraduate degree in psychology. Although it is highly recommended that students submit their application during their junior year, application materials can actually be submitted at any time prior to graduation. Applicants are requested to use the standard paper application form and submit requisite materials to the Office of Graduate Admissions (Dugan Hall - UML south). Application forms and details on applying to graduate school can be accessed at: http://www.uml.edu/grad/docs/BachMast_AppPacket.pdf.

As additional advantages, students applying under the BA/MA option do not have to pay the standard application fee and do not have to take any of the standardized tests usually required of applicants. The decision to accept a BA/MA applicant is based on 3 factors:

- A solid undergraduate record, with an overall GPA of 3.0 or better
- Strong letters of recommendation: three are required, and we expect that at least two of these should be from psychology faculty at UMass Lowell.
- A personal statement that clearly describes the student's interest in our Community Social Psychology program and how it fits with the students educational and professional goals.

Additional Information from Graduate Admissions for BA/MA Students

1. Students admitted to our BA/MA program are accepted on a conditional basis with the requirement that students receive their bachelor's degree at the end of their senior year and graduate with a minimum cumulative GPA of 3.0. If students do not meet this requirement, their master's degree candidacy will be voided and they would be required to re-apply via the traditional application process.
2. BA/MA students must complete their bachelor's degree first before graduate admissions can change their status to that of a fully matriculated graduate student.
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[Additional information on the Bachelor's/Master's Program.](#)

Resources

- [The Center for Family, Work and Community](#)

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The Center for Women and Work is an interdisciplinary center at the University of Massachusetts Lowell. Since the Center is designed to support a wide range of projects, there are exciting opportunities for student involvement in both research and community-based action projects relevant to the theme of women and work.

- [Laboratory for Autism and Spectrum Disorders](#)

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Psychology

Department of Psychology

The Department of Psychology offers master's programs in [Autism Studies](#) and [Community Social Psychology](#) and Graduate Certificate Programs in:

- [Behavioral Intervention in Autism](#)
- [Diversity in the Workplace](#)
- [Domestic Violence Prevention](#) (Interdisciplinary with the School of Criminology and Justice Studies)
- [Family Studies](#)

The Department also offers a combined [bachelor's-master's program](#) for UMass Lowell undergraduates.

Philosophy and Objectives of the Autism Studies Program

Autism Spectrum Disorders (ASDs) are behavioral-neurological disorders, typically diagnosed before the age of three, that profoundly affect the young child's ability to communicate, develop language, form social relationships, and respond appropriately to environmental stimuli. Repetitive, stereotypical, and sometimes even self-injurious behaviors are a common part of the clinical picture. Recent estimates of prevalence report rates in the U.S. as high as 1 in every 91 children. Currently, there is a critical workforce shortage of professionals capable of meeting the challenges of those afflicted with this disorder. The M.S. program in Autism Studies provides students with the knowledge and skills needed to enhance the development of individuals diagnosed with an ASD, support their families and strengthen the ability of schools and hospitals to work with individuals diagnosed on the autism spectrum.

Through their course work and field training, students will gain mastery of skills in several critically important areas:

- definitions and characteristics of autism and other developmental psychopathologies;
- principles, processes, and concepts of Applied Behavior Analysis (ABA);
- methods of behavioral assessment and selection of intervention strategies;
- measurement of behavior and techniques for displaying and interpreting data;
- experimental evaluation of interventions;
- legal and ethical aspects of intervention;
- coordination of programs and services with families, schools, and the community;
- training and supervision of direct service providers.

Graduates of this master's program will have met all the education and training requirements that will allow them to sit for the national certification exam to become Board Certified Behavior Analysts™. As BCBAs, they will be able to work with schools and other agencies to design and implement effective interventions for children on the ASD spectrum and to supervise other direct service providers. They will also be able to conduct research that could lead to new and effective interventions.

Philosophy and Objectives of the Community Social Psychology Program

Community social psychologists study relationships between social and environmental forces and the psychological well-being of people. They seek to understand how individuals and groups are affected by such social influences as employment and educational opportunity, organization and delivery of public services, and the social systems within which people live and work. The M.A. program in Community Social Psychology provides students with a rich understanding of how communities and organizations influence behavior, adjustment, and growth. Students graduate knowing how to analyze and solve human problems in a wide variety of community and organizational settings. An emphasis on facts, methods, values, and especially practical skills creates a dynamic learning experience. This is one of the few M.A. programs of its kind in the Northeast.

By completing this program, students will gain:

- Knowledge about how social and environmental factors affect the individual;
- Proficiency in conducting applied research and performing data analysis;
- Increased awareness of multiculturalism, human diversity, and social justice issues;
- The ability to design, implement, and evaluate community programs.

This graduate program meets the needs of students from various academic and occupational backgrounds. It attracts recent undergraduates from such fields as Psychology, Sociology, Political Science, Health, and Education. For those already working, it enhances the skills and career development of human service workers, community developers, health care providers, teachers, government employees, human resource professionals, administrators, and managers in a wide variety of public and private sector positions. Employment opportunities for graduates of the program, both in the nonprofit and private sectors, have traditionally been very strong.

Francis College of Engineering

The education of engineers in state-of-the-art areas of advanced technology and the UMass Lowell's commitment to national and regional economic development are the major premises upon which the graduate programs in the College of Engineering are based. These programs are intended to produce engineers whose education not only develops expertise in the design, development and production of products, but also an understanding of the management involved in the creation of new products, companies and service organizations. Thus, the graduate programs in engineering are intended to educate engineers capable of keeping abreast with the rapidly changing technology that characterizes the high technology economy of the Northeast. The programs lead to degrees of Master of Science in Engineering, Master of Science, Doctor of Science, Doctor of Philosophy, and Doctor of Engineering. The College is led by [Dr. Jack Wilson](#), president emeritus of the University of Massachusetts and distinguished professor.

On this page you will find:

- [Graduate Programs Offered](#)
- [Common Admission Requirements](#)
- [Common Degree Requirements](#)
- [Dissertation Proposal](#)
- [Nontechnical/Management Courses for Doctor of Engineering](#)
- [Other Doctoral Programs](#)
- [Links to department catalog section](#)
- [Engineering College-Wide Courses](#)
- [Faculty in the College of Engineering](#) (pdf)

Graduate Programs Offered

The Master of Science in Engineering (M.S. Eng.) degree awarded in the following fields:

[Chemical Engineering](#)
[Civil Engineering - Options: Environmental, Geotechnical, GeoEnvironmental, Structural, Transportation](#)
[Computer Engineering](#)
[Electrical Engineering](#)
[Energy Engineering - Options: Nuclear, Solar](#)
[Mechanical Engineering](#)
[Plastics Engineering](#)

The Master of Science (M.S.) degree awarded in the following fields:

[Environmental Studies](#)

The Doctor of Philosophy (Ph.D.) degree awarded through the College of Engineering in the following options:

[Chemical Engineering](#)
[Civil and Environmental Engineering](#)
[Computer Engineering](#)
[Electrical Engineering](#)
[Energy Engineering](#)
[Mechanical Engineering](#)
[Plastics Engineering](#)

The Doctor of Engineering (D.Eng.) degree awarded through the College of Engineering in the following options:

[Chemical Engineering](#)
[Civil and Environmental Engineering](#)
[Computer Engineering](#)
[Electrical Engineering](#)
[Energy Engineering](#)
[Mechanical Engineering](#)
[Plastics Engineering](#)

The intent of the Doctor of Engineering/Doctor of Philosophy (D.Eng./Ph.D.) programs is to prepare engineers for leadership positions in industry, academia and government. The program includes advanced graduate course work in engineering and allied subjects and research culminating in a doctoral dissertation. The Doctor of Engineering/Doctor of Philosophy degree requires completion of 63 semester hours of graduate-level academic credit composed of the following:

- 42 approved credit hours of graduate level engineering courses, which may include the core requirements of the M.S. program and up to 6 approved credit hours in graduate level math and science courses
- For the D.Eng. degree, substitute 9 credit hours of coursework with 9 credit hours of approved non-technical/management courses
- 21 credit hours for the dissertation

Dissertations which are industrial in orientation should use the D.Eng. degree, based upon discussion with the supervising faculty advisor. Students may elect either degree designation with the consent of the faculty advisor, subject to the requirements of each degree.

Options are offered in the following areas:

Computer Engineering
Electrical Engineering
Mechanical Engineering
Plastics Engineering
Civil and Environmental Engineering
Chemical Engineering
Energy Engineering (jointly administered by Mechanical Engineering and Chemical Engineering)

Rules and requirements vary slightly with the administering department.

Common Admission Requirements

Admission to the program will be based on review by Graduate Admissions and by the Admissions Committee of each administering Department. Applicants are required to submit the results from the Graduate Record Examination (GRE) to the Graduate School. In addition, international students must obtain the results of the Test of English as a Foreign Language (TOEFL) examination. Depending on the administering Department, a B.S. or M.S. in Engineering may be required prior to admission. Depending on the option selected, students may be required to make up prerequisites which they lack in comparison to the equivalent Engineering curriculum at the University of Massachusetts Lowell. In cases where a student has an M.B.A. or has completed the Business Administration Minor for Engineering students, in addition to a B.S. in engineering or its equivalent, portions or all of the management/non-technical component of the Doctor of Engineering program may be waived upon review by the administering Department. Students may apply for transfer of up to 24 semester credits in acceptable graduate engineering courses (with grade of B or better) towards the doctoral program, upon approval by the Department Doctoral Committee.

Common Degree Requirements

In addition to 63 semester hours of approved graduate courses and thesis:

1. The student is required to be in full-time residency at the University for at least one year.
2. The student must have a minimum grade point average of 3.25 in order to graduate.
3. Students are required to take a doctoral qualifying examination.

Qualifying Examination

1. The doctoral qualifying examination is administered on a declared schedule, usually twice each year. The student is permitted two attempts at passing the qualifying examination. Students who fail the qualifying examination the first time must retake the exam at its next scheduled offering. Students failing the doctoral exam twice will automatically be dismissed from the doctoral program. Those who do not take the examination at the prescribed time may lose all their financial support, if any, and may be dismissed from the doctoral program.
2. The format of the qualifying examination differs depending on the administering Department which in some cases may have both a written and oral section, and in some cases has an undergraduate-based portion.
3. The decision of each administering Department regarding whether a student has passed the qualifying exam is final.

Dissertation Proposal

The research work for the dissertation shall be conducted under the supervision of a departmental faculty advisor and a committee of two others. Students are required to submit and defend a dissertation proposal before a Department Doctoral Committee. Upon approval by this Departmental committee, the student's name will be submitted to the Dean of the Graduate School as a candidate for the Doctor of Engineering/Doctor of Philosophy degree. Admission to candidacy status does not guarantee awarding of the D.Eng./Ph.D. degree.

Nontechnical/Management Courses for Doctor of Engineering

D.Eng. students are required to take 9 credits of graduate nontechnical/management courses from a list of approved courses offered within the College of Engineering or College of Management.

Approved nontechnical/management graduate courses from the College of Engineering (3 credits each):

22.576 Engineering Project Management
26.507 Plastics Industry Organization
26.514 Statistics for Six Sigma
26.515 Lean Plastics Manufacturing
26.537 Business Law for Engineers
26.540 Commercial Development of Polymeric Systems
26.590 Survey of Intellectual Property

Approved management graduate courses from the College of Management (typically 8 weeks duration):

60.501 Financial Accounting (2 credits)
61.501 Business Finance (2 credits)
62.501 Marketing Fundamentals (2 credits)
63.501 Operations Fundamentals (2 credits)
66.501 Organizational Behavior (2 credits)
66.511 Global Enterprise & Competition (2 credits)
66.615 New Venture Creation (3 credits; full semester)

Course syllabi for nontechnical/management courses

22.576 Engineering Project Management (3 credits)
26.507 Plastics Industry Organization (3 credits)
26.537 Business Law for Engineers (3 credits)
26.590 Survey of Intellectual Property (3 credits)

26.514 Statistics for Six Sigma (3 credits)
26.515 Lean Plastics Manufacturing (3 credits)
26.540 Commercial Development of Polymeric Systems (3 credits)
60.501 Financial Accounting (2 credits)
61.501 Business Financial Analysis (2 credits)
62.501 Marketing Fundamentals (2 credits)
63.501 Operations Fundamentals (2 credits)
66.501 Organizational Behavior (2 credits)
66.511 Global Enterprise and Competition (2 credits)

Other Doctoral Programs

The Doctor of Philosophy in Physics (Ph.D.) degree awarded through the College of Arts and Sciences in the following fields:

[Applied Mechanics](#)
[Energy Engineering](#)
[Radiological Sciences](#)

The Doctor of Philosophy in Chemistry (Ph.D.) degree awarded through the College of Arts and Sciences in the following fields:

[Biochemistry](#)
[Environmental Studies](#)
[Polymer Science/Plastics Eng. Option](#)

The Doctor of Science (Sc.D.) degree awarded through the College of Health Sciences in the following field:

[Work Environment - Options: Occupational Ergonomics, Industrial Hygiene, Epidemiology, Work Environment Policy](#)

Links to Department Sections in This Graduate Academic Catalog:

[Chemical Engineering](#)
[Civil & Environmental Engineering](#)
[Electrical & Computer Engineering](#)
[Energy Engineering](#)
[Mechanical Engineering](#)
[Plastics Engineering](#)

Graduate Certificates

Graduate Certificates in Chemical Engineering

UMass Lowell offers the following graduate certificates in chemical engineering:

- [Biotechnology and Bioprocessing](#)
- [Materials Sciences & Engineering](#)
- [Modeling, Simulation, and Control of Systems and Processes](#)

[Graduate Certificate Application Form](#) (pdf)

Biotechnology and Bioprocessing

Biological Sciences Department & Chemical and Nuclear Engineering Department

Contact:

Dr. Carl Lawton
978-934-3158
carl_lawton@uml.edu

The certificate is intended for students who hold a baccalaureate degree in science, engineering, health, or related disciplines. The courses emphasize biological and engineering principles, process concepts and the application of these to process design and improvement. Courses deliberately cross disciplinary boundaries and emphasize teamwork in a multidisciplinary environment as well as a result-oriented, document-driven approach to efficient project completion.

Required Courses:

- 81.535 -or- 10.535 Principles of Cell and Microbe Cultivation
- 81.545 -or- 10.545 Isolation and Purification of Biotech Products
- 81.555 -or- 10.555 Biopharmaceutical Regulatory Compliance
- Plus One Approved 3 credit Elective

Materials Sciences & Engineering

Department of Chemical and Nuclear Engineering

Contact:

Dr. Alfred A. Donatelli
978-934-3156
alfred_donatelli@uml.edu

This 12 credit certificate provides an advanced course of study in materials science and engineering that will broaden and enhance the capabilities and education of experienced professionals and technologists at the graduate level.

Required Course:

- 10.508 Introduction to Materials Sciences (3 credits)

Elective Courses (choose three):

- 10.523 Electronic Materials (3 credits)
- 10.527 Nanoscale Materials Science (3 credits)
- 10.535 Principles of Cell & Microbe Cultivation (3 credits)
- 10.539 Mathematical Methods in Engineering (3 credits)
- 24.541 X-Ray of Defraction Materials (3 credits)
- 24.542 Microscopy of Advanced Materials (3 credits)

Modeling, Simulation, and Control of Systems and Processes

Department of Chemical and Nuclear Engineering

Contact:

Dr. Alfred Donatelli
978-934-3156
alfred_donatelli@uml.edu

The sequence of courses provides advanced training in the modeling and analysis of complex systems with some special focus on thermo-fluid processes and general control system design and analysis. The courses are mathematically intensive and many require the use of modern computer analysis tools (Matlab, Simulink, Aspen, etc.). The graduate certificate program is appropriate for students and professionals interested in gaining skills in mathematical modeling and simulation techniques, and for those individuals interested in updating their knowledge and experience with modern control methods.

This is a 12 credit certificate.

Choose Four Courses:

- 10/24.509 System Dynamics (same as 22.554) (3 credits)
- 10.522 Computer-Aided Chemical Process Design (3 credits)
- 10.528 Advanced Transport Phenomena (3 credits)
- 10.530 Advanced Control Strategies (3 credits)
- 10/24.539 Math Methods for Engineers (3 credits)

Doctoral Programs

Doctoral Programs in Chemical Engineering

- **Doctor of Engineering (D.Eng.) and Doctor of Philosophy (Ph.D.)**
 - Chemical Engineering Option
 - Nuclear Engineering Concentration
 - [Energy Engineering Option](#)
- **Doctorate in Philosophy in Physics**
 - Energy Engineering Option (see [Physics Dept.](#))

D.Eng. and Ph.D. - Chemical Engineering Option or Energy Engineering Option (Nuclear Engineering Concentration)

Objectives

The Doctor of Engineering/Doctor of Philosophy degree is designed to prepare engineers for leadership positions in industry, academia and government. The program includes advanced graduate course work in engineering and allied subjects.

Admission Requirements

The applicant is required to have at least a B.S. degree in engineering or science. A student may apply to transfer up to 24 credit hours

of applicable graduate course work toward the doctoral degree. In cases where a student has an M.B.A., in addition to the B.S. degree or its equivalent, the management portion of the Doctor of Engineering program may be waived. Students who do not have adequate preparation in chemical engineering may be required to take additional courses to make up deficiencies.

Degree Requirements

A total of 63 credit hours of graduate level courses are required for the doctoral degree. The general degree requirements follow:

1. Forty two (42) approved credit hours of graduate level engineering courses including the core requirements.
2. A two course sequence in advanced mathematics (with approval of the graduate coordinator).
3. For the D. Eng degree, nine (9) credit hours of approved management/non-technical courses is substituted for nine credit hours of engineering courses.
4. Twenty-one (21) credit hours for the dissertation.
5. Students must enroll in at least two semesters of graduate seminar.
6. The student is required to be in full time residence at the University for at least one year.
7. The student must have a minimum grade point average of 3.25 in order to graduate.

Exceptions may be made for students whose Master's Degree is in a discipline other than engineering. Students may register for no more than six credit hours of research in preparing a formal dissertation proposal. This proposal and the student's ability to perform research must be orally defended before the student's doctoral committee and other interested parties. This constitutes their candidacy examination. Upon passing this examination and completing all course requirements, the student becomes a candidate for the doctoral degree and may register for additional research credit with the advisor's approval.

Core Requirements

The core requirements will consist of two courses in advanced mathematics, two courses in thermal/fluid processes and one course in solid mechanics. The specific courses follow:

Advanced Mathematics:

- 10/24.509 Systems Dynamics
- 10/24.539 Mathematical Methods for Engineers

Thermal/Fluid Processes (select two of the following):

- 10.510 Advanced Separation Processes
- 10.520 Advanced Thermodynamics
- 10.528 Advanced Transport Phenomena

Solid Mechanics (select one of the following):

- 10.506 Colloidal, Interfacial and Nanomaterials Science and Engineering
- 10.508 Material Science and Engineering
- 10.523 Nanodevices and Electronic Materials
- 10.525 Design and Packaging of Materials
- 10.535 Principles of Cell and Microbe Cultivation

Elective Requirements

A total of 27 credits of elective courses must be taken. For the Chemical Engineering Option, the courses will be from either the processing, materials or biotechnology/bioprocessing area. For the Nuclear Concentration in the Energy Option, the courses will be from the nuclear area. The specific courses in those areas follow:

Processing (in addition to the core courses):

- 10.506 Colloidal, Interfacial and Nanomaterials Science and Engineering
- 10.518 Microprocessor Control
- 10.522 Computer-Aided Chemical process Design
- 10.530 Advanced Control Strategies
- 10.533 Macromolecular Science and Engineering
- 10.535 Cell and Microbe Cultivation
- 10.545 Isolation and purification

Materials (in addition to the core courses):

- 10.504 process Calculations of paper and pulp processes
- 10.506 Colloidal, Interfacial and Nanomaterials Science and Engineering
- 10.508 Material Science and Engineering
- 10.523 Nanodevices and Electronic Materials
- 10.525 Design and packaging of Materials
- 10.529 Advances in Nanotechnology and Green Chemistry
- 10.533 Macromolecular Science and Engineering
- 10.535 Cell and Microbe Cultivation
- 10.541 Nanostructural Characterization by SEM, TEM and AFM
- 22.5xx (Any Dept of Mechanical Engineering graduate level materials course approved by the student's advisor)
- 26.5xx (Any Dept of plastics Engineering graduate level materials course approved by the student's advisor)

Biotechnology/Bioprocessing (in addition to the core courses):

10.535 Cell and Microbe Cultivation
10.538 Advanced Separations in Biotechnology
10.545 Isolation and purification
10.555 Biopharmaceutical Regulatory Compliance
10.586 Bioprocessing projects Laboratory
81.519 Biochemistry I
81.576 Cell Culture
81.5xx (Any Dept of Chemistry graduate level materials course approved by the student's advisor)

Nuclear (in addition to the core courses):

24.504 Energy Engineering Workshop
24.505 Nuclear Reactor Physics
24.506 Special Topics in Nuclear Reactor Physics
24.507 Nuclear Reactor Engineering and Safety Analysis
24.508 Special Topics in Nuclear Reactor Engineering
24.511 Advanced Reactor Concepts
24.514 Hazardous and Nuclear Waste Management
24.519 Nuclear Reactor Operator Training I
24.520 Nuclear Reactor Operator Training II
22.5xx (Any Department of Mechanical Engineering graduate level course approved by the student's advisor)
98.5xx (Any Department of Radiological Sciences graduate level course approved by the student's advisor)

Qualifying Examination

1. The student is permitted two attempts at passing the qualifying examination which is administered on a declared schedule. Students who fail the qualifying examination the first time must retake the exam at its next scheduled offering. Students failing the doctoral exam twice will automatically be dismissed from the doctoral program. Those who do not take the examination at the prescribed time may lose all their financial support, if any, and may be dismissed from the doctoral program.
2. The qualifying exam will be a closed book examination and will be administered during two specified days. Supplementary material will be provided to the student at the time of the exam. The first day will focus on basic science and engineering concepts and will be similar to the Fundamentals of Engineering (FE) Exam. The student is encouraged to use the FE Exam study guide or take an FE Review Course to prepare for the first day exam. The topics which could be covered are: Chemistry; Fluid Mechanics; Material Science/Structure of Matter; Mathematics; Thermodynamics; Chemical Reaction Engineering; Chemical Thermodynamics; Heat Transfer; Mass Transfer; Material/Energy Balances; and Process Control. The second day will focus on the core areas of Advanced Mathematics and Thermal/Fluid Processes as well as a specialty area selected by the student. For the Chemical Engineering Option the specialty areas are Chemical Processing, Materials and Biotechnology/Bioprocessing.
3. A student enrolled in the Energy Engineering (Nuclear Engineering Concentration) will follow the qualifying exam guidelines for the Energy Engineering Program.

Dissertation

The research work for the dissertation shall be conducted under the supervision of a departmental faculty advisor and a committee of two others. The student must defend and submit an acceptable proposal for the dissertation prior to beginning the research work.

Master's Program

Master of Science in Chemical Engineering Degree Program

The UMass Lowell program in Chemical Engineering is designed to provide the opportunity for graduate students to study the fundamentals and applications of chemical engineering principles, and to carry out independent research.

Admission Requirements

The Department will consider students for enrollment in the Chemical Engineering program who have a BS degree in engineering or science. Those students who do not have an undergraduate degree in Chemical Engineering are required to take complete 10.403 Chemical Reaction Eng., 10.510 Advanced Separation Processes, 10.520 Advanced Thermodynamics, 10.528 Advanced transport Phenomena, and 10.539 Mathematical Methods for Engineers for a total of 15 credits which, if successfully completed, may be used toward the masters or doctoral degree. These students are expected to prepare adequately for these courses through self-study but 10.651/2 can also be utilized. It is highly recommended that such students complete four years of mathematics through differential equations, one year of organic chemistry and one semester of physical chemistry, prior to enrolling in the graduate program.

All applicants must submit all required application materials and fees as specified by the Graduate Admissions Office.

Advisors and Advisory Committee

The Graduate Coordinator will be the academic advisor for each student, to help remedy deficiencies in prerequisites, select electives if most value and plan the overall study program. For those completing a thesis, the thesis advisor will chair the advisory committee, which will guide the student in his or her research and supervise the completion of thesis requirements.

Plan of Study

Each student shall file an approved plan of study with the Department Chairperson and Graduate Coordinator. This form will contain a listing of the courses, which will make up his or her program. Any changes must have the approval of the Department Graduate Coordinator.

Credit Requirements

The Master of Science degree in Chemical Engineering requires the successful completion of 30 credit hours. Students may elect one of two options 1) 24 credit hours of course work, plus at least 6 credit hours in preparation of an acceptable thesis, or 2) 30 credit hours of course work for the non-thesis option. Students who have received a teaching or research assistantship will be required to submit an acceptable thesis. A thesis must be defended in an oral examination conducted by the student's thesis committee.

All students must enroll in at least two semesters of graduate seminar (10.601/602) during the period of study. (These are zero credit seminars.)

Core Requirements

The core requirements will consist of one course in advanced mathematics, one course in thermal/fluid processes and one course in solid mechanics. A minimum of four total courses must be taken from the following core areas.

Advanced Mathematics

10/24.509 System Dynamics

10/24.539 Mathematical Methods for Engineers

Thermal/Fluid Processes

10.510 Advanced Separation Processes

10.520 Advanced Thermodynamics

10.528 Advanced Transport Phenomena

Solid Mechanics

10.506 Colloidal, Interfacial & Nanomaterials Science and Engineering

10.508 Material Science and Engineering (Not for those who graduated from UML)

10.523 Nanodevices and Electronic Materials

10.525 Design and Packaging of Materials

10.535 Cell and Microbe Cultivation

Thesis

Each student who chooses to complete a thesis will be required to complete six credits of thesis and must defend the thesis when completed according to University regulations. The research work for the thesis shall be conducted under the supervision of a department faculty advisor and a committee of two others for the thesis. The student must prepare and submit an acceptable proposal for the thesis prior to beginning the work.

During the period the student is enrolled in graduate thesis, he or she may be required to submit to the faculty of the department a brief monthly report, showing progress in his or her thesis or project and approval by his or her advisor.

Elective Requirements

The remainder of the course requirements are to be made up of elective courses. See the elective course listing under the Doctoral Program.

Chemical Engineering

Department of Chemical Engineering

The Department of Chemical Engineering at UMass Lowell offers a wide variety of advanced degree programs.

- [Doctor of Engineering \(D.Eng.\)](#)
 - Chemical Engineering Option
 - Energy Engineering Option
- [Doctor of Philosophy \(Ph.D.\)](#)
 - Chemical Engineering Option
 - Energy Engineering Option
- **Doctorate in Philosophy in Physics (Ph.D.)**
 - Energy Engineering Option (see [Physics Dept.](#))
- **Master of Science in Engineering (M.S.E.)**
 - [Chemical Engineering](#)
 - [Energy Engineering \(Nuclear Option\)](#)
- [Graduate Certificates](#)
 - Biotechnology and Bioprocessing
 - Materials Science and Engineering

- Modeling, Simulation, and Control of Systems and Processes
- [Combined BS/MS Engineering Program](#)

The departmental programs encompass both traditional areas of chemical and nuclear engineering and modern frontier areas such as advanced engineered materials, biotechnology, and computer aided process design and controls. The department encourages cooperative university-wide efforts, especially in areas such as bioengineering, materials and recycling.

Graduate Certificates

Graduate Certificates in Civil & Environmental Engineering

The UMass Lowell Department of Civil & Environmental Engineering offers three interdisciplinary graduate certificates.

- [Environmental Biotechnology](#)
- [Nanotechnology](#)
- [Sustainable Infrastructure for Developing Nations](#)

[Graduate Certificate Application Form](#) (pdf)

Environmental Biotechnology

Biology, Chemistry, Civil & Environmental Engineering departments

Contact:

Dr. Juliette Rooney-Varga
978-934-4715
juliette_rooneyvarga@uml.edu

Environmental biotechnology refers to the application of biological technologies to monitor, understand, and remediate environmental problems. This certificate combines courses that explore the ecological impact of anthropogenic environmental change with courses that provide training in current biological technologies that can be brought to bear on environmental problems. Recent advances in biotechnology are providing new avenues for investigating biologically mediated environmental processes, many of which were inaccessible using traditional approaches. New biological technologies are being developed to mitigate environmental problems. These include the biological remediation of pollutants, biological treatment of wastewater and drinking water, source tracking of microbial pathogens, and mitigation of toxic algal blooms. As environmental resources are increasingly strained and new biological technologies with the potential to improve our environment become available, the demand for professionals with training in environmental biotechnology will continue to increase.

Required Courses (choose two):

- 81.504 Environmental Microbiology (3 credits)
- 81.523 Biology of Global Change (3 credits)
- 14.578 Biological Wastewater Treatment (3 credits)

Elective courses (choose six to eight credits):

- 84.580 Advanced Analytical Biochemistry (3 credits)
- 84.514 Advanced Analytical Chemistry (3 credits)
- 81.505/507 Bioinformatics (4 credits)
- 84.526 Chromatography (3 credits)
- 14.567 Environmental Aquatic Chemistry (3 credits)
- 14.568 Environmental Fate and Transport (3 credits)
- 14.595 Hazardous Waste Site Remediation (3 credits)
- 81.567 Recombinant DNA Techniques (3 credits)
- 81.569 Recombinant DNA Techniques Laboratory (2 credits)

Total: 12-14 credits

Nanotechnology

Civil & Environmental, Mechanical, Plastics Engineering departments

Contact:

Dr. Jackie Zhang
978-934-2287
jackie_zhang@uml.edu

The program will provide students with a fundamental knowledge of nanotechnology and is intended to respond to the increasing demand for trained professionals in nanoscience and technology. The certificate is designed for students with a background in chemistry, physics, biology, or any branch of engineering who want nanotechnology and nanomanufacturing workforce preparation. Students may focus on a concentration area based on their interests and background. Courses in each concentration area are carefully

designed to provide both analytical and practical competence. Students may take any combination from the electives list.

Core Course: (required)

- 25.550 Introduction to Nanotechnology (3 credits)

Core Courses: (choose one)

- 10.541 Nanostructural Characterization by SEM, TEM, and AFM (3 credits)
- 84.510 Electron Microscopy of Advanced Materials (3 credits)
- 84.525 Analysis of Advanced Materials (3 credits)

Elective Courses: (choose two courses from one of the following topic areas)

Materials

- 10.506 Interfacial Science and Engineering and Colloids (3 credits)
- 10.527 Nanomaterials Science and Engineering (3 credits)
- 22.578 Advanced Materials (3 credits)
- 26.513 New Plastics Materials (3 credits)
- 26.598 Smart Polymers (3 credits)

Manufacturing

- 10.523 Electronic Materials Processing (3 credits)
- 10.524 Self-assembly and Nanotechnology (3 credits)
- 10.535 Cell & Microbe Cultivation (3 credits)
- 10.545 Isolation & Purification of Biotech Products (3 credits)
- 16.504 VLSI Fabrication (3 credits)
- 25.551 Nanomanufacturing I (3 credits)
- 25.526 Nanoscale Plastics Processing (3 credits)
- 26.502 New Plastics Processing Techniques (3 credits)

Design and Devices

- 16.502 VLSI Design (3 credits)
- 16.512 Electronic Materials (3 credits)
- 16.508 Quantum Electronics for Engineers (3 credits)

Health and Environmental Impacts

- 19.503 Toxicology and Health (3 credits)
- 19.514 Aerosol Science (3 credits)
- 19.525 Industrial Hygiene and Ergonomics (3 credits)
- 19.557 Toxic Use Reduction (3 credits)
- 19.610 Exposure Assessment (3 credits)
- 19.617 Measurements of Airborne Contaminants (3 credits)

Sustainable Infrastructure for Developing Nations

Civil and Environmental Engineering Department

Contact:

Dr. William B. Moeller
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This 12 credit certificate prepares engineers and allied professionals for work in developing regions. It develops the special skills and awareness necessary for development of functionally sustainable infrastructure. The technical material provides advanced knowledge fully applicable to situations of both domestic and international infrastructure development.

Required Courses:

A pair of closely related courses (6 credits) that develop an area of concentration from among the list of offerings is required. 14.576 Practicum may be taken as one of these.

Elective Courses:

The certificate may be completed with any two additional courses from the list below. Individual programs of courses for the certificate will be developed in consultation with faculty.

- 14.527 Geotechnical and Environmental Site Characterization (3 credits)
- 14.559 Design of Masonry Structures (3 credits)

- 14.564 Water Supply Systems and Management (3 credits)
- 14.570 Wastewater Treatment and Storm Water Management Systems (3 credits)
- 14.573 Solid Waste Engineering (3 credits)
- 14.576 Geographic Information System Applications in Civil & Environmental Engineering (3 credits)
- 18.501 Wetlands Ecology (3 credits)
- 18.510 Water Resource System Assessment (3 credits)
- 18.535 Global Environmental Science (3 credits)
- 22.521 Solar Fundamentals (3 credits)
- 22.527 Solar Systems Engineering (3 credits)
- 14.582 Capstone Practicum (3 credits)
- 14.546 Ground Transportation Infrastructure* (3 credits)
- 14.580 Public Health and Solid Waste Engineering* (3 credits)

(*Proposed future offering)

Business Administration Minor for Civil & Environmental Engineering

The Business Administration Minor for Civil & Environmental Engineering is a program delivered by the College of Management. It consists of a focused set of 5 courses plus two courses already in the Civil and Environmental Engineering (CEE) core program, of which two may be used as CEE senior year Professional electives. The net additional course work (over and above the 128 credits needed for the CEE degree) is three courses (some of which may be taken during the summer).

This Minor provides management training which is very desirable in industry, and allows an easy transition into a later MBA program.

For students in Civil & Environmental Engineering, the following courses are required in the Business Administration Minor:

- 49.201 Economics I (already in CEE core)
- 60.201 Accounting/Financial *
- 61.301 Business Finance *
- 62.201 Marketing Principles
- 66.301 Organizational Behavior * (may be used as a CEE Professional Elective)
- 14.372 Civil Engineering Systems (already in CEE core)
- 14.475 Construction Management (CEE Professional Elective)

Courses marked with an asterisk * are available during the summer or on-line.

To enroll in this Minor, students need to file a Declaration of Minor form with the College of Management before registering for 300 level courses, and indicate their intention to pursue this Minor with their CEE Faculty Advisor. Immediately after registering for the final courses which complete the minor, the student should file an academic petition, indicating approval by the College of Management, with the Office of Enrollment Services.

This Minor differs from the "regular" Minor in Business Administration offered by the College of Management in that 14.372 Civil Engineering Systems is used in lieu of one of the CoM electives, and 14.475 Construction Management is used in lieu of an MIS course.

Doctoral Programs

The UMass Lowell Department of Civil & Environmental Engineering offers three doctoral programs.

- **Doctor of Engineering (D.Eng.)**
Civil and Environmental Engineering Option
- **Doctor of Philosophy (Ph.D.)**
Civil and Environmental Engineering Option
- **Doctor of Philosophy (Ph.D.) in Chemistry**
[Environmental Studies Option](#)

D.Eng. and Ph.D. - Civil & Environmental Engineering Option

Objectives

The objective of the Doctor of Engineering/Doctor of Philosophy degree in Civil and Environmental Engineering is to develop decision-making, research-oriented engineers with the ability to produce new engineering knowledge and analyze complex, cross-disciplinary issues. Successful applicants are expected to perform advanced research in one or more areas of concentration within the Department of Civil and Environmental Engineering and successfully complete both core courses and electives that may be drawn from a variety of disciplines. Beyond the core courses, the program can be tailored to the needs of each student through a formal arrangement between the student and his or her research advisor.

Areas of Concentration

The areas of concentration within the Doctor of Engineering/Doctor of Philosophy in Civil and Environmental Engineering are:

- Environmental Engineering
- Geoenvironmental Engineering
- Geotechnical Engineering
- Transportation Engineering
- Structural Engineering

Program Curriculum

In addition to the general degree requirements described earlier, students are required to take the Core Courses in one of the program concentration areas listed below.

Core for Environmental Engineering Concentration

- 14.561 Physical and Chemical Treatment Processes
- 14.562 Physical and Chemical Hydrogeology
- 14.567 Environmental Aquatic Chemistry
- 14.568 Environmental Fate and Transport
- 14.578 Biological Wastewater Treatment
- 14.595 Hazardous Waste Site Remediation

Core for Geoenvironmental Engineering Concentration

- 14.531 Advanced Soil Mechanics
- 14.536 Soil Engineering
- 14.562 Physical and Chemical Hydrogeology
- 14.567 Environmental Aquatic Chemistry
- 14.595 Hazardous Waste Site Remediation

and at least one of the following:

- 14.529 Engineering with Geosynthetics
- 14.538 Soil Behavior
- 14.527 Geotechnical and Environmental Site Characterization

Core for Geotechnical Engineering Concentration

- 14.531 Advanced Soil Mechanics
- (and any four of the following:)
- 14.527 Geotechnical and Environmental Site Characterization
- 14.529 Engineering with Geosynthetics
- 14.530 Deep Foundations
- 14.532 Theoretical Soil Mechanics
- 14.533 Advanced Foundation Engineering
- 14.534 Soil Dynamics and Earthquake Engineering
- 14.536 Soil Engineering
- 14.537 Experimental Soil Mechanics
- 14.538 Soil Behavior
- 14.539 Ground Improvement

Core for Transportation Engineering Concentration

- 14.540 Urban Transportation Planning
- 14.541 Traffic Engineering
- 14.581 Engineering Systems Analysis
- 14.583 Stochastic Concepts

Core for Structural Engineering Concentration

- 14.504 Advanced Strength of Materials
- 14.551 Design of Steel Structures or
- 14.552 Design of Reinforced Concrete Structures
- 14.556 Finite Element Analysis or equivalent
- 14.557 Structural Dynamics

Admissions Requirements

Admission to applicants who have at least one degree in engineering from an accredited university and department requires high academic standing in all prior course work. Admission may be also offered to applicants who hold a Bachelor's and/or Master's degree in non-engineering fields. In such cases, the applicant must successfully complete all requirements for a Master of Science in Civil and Environmental Engineering prior to being considered a candidate for the Doctor of Engineering/Doctor of Philosophy degree.

Plan of Study

Within about one academic year of initiation of doctoral study, each student must work with his/her research advisor to develop a Plan of Study that complies with doctoral program and University policies. Courses substitutions in the Plan of Study must be reviewed by the Departmental Graduate Committee. Formal requests for substitutions are made by the student's Research Advisor. The student's Research Advisor is the supervisor of the student's research activities. The Advisor will work with the student to develop Dissertation

research focus and request the service of appropriately qualified persons in the student's Dissertation Committee. The Dissertation Committee will comprise a minimum of 4 persons of which at least 2 will be full time, regular faculty members of the Department of Civil and Environmental Engineering. The function of the Dissertation Committee is to ensure that the final edition of the student's dissertation meets the high technical standards expected in doctoral work and that the student successfully defends his/her findings prior to the award of the Doctor of Engineering degree. Dissertation Committee members are not necessarily co-investigators of the student's research topic.

Qualifying Examination

Upon the completion of a maximum of 45 credit hours of graduate work that count towards the doctoral degree, the student will apply to the Dissertation Committee to take a Qualifying Examination. In addition, students who were admitted as non-engineering degree holders into the Doctor of Engineering/ Doctor of Philosophy program must satisfy all requirements for the award of the M.S. degree in Civil and Environmental Engineering before they are allowed to take the Qualifying Examination. The Qualifying Examination may be written and oral. The Dissertation Committee members will submit their grades to the Doctoral Program Coordinator who will tally them and report the overall grade on a pass/fail basis, to the student and his/her advisor. Students who successfully complete the Qualifying Examination will be designated as Candidates for the Doctor of Engineering /Doctor of Philosophy degree. For each doctoral student, a maximum of two Qualifying Examinations will be allowed. A doctoral student who fails the Qualifying Examination two times will not be allowed to continue in the doctoral program. Shortly after passing the Qualifying Examination, the Doctoral degree candidate will be expected to develop a thesis plan in collaboration with his/her advisor, and defend it successfully before the Doctoral Committee.

PH.D. Program in Chemistry - Environmental Studies Option

A Ph.D. in Chemistry with an option in Environmental Studies is offered jointly by the Department of Chemistry and the Department of Civil and Environmental Engineering. The program is described in detail in the [Chemistry Department](#) section of this catalog.

Masters Program

Civil & Environmental Engineering Master's Programs

The UMass Lowell Department of Civil & Environmental Engineering offers master's degree programs in Civil & Environmental Engineering and in Environmental Studies. Options within the Master of Science in Civil and Environmental Engineering include: Environmental Engineering, Geotechnical Engineering, Geoenvironmental, Structural Engineering, and Transportation Engineering. There are two concentrations within the Master of Science in Environmental Engineering - one in Atmospheric Sciences, and another in Environmental Engineering Sciences.

[Master of Science in Civil & Environmental Engineering](#)

- [Environmental Engineering Option](#)
- [Geotechnical Engineering Option](#)
- [Geoenvironmental Option](#)
- [Structural Engineering Option](#)
- [Transportation Engineering Option](#)

[Master of Science in Environmental Studies](#)

- [Atmospheric Sciences Concentration](#)
- [Environmental Engineering Sciences Concentration](#)

Master of Science in Civil & Environmental Engineering

Program Description and General Requirements

Graduate study in Civil and Environmental Engineering is an intensive program of instruction at an advanced technical level. The program permits students to design, in consultation with their advisor, a plan of study that meets individual goals and career objectives.

Program options include environmental engineering, geoenvironmental engineering, geotechnical engineering, structural engineering and transportation engineering.

Admission to a particular engineering option is open to applicants with undergraduate degrees in engineering, mathematics or science. The degree requires successful completion of 30 credit hours of course work, or 24 credit hours of instruction and a publishable thesis, or 27 hours of course work and preparation of a project report.

Courses are scheduled in the late afternoon and evening to provide study opportunities for students with full-time employment. Successful completion of undergraduate prerequisite courses is required prior to registering for graduate courses. However, undergraduate prerequisites and selected graduate courses, that do not have prerequisites, may be taken during the first year of study, but only with the written permission of the student's advisor. Required undergraduate prerequisite courses are listed in descriptions of the core graduate courses shown below.

Applicants who satisfy graduate admission requirements will be assigned to a faculty member who will serve as their academic advisor. Students receiving a teaching or research assistantship will normally be required to submit a publishable thesis. Those admitted to graduate study as non-degree students may apply for matriculated status. However, no more than 12 credits of work completed while in non-degree student status or transferred from another department or college will be used toward a degree. Matriculated status is preferred before initial registration and is mandatory prior to registration for second semester courses. Faculty will review a petitioner's

performance in all courses attempted.

Visit the [Civil & Environmental Engineering Department](#) website for more information.

M.S. in Civil Engineering (Environmental Engineering Option)

The program offers an opportunity to pursue a broad range of interests in the fields of environmental and water resources engineering. The course of study is designed to meet an individual student's interests and career goals. Programs consist of civil engineering courses in water and wastewater treatment, environmental chemistry, hydrology, hydraulics, air pollution control, environmental law and policy and may include courses from allied disciplines such as biological and health sciences, environmental studies, chemistry and work environment. The program of study consists of four core courses and elective courses. Undergraduate core course prerequisites must be completed before beginning graduate course work.

Prerequisite Undergraduate Courses for MS Environmental Engineering Option

In order to obtain the MS Degree in Civil and Environmental Engineering Environmental Engineering Option, a student is required to have completed undergraduate courses in the areas of chemistry, physics, mathematics and engineering. At a minimum, the following courses are required. University of Massachusetts Lowell (UML) course numbers are provided for reference purposes. Course work that is equivalent to the UML courses specified are acceptable. However, an official determination of prerequisite course equivalency will be conducted by UML faculty that teach the specified undergraduate course, or by the Department of Civil and Environmental Engineering Graduate Coordinator, only after the student has applied and been accepted into the graduate program. This list represents the minimum prerequisite course requirements. Additional undergraduate course work may be required to remedy academic deficiencies. Students will be notified of deficiencies in an acceptance letter. All deficiencies must be eliminated before a student can be classified as "fully matriculated".

The undergraduate prerequisite courses are as follows:

- 84.121 Chemistry I
- 84.123 Chemistry I Lab
- 84.122 Chemistry II
- 84.124 Chemistry II Lab
- 92.131 Calculus I
- 92.132 Calculus II
- 92.231 Calculus III
- 95.141 Physics I
- 96.141 Physics I Lab
- 92.234 Differential Equations
- 14.203 Statics
- 14.205 Dynamics
- 14.301 Fluid Mechanics
- 14.362 Environmental Engineering

Core Courses

- 14.561 Physical and Chemical Treatment Processes
- 14.562 Physical and Chemical Hydrogeology
- 14.567 Environmental Aquatic Chemistry
- 14.568 Environmental Fate and Transport
- 14.578 Biological Wastewater Treatment

Elective Courses

Individual student programs consist of a complement of elective courses usually taken from the following list:

- 14.509 Environmental Engineering Geology
- 14.527 Geotechnical and Environmental Site Characterization
- 14.529 Engineering with Geosynthetics

14.570 Small and Alternative Waste Water Treatment

14.572 Marine and Coastal Processes

14.573 Solid Waste Engineering

14.574 Air Quality Modeling

14.575 Groundwater Modeling

14.595 Hazardous Waste Site Remediation

18.501 Wetlands Ecology

18.505 Glacial Geology

18.506 Regional Hydrogeology

18.510 Water Resources Management

18.523 Air Pollution Control

18.571 Air Pollution Phenomenology

18.581 Understanding the Massachusetts Contingency Plan

M.S. in Civil Engineering (Geotechnical Engineering Option)

The master's degree program in geotechnical engineering encompasses soil mechanics theory and applications in the fields of foundation and soil engineering. Course work emphasizes the engineering behavior of soil, soil property determination, and the use of advanced soil mechanics theory and soil-structure interaction in the solution of soil and foundation engineering problems. Elementary courses in soil mechanics, statics, strength of materials and fluid mechanics are required as prerequisites for graduate core courses. Students receiving a teaching or research assistantship are required to submit a publishable thesis. The program of study consists of five required courses: 14.531 Advanced Soil Mechanics and any four core courses and four elective courses, selected with the consent of a student's faculty advisor. Program and course details are included in the graduate course list and the graduate catalog.

Core Courses

(Select any four of the following as core courses, others may be used as electives)

14.529 Engineering with Geosynthetics

14.530 Deep Foundations

14.532 Theoretical Soil Mechanics

14.533 Advanced Foundation Engineering

14.534 Soil Dynamics and Earthquake Engineering

14.536 Soil Engineering

14.537 Experimental Soil Mechanics

14.538 Soil Behavior

Additional Elective Courses

14.504 Advanced Strength of Materials

14.509 Environmental and Engineering Geology

14.521 Reliability Analysis in Engineering

14.527 Geotechnical and Environmental Site Characterization

14.529 Engineering with Geosynthetics

14.539 Ground Improvement

14.550 Behavior of Structures

14.562 Physical and Chemical Hydrogeology

14.581 Engineering Systems Analysis

M.S. in Civil Engineering (Geoenvironmental Option)

The solution of environmental problems related to soil and/or groundwater often requires knowledge of both Geotechnical and Environmental Engineering. The Geoenvironmental program provides fundamental training in soil mechanics, groundwater hydrology, environmental chemistry, and soil engineering. Course work is offered in each area as well as in courses that combine disciplines generally required in the solution of complex site problems, such as, landfill design, remediation of hazardous waste sites, dewatering and soil improvement.

Core Courses

- 14.531 Advanced Soil Mechanics
- 14.536 Soil Engineering
- 14.562 Physical and Chemical Hydrogeology
- 14.567 Environmental Aquatic Chemistry
- 14.595 Hazardous Waste Site Remediation

Elective Courses

- 14.527 Geotechnical Environmental Site Characterization
- 14.529 Engineering with Geosynthetics
- 14.530 Deep Foundations
- 14.532 Theoretical Soil Mechanics
- 14.533 Advanced Foundation Engineering
- 14.534 Soil Dynamics and Earthquake Engineering
- 14.537 Experimental Soil Mechanics
- 14.538 Soil Behavior
- 14.561 Physical and Chemical Treatment Process
- 14.568 Environmental Fate and Transport
- 14.573 Solid Waste Engineering
- 14.575 Groundwater Modeling
- 14.576 GIS Applications in Civil & Environmental Engineering
- 18.581 Understanding the Massachusetts Contingency Plan

M.S. in Civil Engineering (Structural Engineering Option)

The structural option within Civil and Environmental Engineering offers instruction and research in advanced concepts and techniques in the solution of complex structural engineering problems. A student seeking an MS Engineering in Structural Engineering must have a structural analysis course which includes statically indeterminate structures and junior or senior level courses in the design of steel and concrete structures. Student study programs in structural engineering are developed with a faculty advisor to meet the needs of the individual. These undergraduate courses are core graduate course prerequisites and students deficient in these areas must take these courses before they can take advanced courses.

Core Courses

- 14.504 Advanced Strength of Materials
- 14.551 Design of Steel Structures or
- 14.552 Design of Reinforced Concrete Structures
- 14.556 Finite Element Analysis (or equivalent)
- 14.557 Structural Dynamics

Elective Courses

- 14.521 Reliability Analysis in Engineering

- 14.550 Behavior of Structures
- 14.551 Design of Steel Structures
- 14.552 Behavior of Concrete Structures
- 14.553 Wood Structures
- 14.554 Prestressed Concrete Design
- 14.555 Seismic Design of Structures
- 14.558 Bridge Design
- 14.531 Advanced Soil Mechanics
- 14.533 Advanced Foundation Engineering
- 14.536 Soil Engineering

Additional geotechnical and geoenvironmental courses and appropriate courses from the Departments of [Mathematics](#) and [Mechanical Engineering](#) may also be included in a degree plan.

M.S. in Civil Engineering (Transportation Engineering Option)

The program in Transportation Engineering offers courses in planning, design and operation of multi-modal transportation facilities. It emphasizes the interdisciplinary nature of the subject, supplementing engineering concepts with techniques from management, economics, operations research and environmental studies. It is designed to provide students with advanced technical knowledge for addressing transportation problems in a variety of practical situations. Specialization in a specific area can be achieved through thesis and project work. Graduate study plans are designed based upon student interest, professional needs and undergraduate preparation. Students are expected to have completed or show proficiency in the following courses in partial fulfillment of degree requirements:

Core Courses

- 14.540 Urban Transportation Planning
- 14.541 Traffic Engineering
- 14.581 Engineering Systems Analysis
- 14.583 Stochastic Concepts

Courses from other appropriate disciplines such as engineering, management, and pure and applied science may be taken to form a coherent program in Transportation Engineering. A graduate plan of study will be designed to meet the professional needs of each student; however, at a minimum, each student. Following is a list of elective courses that are periodically being offered by the Department.

Elective Courses

- 14.522 Statistical Applications in Civil Engineering
- 14.542 Fundamentals of ITS and Traffic Management
- 14.544 Transportation Planning Practice
- 14.545 Public Transit Planning and Design
- 14.546 Pavement Design
- 14.547 Airport Planning and Design
- 14.548 Traffic Management and Control
- 14.549 Traffic Flow Theory Elective

Master of Science in Environmental Studies

Environmental Engineering Sciences Concentration

This interdisciplinary program offers a Master of Science in Environmental Studies with a thesis or a non-thesis track. Enrollment in the program is open to individuals with a baccalaureate degree in technology, biology or a physical science. Others may be admitted with the approval of the Graduate Coordinator. Such students may make up course pre-requisite deficiencies while in the program, although those credits will not count toward the total required for the master's degree. Frequently, students entering the program are required to take a number of undergraduate courses to develop analytical skills and to prepare for advanced level course work. Undergraduate courses may include calculus, statistics, chemistry, computer programming or courses designed to develop problem-solving skills. Course requirements are determined by discussion with the Program Coordinator. The thesis track requires completion of an approved

program of study involving a minimum of 24 credits of core courses and electives, and 6 credits of thesis, consisting of laboratory research or scholarly investigation, for a total of 30 credits. Students may only register for thesis research with the prior approval of a thesis advisor. The thesis work is to be guided by a principal advisor who is a member of the University of Massachusetts Lowell faculty and by two additional committee members, at least one of whom must be a member of the faculty. Committee selection and the thesis topic are subject to the approval of the graduate coordinator. The non-thesis track requires completion of an approved program of study involving 30 credits of core courses and electives. All individual programs of study must include the core courses listed below:

Prerequisite Undergraduate Courses for M.S. Environmental Studies Option

In order to obtain the M.S. Degree in Environmental Studies, a student is required to have completed undergraduate courses in the areas of chemistry, physics, and mathematics. At a minimum, the following courses are required. University of Massachusetts Lowell (UML) course numbers are provided for reference purposes. Course work that is equivalent to the UML courses specified are acceptable. However, an official determination of prerequisite course equivalency will be conducted by UML faculty that teach the specified undergraduate course, or by the Environmental Studies Graduate Coordinator, only after the student has applied and been accepted into the graduate program. This list represents the minimum prerequisite course requirements. Additional undergraduate course work may be required to remedy academic deficiencies. Students will be notified of deficiencies in an acceptance letter. All deficiencies must be eliminated before a student can be classified as "fully matriculated".

The undergraduate prerequisite courses are as follows:

84.121 Chemistry I

84.123 Chemistry I Lab

84.122 Chemistry II

84.124 Chemistry II Lab

92.131 Calculus I

92.132 Calculus II

95.141 Physics I

96.141 Physics I Lab

Core Courses

18.510 Water Resources Management

14.573 Solid Waste Engineering

18.523 Air Pollution Control or

18.571 Air Pollution Phenomenology

Elective Courses

14.509 Environmental/Engineering Geology

14.561 Physical and Chemical Treatment Processes

14.562 Physical and Chemical Hydrogeology

14.567 Environmental Aquatic Chemistry

14.568 Environmental Fate and Transport

14.570 Small and Alternative Wastewater Treatment

14.572 Marine and Coastal Processes

14.574 Air Quality Modeling

14.575 Groundwater Modeling

14.595 Hazardous Waste Site Remediation

18.501 Wetlands Ecology

18.502 Limnology

18.503 Environmental Toxicology and Risk Assessment

18.505 Glacial Geology

18.506 Regional Hydrogeology
18.527 Environmental Laws
18.571 Air Pollution Phenomenology
18.572 Energy and the Environment
18.575 Physical Chemistry for Environmental Studies
18.576 Boundary layer Meteorology
18.577 Remote Sensing of the Atmosphere
18.578 Advanced Synoptic Meteorology
18.579/85.515 Atmospheric Structure and Dynamics
18.580 Implementation of Environmental Policy
18.581 Understanding the Massachusetts Contingency Plan
84.519 Environmental Chemistry

Atomspheric Sciences Concentration

Enrollment in this program is open to individuals with a bachelor's degree in sciences, mathematics and engineering. Others may be admitted with the approval of the Graduate Program Coordinator. Such students may make up course prerequisite deficiencies while in the program, although these credits will not count toward the total required for the master's degree. Frequently, students entering the program are required to take a number of undergraduate courses to develop the analytical skills, and to prepare for the advanced level courses.

The M.Sc. program requires the completion of 30 credits, 9 in core courses, and 15 in elective courses listed below. Six credits may be achieved by completing a Master's Thesis. The thesis involves original laboratory or theoretical work, usually publishable in accredited and peer reviewed technical journals. With the Graduate Program Coordinator's approval, the thesis work may be performed at home or at the student's employment facilities. The thesis advisory committee will consist of a Principal Advisor who is the member of the EEAS faculty, and two members chosen from EEAS or associated UMass Lowell faculty. One member may be from outside the University, with the approval of the Graduate Coordinator. Students may elect to take additional courses instead of writing a thesis.

Most of the courses are offered in the evening, usually from 6 to 9 p.m., once per week. This enables working students to complete the course requirements while the student is employed. A maximum of 5 years is allowed for completion of the master's degree, including the thesis.

Core Courses

85.501 Boundary Layer Meteorology
87.575/84.575 Physical Chemistry for Environmental Studies

Chose one of the two following courses:

19.527/18.527 Environmental Law and Policy
49.615 Environmental and Natural Resources Economics

Elective Courses

85.502 Advanced Synoptic Meteorology
85.503 Remote Sensing of the Atmosphere
85.511 Solar Terrestrial Relations
85.515 Atmospheric Structure and Dynamics
85.523 Air Pollution Control
85.571 Air Pollution Phenomenology
85.673/19.617 Air Pollution Laboratory/Measurement of Airborne Contaminants
85.674 Air Quality Modeling
87.572 Energy and the Environment
19.514 Aerosol Science

92.550 Mathematical Modeling

98.613 Environmental Monitoring and Surveillance (Radionuclides)

Civil & Environmental Engineering

Department of Civil and Environmental Engineering

The UMass Lowell Department of Civil and Environmental Engineering offers a wide variety of graduate programs. Program options include environmental engineering, geoenvironmental engineering, geotechnical engineering, structural engineering, transportation engineering, and environmental studies.

- [Doctor of Engineering \(D.Eng.\)](#)
 - Civil and Environmental Engineering Option
- [Doctor of Philosophy \(Ph.D.\)](#)
 - Civil and Environmental Engineering Option
- [Doctor of Philosophy in Chemistry \(Ph.D.\)](#)
 - Environmental Studies Option
- [Master of Science in Civil and Environmental Engineering](#)
- [Master of Science in Environmental Studies](#)
 - Environmental Engineering Science Concentration
- [Master of Science in Environmental Studies](#)
 - Atmospheric Sciences Concentration
- Graduate Certificate Programs
 - [Environmental Biotechnology](#)
 - [Nanotechnology](#)
 - [Sustainable Infrastructure for Developing Nations](#)
- [Bachelor's-Master's Engineering Program](#)

Graduate study in Civil and Environmental Engineering is an intensive program of instruction at an advanced technical level. The program permits students to design, in consultation with their advisor, a plan of study that meets individual goals and career objectives.

Graduate Certificates

Department of Electrical and Computer Engineering

Electrical and Computer Engineering Graduate Certificates:

- ? [Communications Engineering](#)
- ? [Microwave and Wireless Engineering](#)
- ? [Stochastic Systems](#)
- ? [VLSI and Microelectronics](#)

Interdisciplinary Graduate Certificates:

- ? [Biomedical Engineering](#)
- ? [Energy Conversion](#)
- ? [Integrated Engineering Systems](#)
- ? [Nanotechnology](#)
- ? [Photonics and Optoelectronics](#)
- ? [Telecommunications](#)

Graduate certificate programs are ideal for bachelor's degree-prepared engineers who wish to continue their studies without making the commitment of a master's program. Students may want to brush-up on new developments in their field or investigate another specialty. Certificates are earned by taking four courses from a list associated with each certificate. ECE certificates can be used as concentrations in the ECE Master's programs.

Credits earned from these graduate certificates may be used toward a graduate degree with the approval of the graduate program coordinator.

Each of these certificates are described below and include the name and contact information of the certificate coordinator.

About Graduate Certificates

Most graduate certificates are comprised of four courses (12 graduate credits) designed to provide specific knowledge and expertise vital to today's changing and complex needs in the work place. In most cases courses may be applied toward a degree program.

Requirements to Complete a Graduate Certificate

The four courses must be completed within a five year period with a minimum 3.0 grade point average, and with no more than 6 credits below B. Courses completed for one certificate may not be used for another certificate.

Certificate Application Process

Individuals must complete a simplified application, provide an official undergraduate transcript indicating that a baccalaureate degree has been awarded, and submit a nominal application fee. GRE's are not required.

[Graduate Certificate Application Form](#) (pdf)

Communications Engineering Certificate

Electrical and Computer Engineering Department

Contact:

Dr. Kavitha Chandra
978-934-3356
kavitha_chandra@uml.edu

This certificate provides a fundamental background in the understanding of information transmission, statistical properties of signals and noise, and both analog and digital modulation/demodulation techniques. Advanced topics in modern communications and the characterization of communication channels are covered in optional courses in coding, error correction, information measures, stochastic system modeling and wireless communications. The holder of the certificate will have both analytical and practical competence to contribute significantly to the design and development of new and updated communications systems.

This is a 12 credit certificate; all courses are 3 credits each.

Required Courses:

16.543 Communications Theory
16.584 Probability and Random Processes

Elective Courses: (Choose two of the following)

16.548 Coding and Information Theory
16.582 Wireless Communication
16.618 Performance of Wireless Communications Networks
16.685 Statistical Communication Theory
16.687 Applied Stochastic Estimation

Microwave and Wireless Engineering Certificate

Electrical and Computer Engineering Department

Contact:

Dr. Tenneti C. Rao
978-934-3323
tenneti_rao@uml.edu

Wireless technologies are of increasing importance in a variety of personal communications and control applications. The certificate is open to students who have an interest in learning the fundamentals and engineering applications of radio wave and microwave devices and systems. The integrated set of courses offers graduate level skills and knowledge which will provide a background for those wishing to participate in this rapidly expanding field. The certificate is open to students with a BS degree in electrical engineering or in related disciplines such as physics or electronics engineering technology with an appropriate background in electromagnetics.

This is a 12 credit certificate; all courses are 3 credits each.

Required Courses:

16.531 Radio Frequency (RF) Design
16.532 Microwave Engineering
16.582 Wireless Communications

Elective Courses: (Choose one of the following)

16.506 Antenna Design
16.571 Radar System
16.618 Performance of Wireless Communication Networks

Stochastic Systems Certificate

Electrical and Computer Engineering Department

Contact:

Dr. Oliver Ibe
978-934-3118
oliver_ibe@uml.edu

This certificate provides a thorough grounding in the modeling of signals represented as random functions of time. A background in linear system theory, signal transforms and the theory of probability and random processes is given. The certificate is completed by choosing specialized courses in time series analysis, statistical communication theory or applied stochastic estimation. These courses deal with the estimation of signals and of noise using a variety of mathematical models such as likelihood and entropy based techniques, matched, adaptive and nonlinear filtering of signals. The holder of this certificate will have the analytical and practical competence to design for and evaluate probabilistic issues in communications, complex systems, and/or networks.

This is a 12 credit certificate; all courses are 3 credits each.

Required Courses:

16.584 Probability and Random Processes
16.711: Special Topics in ECE: Advanced Markov Methods

Elective Courses: (Choose two of the following)

16.509 Linear Systems Analysis
16.543 Theory of Communication
16.687 Applied Stochastic Estimation

VLSI & Microelectronics Certificate

Department of Electrical & Computer Engineering

Contact:

Dr. Kanti Prasad
978-934-3326
kanti_prasad@uml.edu

The purpose of this certificate program is to provide essential background in solid state physical electronics and very large scale integrated (VLSI) circuit fabrication. These courses, combined with two electives, will provide a customized background to the subject but with sufficient depth in an area of choice to provide tangible useful expertise.

This is a 12 credit certificate; all courses are 3 credits each.

Required Courses: (Choose two of the following)

16.502 VLSI Design
16.595 Solid State Electronics
16.504 VLSI Fabrication
16.508 Quantum Electronics for Engineers

Elective Courses: (Choose two of the following)

16.502 VLSI Design
16.505 Microwave Electronics
16.507 Electromagnetic Waves and Materials
16.508 Quantum Electronics for Engineers
16.517 MMIC Design and Fabrication
16.565 Analog Devices
16.568 Electro Optics and Integrated Optics

The Electrical and Computer Engineering Department also participates in the following interdisciplinary certificate programs:

Biomedical Engineering Certificate

Electrical & Computer Engineering Department
Dr. Mufeed Mah'd 978-934-3317
Mufeed_Mahd@uml.edu

Image data are of increasing importance in Biomedical Engineering and Biotechnology. The application of microelectronic circuitry, high performance processors, and improved algorithms based on advanced mathematics has resulted in innovative new methodologies to acquire and process image data, permitting visualization, quantification, and functional analysis of tissues and organs. The Biomedical Engineering Graduate Certificate is a multidisciplinary program, spanning courses in several departments in the College of Engineering including Departments of Electrical and Computer Engineering, Plastic Engineering, Chemical and Nuclear Engineering, as well as the Biomedical Engineering and Biotechnology program. The certificate provides an excellent opportunity for educational

experience to learn the principles and applications of imaging technology. It is a coordinated program of courses, seminars, and laboratory experiences jointly

offered by the participating departments. This is a 12 credit program comprised of two required three-credit courses, and two elective three-credit courses.

Required Courses:

16.511 Medical Imaging Diagnosis (IB511)
16.560 Biomedical Instrumentation (IB560)

Elective Courses: (Choose two of the following)

16.510 Digital Signal Processing (IB510)
IB.500 Introduction to Biomedical Engineering and Biotechnology
IB512 Medical Image Processing
IB516 Principles of Nuclear Magnetic Resonance Imaging
IB517 Embedded System Design in Medical Systems
19.531 Occupational Biomechanics
24.542 Microscopy of Advanced Materials
24.541 AFM and X-ray Diffraction Analysis of Advanced Materials
26.553 Polymers in Medicine I
26.575 Biomaterials
IB 512 Medical Image Processing

Energy Conversion Certificate

Electrical and Computer Engineering Department
Dr. Ziyad Salameh 978-934-3333
ziyad_salameh@uml.edu

Energy conversion is a discipline that spans across three departments: Electrical, Mechanical and Chemical & Nuclear Engineering. Interest is rising for practical applications in the housing industry to supply houses with clean sources of energy to meet electrical supply needs, as well as for space heating/ cooling. All renewable energy sources will be considered (e.g. wind energy and photovoltaics). Information about batteries, battery charging stations, battery chargers and energy conversion devices (such as rectifiers, inverters, choppers, controllers) is presented as related to the development of low emission vehicles.

Choose four of the following courses:

16.515 Power Electronics
16.525 Power Systems Distribution
16.528 Alternative Energy Sources
16.529 Electric Vehicle Technology
22.521 Fundamentals of Solar Energy Engineering
22.527 Solar Energy Engineering

Integrated Engineering Systems Certificate

Applied Physics, Computer Engineering, Computer Science, Electrical Engineering, Materials Engineering, Mechanical Engineering, Plastics Engineering Departments

Contact:

Dr. Craig Armiento
978-934-3395
Craig_Armiento@uml.edu

As companies increasingly undertake engineering projects that bring together a wide range of disciplines for manufacturing an integrated product, it is often necessary to assemble teams of experts in these various disciplines, and prepare managers who have a fundamental, overall understanding of several different engineering areas. The certificate is designed to respond to the need for trained professionals who are responsible for managing complex engineering systems integrating algorithms, information, software and hardware. Completion of certificate courses in areas complementary to the individual's specific training will serve as an important starting point for engineering managers (and prospective managers) who need to solve complex interdisciplinary problems at the interfaces of electrical, computer, mechanical, materials engineering, and computer science and applied physics.

The program consists of six clusters:

1. Applied Physics
2. Computer Engineering
3. Computer Science
4. Electrical Engineering
5. Materials Engineering
6. Mechanical Engineering

Within each cluster, there are a number of carefully selected courses ranging from introductory graduate level to more advanced, specialized electives.

Students must successfully complete four courses (12 credits), one or two of which may be taken in their area of expertise. The remaining courses must be taken in separate and different cluster areas. Courses are selected in consultation with one (or more) graduate program coordinators to best meet the student's needs in terms of background, interests, and work requirements. It may be necessary for students to take prerequisite course(s) if they do not have appropriate backgrounds for a particular cluster course.

CLUSTER AREAS AND DESIGNATED COURSES:

Applied Physics

95.553 Electromagnetism I
95.554 Electromagnetism II
95.540 Image Processing (4 credits)
95.578 Integrated Optics: Wave Guide and Lasers
95.535 Introduction of Quantum Mechanics I
95.547 Laser Physics and Applications
95.538 Physical Optics and Waves
95.577 Solid State Electronic and Opto-Electronic Devices
95.521 Statistical Thermodynamics

Computer Engineering

16.550 Advanced Digital System Design
16.561 Computer Architecture Design
16.581 Computer Vision and Digital Image Processing
16.510 Digital Signal Processing
16.572 Embedded Real-Time Systems
16.575 FPGA Logic Design Techniques
16.552 Microprocessors Systems II and Embedded Systems
16.582 Network Design: Principles, Protocols, and Applications
16.573 Operating Systems and Kernel Design
16.521 Real Time DSP
16.502 VLSI Design
16.504 VLSI Fabrication

Computer Science

91.561 Computer Security I
91.562 Computer Security II
91.563 Data Communications I
91.564 Data Communications II
91.549 Mobile Robots
91.515 Operating Systems I
91.516 Operating Systems II
91.548 Robot Design
91.523 Software Engineering I
91.524 Software Engineering II

Electrical Engineering

16.528 Alternative Energy Sources
16.506 Antenna Theory and Design
16.532 Computational Electromagnetics
16.513 Control Systems
16.529 Electric Vehicle Technology
16.507 Electromagnetic Waves and Materials
16.512 Electronic Materials
16.519 Engineering of Submicron Machines
16.590 Fiber Optic Communications and Networks
16.543 Theory of Communication
16.509 Linear System Analysis
16.505 Microwave Electronics
16.533 Microwave Engineering
16.515 Power Electronics
16.584 Probability and Random Processes
16.571 Radar Systems
16.517 MMIC Design and Fabrication

Materials Engineering

26.544 Advanced Plastics Materials
10.506 Interfacial Science and Engineering and Colloids
10.507 Material Science and Engineering
26.503 Mechanical Behavior of Polymers
10.523 Nanodevices and Electronic Materials
10.527 Nanomaterials Science and Engineering
10.541 Nanostructural Characterization by SEM, TEM, and AFM
26.518 Plastics Product Design

Mechanical Engineering

22.512 Applied Finite Element Analysis
22.571 Concurrent Engineering and Quality
22.523 Cooling of Electronic Equipment
22.574 Design for Reliability Engineering

22.516 Experimental Modal Analysis
22.524 Fundamentals of Acoustics
22.575 Industrial Design of Experiments
22.573 Manufacturing Systems Engineering
22.591 Mechanical Behavior of Materials
22.515 Modal Analysis- Theoretical Methods
22.579 Robotics
22.562 Solid Mechanics
22.527 Solar Systems Engineering
22.550 Vibrations

Nanotechnology Certificate

Civil & Environmental, Mechanical, Plastics Engineering Departments
Dr. Jackie Zhang 978-934-2287
jackie_zhang@uml.edu

The program will provide students with a fundamental knowledge of nanotechnology and is intended to respond to the increasing demand for trained professionals in nanoscience and technology. The certificate is designed for students with a background in chemistry, physics, biology, or any branch of engineering who want nanotechnology and nanomanufacturing workforce preparation. Students may focus on a concentration area based on their interests and background. Courses in each concentration area are carefully designed to provide both analytical and practical competence. Students may take any combination from the electives list.

Core Courses - Required:

25.550 Introduction to Nanotechnology

Core Courses: (Choose one)

10.541 Nanostructural Characterization by SEM, TEM, and AFM

84.510 Electron Microscopy of Advanced Materials

84.525 Analysis of Advanced Materials

Elective Courses: (choose two courses)

Materials

10.527 Nanomaterials Science and Engineering

10.506 Interfacial Science and Engineering and Colloids

22.591 Mechanical Behavior of Materials

26.513 New Plastics Materials

26.598 Smart Polymers

Manufacturing

10.523 Electronic Materials Processing

10.535 Cell & Microbe Cultivation

10.545 Isolation & Purification of Biotech Products

16.504 VLSI Fabrication

26.502 New Plastics Processing Techniques

26.578 Advanced Polymer Processing

xx.xxx Processing of Nanocomposites

Design and Devices

16.710: Special Topics in ECE: Nanoelectronics

16.502 VLSI Design

16.512 Electronic Materials

16.508 Quantum Electronics for Engineers

Health and Environmental Impacts

19.514 Aerosol Science

19.525 Industrial Hygiene and Ergonomics

19.557 Toxic Use Reduction

19.610 Exposure Assessment

19.617 Measurements of Airborne Contaminants

19.503 Toxicology and Health

Photonics & Opto-Electronic Devices Certificate

Physics Department and Electrical & Computer Engineering Department
Dr. James Egan 978-934-3774 / 978-934-3300
james_egan@uml.edu

The certificate is offered jointly by the Electrical & Computer Engineering & Physics Departments and reflects the strong interests in the physics and technologies of electro-optics. Extensive research facilities include: new materials growth (molecular beam epitaxy) and device fabrication and testing laboratories.

Required Courses:

95.577 Solid State Electronic & Opto-electronic Devices

-and-

95.539 Electro-optics

-OR-

16.595 Solid State Electronics

-and-

16.568 Electro Optics and Integrated Optics

Elective Courses: (choose two of the following):

16.507 Electromagnetic Waves and Materials

16.508 Quantum Electronics for Engineers

16.590 Fiber Optic Communications

16.607 Electromagnetics of Complex Media

16.669 Opto Electronic Devices

95.547 Laser Physics & Applications

95.631 Nonlinear Optics

95.578 Integrated Optics: Wave Guides & Lasers

Telecommunications Certificate

Computer Science Department

Dr. Byung Kim 978-934-3617

byung_kim@uml.edu

The graduate certificate consists of courses from both the Computer Science and Electrical Engineering Departments. It is intended for students who hold a baccalaureate degree in science or engineering and who wish to concentrate on hardware/software issues pertaining to telecommunications.

Required Courses:

16.543 Theory of Communication

91.555 Computer Networks

91.563 Data Communications I

Plus One Approved Elective

Electrical & Computer Engineering

Department of Electrical and Computer Engineering

Graduate Degrees:

- Master's of Science in Electrical Engineering (M.S.E.)
- Master's of Science in Computer Engineering (M.S.E.)
- Doctor of Philosophy in Electrical Engineering (Ph.D.)
- Doctor of Philosophy in Computer Engineering (Ph.D.)
- Doctor of Engineering in Electrical Engineering (D.Eng.)
- Doctor of Engineering in Computer Engineering (D.Eng.)

Graduate Certificates:

Electrical and Computer Engineering

- Communications Engineering
- Microwave and Wireless Engineering
- Stochastic Systems
- VLSI and Microelectronics

Interdisciplinary

- Biomedical Engineering
- Energy Conversion
- Integrated Engineering Systems
- Nanotechnology
- Photonics and Optoelectronics
- Telecommunications

The Department of Electrical and Computer Engineering graduate program provides an education based on excellent teaching and cutting-edge research to qualify students as leaders in both industrial and academic environments. It is distinguished by an extensive set of courses in all of the major disciplines within electrical and computer engineering fields. Our mission is supported by six research centers, over ten research laboratories and a world-class faculty with ongoing research in a broad set of disciplines. The program offers masters degrees in both Electrical Engineering and Computer Engineering, as well as two doctoral degrees, Doctor of Philosophy and

Doctor of Engineering, in Electrical Engineering and Computer Engineering.

Research

Research is conducted and courses offered in the following areas:

- Artificial/Machine Intelligence
- Bio-Engineering/Bio-Informatics/Bio-Sensors
- Computational Engineering
- Computing and Embedded Systems Hardware and Architecture
- Computer/Telecommunications/Sensor Networks
- Control Systems
- Distributed Systems and Networks
- Electric Vehicles and Battery Technology
- Electromagnetics
- Ionospheric Measurements
- Microwave Engineering
- Mobile/Wireless Communications
- Optoelectronic and Semiconductor Devices
- Power Systems
- Quantum/Nano Electronics
- Signal/Image Processing and Computer Vision
- Solar Energy and Photovoltaics
- Stochastic Processes
- VLSI Design and Fabrication

Graduate Certificates

Four graduate certificates in Electrical and Computer Engineering and six interdisciplinary certificates in corporation with other departments are also offered. These certificates allow students who are not in a degree program to further their education. Approvals to take courses associated with these certificates are subject to approval of the certificate coordinator. Because there is no transfer policy for certificates, students should not take any course for certificates before being accepted.

Doctoral Programs

DOCTOR of PHILOSOPHY PROGRAMS

Doctor of Philosophy Program in ELECTRICAL ENGINEERING (EE)

Doctor of Philosophy Program in COMPUTER ENGINEERING (CP)

DOCTOR of ENGINEERING PROGRAMS

Doctor of Engineering Program in ELECTRICAL ENGINEERING (EE)

Doctor of Engineering Program in COMPUTER ENGINEERING (CP)

There are two types of doctoral degrees, the Doctor of Philosophy (Ph.D.) and the Doctor of Engineering (D.Eng.). The former is more research oriented while the latter is more industrially oriented. The primary difference between the two types of doctoral degrees is the requirement of 9 management credits for the D.Eng degrees. There may also be differences in the content of the dissertations.

Objective

The primary goal of the Doctoral programs is to develop research engineers with the ability to produce new engineering knowledge. A secondary goal for the Doctor of Engineering programs is to develop an appreciation for the social and economic issues connected with the operation of a modern high technology enterprise. The programs include advanced graduate coursework in Electrical/Computer Engineering and allied subjects, a non-technical component (in the case of the Doctor of Engineering programs), and research culminating in a doctoral dissertation.

A complete description of the doctoral programs are found in the Department of Electrical and Computer Engineering Doctoral Student Handbook which is updated annually and available from the department office.

Admission Requirements

Applicants must have a BS or MS degree in Electrical Engineering or Computer Engineering or their equivalent from a recognized college or university with an acceptable quality of prior academic work. Applicants must submit official transcripts of all prior undergraduate and graduate courses. Each applicant must submit an official report of Graduate Record Examination (GRE) General Test scores. The TOEFL exam is required for students from abroad whose native language is not English.

Plan of Study

Each student entering the program must develop a plan of study in consultation with his/her advisor.

Residency Requirement

One year of full-time residence is required of all students in the program.

Program Duration

The time for graduation for full-time students is expected to range from a minimum of three and a half years to a maximum of five years after BS Engineering and a minimum of two and a half years to a maximum of four years after MS Engineering.

Transfer Credit

Up to 24 semester credits in graduate courses in Electrical/Computer Engineering and allied subjects are transferable to the doctoral program upon approval by the Doctoral Committee of the Department of Electrical and Computer Engineering.

Candidacy Requirements

1. Qualifying Examination

The qualifying examination is a written exam which is conducted annually on the Tuesday after Spring break in March. Students accepted to the Doctoral Programs must take the qualifying examination within one year of their admissions.

2. Thesis Proposal and Oral Exam in Area of Concentration

Having passed the qualifying examination, a student may submit his/her dissertation proposal and defend the proposal before the Doctoral Committee. The proposal examination will also include an oral examination on topics connected with the student's area of research. On passing this examination, the student's name will be submitted to the College Doctoral Committee and the Registrar's Office for acceptance as a candidate for the Doctor of Philosophy or Doctor of Engineering Degree. Admission to candidacy status does not guarantee the obtaining of the degree.

Academic Requirements

1. Credit Requirement

The Doctor of Philosophy (Ph.D.) degree requires completion of a minimum of 63 semester hours of academic credit beyond the Bachelor of Science degree. A typical program consists of the following:

ECE and Allied Subjects 42

Thesis 21

Total credit hours 63

The Doctor of Engineering (D.Eng.) degree requires completion of a minimum of 63 semester hours of academic credit beyond the Bachelor of Science degree. A typical program consists of the following:

ECE and Allied Subjects 33

Thesis 21

Non-Technical Component 9

Total credit hours 63

The Doctoral Program Coordinator of the Department of Electrical and Computer Engineering will assist students in selecting courses to meet the non-technical component of the Doctor of Engineering program.

2. Core Requirement

The core courses are beginning graduate courses. They emphasize the fundamentals, concepts, and analytical techniques relevant to Electrical/Computer Engineering. They also help the student prepare for the qualifying examination.

Required Core Courses for Ph.D. and D.Eng degrees in Electrical Engineering: (choose three courses)

- 16.507 Electromagnetic Materials and Waves
- 16.508 Quantum Electronics for Engineers
- 16.509 Linear Systems Analysis
- 16.513 Control Systems
- 16.515 Power Electronics
- 16.520 Computer-Aided Engineering Analysis
- 16.543 Introduction to Communications Theory
- 16.584 Probability and Random Processes
- 16.595 Solid State Electronics

Students in Electrical Engineering must take three courses of the above courses.

Required Core Courses for Ph.D. and D.Eng degrees in Computer Engineering: (choose three courses)

- 16.553 Software Engineering
- 16.561 Computer Architecture and Design
- 16.562 VHDL/Verilog Synthesis and Design
- 16.573 Operating Systems and Kernel Design

Students in Computer Engineering must take three courses of the above courses.

3. Grade-Point Average (GPA) Requirement

To successfully complete the program, a student must achieve a cumulative grade-point average (GPA) of at least 3.25 in all course work.

4. Research Requirement and Dissertation

Each student is required to do a research internship for at least one year in industry, government, or at the University. The purpose of the internship is to place the student in a realistic engineering setting in which he/she will function as a responsible engineer and carry out the research work required for the dissertation. During the internship, the student must maintain close contact with his/her academic advisor. A written thesis must be submitted and defended orally.

Masters Program

Master's Programs in Electrical and Computer Engineering

Master's of Science in Engineering (M.S. Eng.) - ELECTRICAL ENGINEERING (EE)

Master's of Science in Engineering (M.S. Eng.) - COMPUTER ENGINEERING (CP)

[Graduate Admissions Requirements](#)

[Academic Requirements](#)

[Areas of Concentration in Electrical Engineering](#)

- Information Systems (Telecommunications)
- Information Systems (Communications Engineering)
- Power and Energy Engineering
- Opto-Electronics
- Other

[Areas of Concentration in Computer Engineering](#)

- ComputerNetworking and Distributed Systems
- Computing and Embedded Systems Hardware an Architecture
- Artificial and Machine Intelligence
- Multimedia Digital Signal and Image Processing and Applications

Graduate Admissions Requirements

1. General requirement for all applications:

All applicants must submit the application materials supplied by the Graduate Admissions Office as well as the official score report for the Graduate Record Examination (GRE) Aptitude Test.

2. With a BS in Engineering and related areas:

- Applicants to the MS Engineering in EE or CP programs should hold a BS degree in EE, CP, areas related to EE or CP, Computer Science, Mathematics, Physics, or other Engineering disciplines, with acceptable quality of undergraduate work from an accredited college or university.
- Applicants to the MS Engineering in EE or CP should possess the following backgrounds and their pre-requisites.

Electrical Engineering

16.265 Logic Design I

16.311 Electronics Lab I

16.317 Microprocessor Systems Design I

16.360 Engineering Electromagnetics I

16.362 Signal and Systems I

16.365 Electronics I

16.413 Linear Feedback Systems

Computer Engineering

16.216 A high-level programming language such as C/C++

16.265 Logic Design

16.311 Electronics Lab I

16.317 Microprocessor Systems Design I

16.362 Signal and Systems I

16.364 Engineering Mathematics

(or another appropriate advanced course beyond 92.231 Calculus III and 92.236 Engineering Differential Equations)
16.365 Electronics I

Applicants who lack any of the above backgrounds and their pre-requisites are required to make up their deficiencies as conditions for acceptance.

3. With a BS in Technology:

Students who lack the BS Engineering in EE or CP but hold a bachelor's degree in Electrical or Computer Engineering Technology, or Electronics Technology may be admitted under special circumstances. These circumstances include an academic record of high achievement in their undergraduate studies in Technology as evaluated at the discretion of the Graduate Coordinator.

In addition, such students must complete a series of analytically oriented courses in the Department of Electrical and Computer Engineering, University of Massachusetts Lowell.

4. Applicants applying for the Accelerated Bachelor's to Master's program:

The Bachelor's to Master's program is an accelerated program offered by the Department of Electrical and Computer Engineering to encourage its outstanding undergraduate students to continue study at graduate level. Undergraduate students who have a GPA of 3.00 or better at the end of their junior year and are interested in this program must apply for this program before they complete the undergraduate graduation requirements. Students who apply for the BS/MS program are not required to submit the Graduate Record Examination (GRE) scores and are exempted from the application fee. With the approval of the Graduate Coordinator, students in the BS/MS program may use up to six credits of graduate courses with an earned grade of B or better for both graduate and undergraduate degrees.

Academic Requirements

Graduate students can choose to complete a thesis or a non-thesis option. Students are required to take 9 credits of core courses as well as elective courses to complete their program of study.

1. Credit Requirements

Non-Thesis Option

Core Requirements 9
Technical Electives 21
Advanced Project 3

Total credit hours.....33 credits

Thesis Option

Core Requirements 9
Technical Electives 15
Thesis 6

Total credit hours.....30 credits

With the approval of the Graduate Coordinator, students in the BS/MS program may use up to six credits of graduate courses with an earned grade of B or better for both graduate and undergraduate degrees.

Technical electives are Electrical and Computer Engineering graduate course and concentration courses. Students may choose their technical electives in their area of concentration and across other areas to establish a broad knowledge base. Graduate courses in Computer Science, Mathematics, Physics, and other engineering disciplines may be taken as technical electives only if they are pre-approved by the Graduate Coordinator for non-thesis option, or concurrently by the Graduate Coordinator and the student's thesis advisor for thesis option.

The credits for Advanced Graduate Project (16.733) cannot be counted toward the requirement for the thesis-option. It can be replaced with a 3-credit technical elective for the non-thesis option.

2. Core Requirement

The objective of the core requirement is to guarantee broad analytical strength for the MS Engineering students.

Required Core Courses for MS in Electrical Engineering (choose 3 courses)

16.507 Electromagnetic Waves and Materials
16.508 Quantum Electronics for Engineers
16.509 Linear Systems Analysis
16.513 Control Systems
16.515 Power Electronics
16.520 Computer-Aided Engineering Analysis

16.543 Introduction to Communications Theory
16.584 Probability and Random Processes
16.595 Solid State Electronics

Students in Electrical Engineering must take three of the above courses that may be pertinent to their area of concentration.

Required Core Courses for MS in Computer Engineering (choose 3 courses)

16.553 Software Engineering
16.561 Computer Architecture and Design
16.562 VHDL/Verilog Synthesis and Design
16.573 Operating Systems and Kernel Design

Students in Computer Engineering must take three of the above courses that may be pertinent to their area of concentration.

3. Concentration

A concentration is generally defined by a coordinated and approved sequence of at least four graduate courses. Each student can choose to work out a concentration either with the graduate coordinator or with his/her academic advisor. Completion of a specific concentration is not required for graduation. The course sequences in the concentrations serve as a starting point for establishing a program of study in consultation with the Graduate Coordinator or the student's academic/thesis advisor to meet his/her educational objectives. It is expected that the courses comprising the concentration will complement the work the student will undertake in fulfillment of the research requirement.

4. Research for Thesis Option

The research requirement may be fulfilled by completion of an MS Thesis, including registration for six credits of 16.743/16.746 - MS Thesis Research, oral defense of the thesis and submission of the written document.

Areas of Concentration

In addition to the required three core courses (9 credits), three additional courses from a concentration are recommended depending upon whether a thesis is selected or not.

1. Concentration courses in Electrical Engineering

- Information Systems (Telecommunications)

16.510 Digital Signal Processing
16.511 Medical Imaging Diagnosis
16.546 Computer Telecommunications
16.548 Coding and Information Theory
16.582 Wireless Communications
16.586 Stochastic Modeling in Telecommunications
16.617 Modeling and Simulation Techniques for Communication Networks
16.618 Performance of Wireless Communications Networks
16.661 Local Area /Computer Networking
16.685 Statistical Theory of Communications
16.687 Stochastic Estimation
16.688 Theoretical Acoustics
91.555 Computer Networks
91.563 Data Communications I
91.564 Data Communications II

- Information Systems (Communications Engineering)

16.533 Microwave Engineering
16.546 Computer Telecommunications
16.548 Coding and Information Theory
16.571 Radar Systems
16.582 Wireless Communications
16.586 Stochastic Modeling in Telecommunications
16.617 Modeling and Simulation Techniques for Communication Networks
16.618 Performance of Wireless Communications Networks
16.661 Local Area/Computer Networking
16.684 Time Series Analysis
16.685 Statistical Theory of Communications
16.687 Stochastic Estimation
91.563 Data Communications I
91.564 Data Communications II

- Power and Energy Engineering

16.514 Power Systems Transmission

16.515 Power Electronics
 16.516 Advanced Machine Theory
 16.525 Power Systems Distribution
 16.528 Alternative Energy Sources
 16.529 Electric Vehicle Technology
 16.615 Solid State Drives Systems
 16.616 Computational Power Analysis Opto-Electronics
 16.508 Quantum Electronics for Engineers
 16.518 Electromagnetic Materials for Optical Engineering
 16.519 Engineering of Submicron Machines
 16.523/423 Introduction to Solid State Electronics
 16.532 Computational Electromagnetics
 16.583 Wave Propagation in Plasmas
 16.590 Fiber Optic Communications
 16.595 Solid State Electronics
 16.607 Electromagnetics of Complex Media
 16.608 Scattering and Diffraction of EM Waves
 16.610 Optics for Information Processing
 95.631 Non-Linear Optics

Opto-Electronics is an option in cooperation with the Department of Physics, and may be pursued by students enrolled in the MS Eng in EE program. This option contains required and recommended courses designed to provide a fundamental background in optical devices and systems, as well as in optical physics and in the electro-optical properties of materials.

In addition to the required three core courses, students pursuing this option must take 16.568 Electro-Optics and Integrated Optics and two other courses from the above list.

Other concentrations in Electrical Engineering can be found from the clusters of courses specified as ECE certificates in the ["Graduate Certificates"](#) section.

2. Concentration courses in Computer Engineering

- Computer Networking and Distributed Systems
 - 16.558 World Wide Web programming
 - 16.583 Network Design: Principles, Protocols and Applications
 - 16.590 Fiber Optic Communications
 - 16.657 High-Speed Integrated Networks: Design and Evaluations
 - 16.658 Computer Network Security
 - 16.659 Distributed Systems
 - 16.660 Mobile IP Networking
 - 16.661 Local Area/Computer Networking
 - 16.666 Storage Area Networks
- Computing and Embedded Systems Hardware and Architecture
 - 16.502 VLSI Design
 - 16.504 VLSI Fabrication
 - 16.517 MMIC Design and Fabrication
 - 16.550 Advanced Digital Systems Design
 - 16.552 Microprocessors II and Embedded Systems
 - 16.553 Software Engineering
 - 16.557 Object Oriented Design
 - 16.572 Embedded Real-time Systems
 - 16.574 Advanced Logic Design
 - 16.575 FPGA Logic Design Techniques
 - 16.650 Advanced Computing Systems Hardware Architecture
 - 16.652 Parallel and Multi-processor Architecture
 - 16.656 Fault Tolerance Systems Design
 - 16.663 Compiler Structures
- Artificial and Machine Intelligence
 - 16.511 Medical Imaging Diagnosis
 - 16.552 Microprocessors II and Embedded Systems
 - 16.553 Software Engineering
 - 16.554 Voice Recognition, Processing and Computer Sound Drivers
 - 16.556 Robotics
 - 16.557 Object Oriented Design
 - 16.572 Embedded Real-time Systems
 - 16.651 Computer Vision
 - 16.653 Artificial Intelligence and Machine Learning
 - 16.750 Advanced Robotics and Machine Intelligence

- Multimedia Digital Signal and Image Processing and Applications

16.502 VLSI Design
 16.510 Digital Signal processing
 16.511 Medical Imaging Diagnosis
 16.521 Real Time DSP
 16.553 Software Engineering
 16.554 Voice Recognition, Processing and Computer Sound Drivers
 16.572 Embedded Real-time Systems
 16.581 Computer Vision and Digital Image Processing

Energy Engineering Doctoral Programs

- **Doctor of Engineering (D.Eng.)**
 - Energy Engineering Option
- **Doctor of Philosophy (Ph.D.)**
 - Energy Engineering Option

The objective of UMass Lowell's doctoral program in energy engineering is to prepare engineers for leadership positions in industry, academia, and government to provide society with sustainable energy systems. Presently there are two areas of concentration: renewable (solar) and nuclear. The renewable (solar) concentration is administered by the Mechanical Engineering Department and the nuclear engineering concentration is administered by the Chemical Engineering Department.

Admission Requirements

The applicant is required to have an M.S. degree in engineering or other suitable technical area, or its equivalent, or to have completed fifteen credit hours of graduate study, with a minimum grade point average of 3.25.

Students may be required to make up prerequisites which they lack in comparison to the equivalent Engineering curriculum at the University of Massachusetts Lowell. In cases where a student has an M.B.A. or has completed the Business Administration Minor for Engineering students, in addition to a B.S. in engineering or its equivalent, portions or all of the management/non-technical component of the Doctor of Engineering program may be waived upon review by the administering Department. Students may apply for transfer of up to a maximum of 24 credits in acceptable graduate engineering courses (with grade of B or better) towards the doctoral program, upon approval by the Program Doctoral Committee.

Course Requirements

The Doctor of Engineering/Doctor of Philosophy degree requires the completion of 63 semester hours of graduate-level academic credit composed of the following:

- Forty-two approved credit hours of graduate level engineering courses, which may include the core requirements of the M.S. program and up to 6 approved credit hours in graduate level math and science courses.
- For the D.Eng. degree, substitute 9 credit hours of coursework with 9 credit hours of approved nontechnical/management courses.
- Twenty-one credit hours for the dissertation.

Dissertations which are industrial in orientation should use the D.Eng. degree, based upon discussion with the supervising faculty advisor. Students may elect either degree designation with the consent of the faculty advisor, subject to the requirements of each degree.

Core Courses

The core requirements will consist of two courses in advanced mathematics, two courses in thermal/fluid processes, one course in materials, and one course in systems/controls. The specific courses follow:

Advanced Mathematics (select two of these or suitable alternatives with approval of the graduate coordinator):

10/24.509 Systems Dynamics
 10/24.539 Mathematical Methods for Engineers
 92.545 Partial Differential Equations
 92.530 Applied Math

Thermal/Fluid Processes (select two of these or suitable alternatives with approval of the graduate coordinator):

10.510 Advanced Separation Processes
 10.520 Advanced Thermodynamics
 10.528 Advanced Transport Phenomena
 22.540 Conduction Heat Transfer
 22.541 Radiation Heat Transfer
 22.542 Convective Heat and Mass Transfer
 22.513 Finite Element Methods

Materials (select one of these or a suitable alternative with approval of the graduate coordinator):

10.506 Interfacial Science and Engineering and Colloids
10.508 Material Science and Engineering
10.523 Nanodevices and Electronic Materials
10.525 Design and Packaging of Materials
10.527 Nanomaterials Science and Engineering
10.535 Principles of Cell and Microbe Cultivation
95.539 Electro_Optics

Systems/Controls (select one of these or a suitable alternative with approval of the graduate coordinator):

16.513 Control Systems
16.584 Probability and Random Processes
22.556 Stochastic Processes
22.573 Manufacturing Systems (Operations Research)
22.554 Dynamic Systems and Control

Concentration Courses

A total of 15 credits of concentration courses must be taken, either from the renewable area or from the nuclear area. The specific courses in those areas follow:

Renewable (select five of these or suitable alternatives with approval of the graduate coordinator):

22.521 Solar Engineering Fundamentals
22.527 Solar Systems Engineering
22.504 Energy Systems Design Workshop
16.515 Power Electronics
16.528 Alternative Energy Systems
87.572 Energy and the Environment
22.531 Energy and Sustainable Development
95.537 Geometrical Optics
95.538 Physical Optics
95.577 Solid State Electronic and Optoelectronic Devices

Nuclear (select five of these or suitable alternatives with approval of the graduate coordinator):

24.504 Energy Engineering Workshop
24.505 Nuclear Reactor Physics
24.506 Special Topics in Nuclear Reactor Physics
24.507 Nuclear Reactor Engineering and Safety Analysis
24.508 Special Topics in Nuclear Reactor Engineering
24.511 Advanced Reactor Concepts
24.514 Hazardous and Nuclear Waste Management
24.519 Nuclear Reactor Operator Training I
24.520 Nuclear Reactor Operator Training II

Qualifying Examination

Students are required to take the qualifying examination within their first year of residency in the program. The first part of the exam is intended to cover knowledge of undergraduate engineering and is satisfied by passing the Professional Engineering Fundamentals Exam. The second part is intended to cover topics in an area of energy engineering of the student's interest, with the approval of the student's thesis advisor. The written part of this examination is closed book and composed of two sections, each of three hours duration. The examination is set and evaluated by the program Graduate Examination Committee, which determines whether or not a student shall be eligible to take the oral portion. Students who pass the written part of the qualifying examination must take the oral part of the examination within 6 weeks of notification of results of the written exam. The student is permitted two attempts at passing the qualifying examination which is administered on a declared schedule. Students who fail the qualifying examination the first time must retake the exam at its next scheduled offering. Students failing the doctoral exam twice will be automatically dismissed from the doctoral program.

Dissertation

Students may register for no more than six credit hours of research in preparing a formal dissertation proposal. This proposal, and the student's ability to perform the research, must be orally defended before the student's doctoral committee and other interested parties. The written proposal and oral defense constitute the candidacy examination. Upon passing this examination and completing all course requirements, the student becomes a candidate for the D.Eng./Ph.D. degree and may register for additional research credit with the advisor's approval.

The research work for the dissertation shall be conducted under the supervision of a program faculty advisor and a committee of two others, at least one of whom must be a faculty member in the university with the appropriate background for the thesis topic.

Other Requirements

- The student is required to be in full time residency at the University for at least one year.
- The student must have a minimum grade point average of 3.25 in order to graduate.

Master's Program

Master of Science Degree Program in Energy Engineering

The UMass Lowell graduate program in Energy Engineering offers professional training at the master's degree level designed to prepare the student to perform state-of-the-art work on energy systems. There are two options:

- **Renewable (Solar) Engineering**
- **Nuclear Engineering**

The programs are designed to achieve a balance between hands-on experience and theory. Energy engineering involves subject matter and draws students from all branches of engineering, science, mathematics and economics.

Thesis, Project, and Course-Only Requirements

There are three pathways to earning an MS degree in Energy Engineering:

Thesis: 30 credits - 24 credits of courses (15 credits from core), plus 6 credits of thesis,

Project: 30 credits - 27 credits of courses (15 from core), plus 3 credits of project

Course-Only: 30 credits - all from courses (15 from core, none from thesis or project credits)

A student's thesis or project work must be defended in an oral examination conducted by the student's thesis/project committee. A thesis is usually more formal and more comprehensive than a Master's project.

Course Requirements

Students may choose to specialize in any area of interest in the college related to the energy field. Each student must take a series of core courses appropriate for the area of specialization. The exact makeup of the core curriculum will be guided and approved by the Graduate Committee of the Energy Engineering program. All students working toward the Master of Science Degree in Energy Engineering must take the following core courses:

- 24.504 Energy Engineering Workshop
- 24.509 System Dynamics
- 10.528 Advanced Transport Phenomena

Renewable (Solar) Option: required courses

- 22.521 Fundamentals of Solar Utilization
- 22.527 Solar Systems Engineering

Nuclear Option: required courses

- 24.505 Nuclear Reactor Physics
- 24.507 Nuclear Reactor Engineering Analysis

The remainder of the course requirements are to be made up of elective courses which should be approved by the appropriate graduate coordinator. In addition to the course and credit requirements above, all students working toward the M.S. degree are required to participate in the Graduate Research Seminar, 24.601/602.

The courses that are typically taken as elective courses include, but are not restricted to:

- 10/24.539 Mathematical Methods for Engineers
- 92.545 Partial Differential Equations
- 92.530 Applied Math
- 10.510 Advanced Separation Processes
- 10.520 Advanced Thermodynamics
- 22.540 Conduction Heat Transfer
- 22.541 Radiation Heat Transfer
- 22.542 Convective Heat and Mass Transfer
- 22.513 Finite Element Methods
- 22.546 Computational Thermofluids I
- 22.528 PV Manufacturing
- 10.506 Colloidal, Interfacial and Nanomaterials Science and Engineering
- 10.508 Material Science and Engineering
- 10.523 Nanodevices and Electronic Materials
- 10.525 Design and Packaging of Materials
- 10.535 Principles of Cell and Microbe Cultivation
- 16.513 Control Systems

- 16.584 Probability and Random Processes
- 22.556 Stochastic Processes
- 22.573 Manufacturing Systems (Operations Research)
- 22.554 Dynamic Systems and Control
- 16.515 Power Electronics
- 16.528 Alternative Energy Systems
- 87.572 Energy and the Environment
- 95.537 Geometrical Optics
- 95.538 Physical Optics
- 95.577 Solid State Electronic and Optoelectronic Devices
- 95.539 Electro-Optics

For additional information, contact the graduate coordinator for [Solar Engineering](#) or the graduate coordinator for [Nuclear Engineering](#).

[Bachelor's-Master's Program](#) available for current UMass Lowell undergraduates.

Energy Engineering

Energy Engineering Program

Graduate Programs offered:

- [Doctor of Engineering](#) (D.Eng.)
 - Energy Engineering Option
- [Doctor of Philosophy](#) (Ph.D.)
 - Energy Engineering Option
- [Master of Science in Engineering](#) (M.S.E.)
 - Renewable (Solar) Engineering Option - administered through the Mechanical Engineering Department
 - Nuclear Engineering Option - administered through the Chemical Engineering Department
- [Bachelor's-Master's Program](#)

Energy Engineering offers professional training at the doctoral and master's degree levels designed to prepare the student to perform state-of-the-art research and design work on energy systems.

For additional information, contact the graduate coordinator for [Renewable \(Solar\) Engineering](#) or the graduate coordinator for [Nuclear Engineering](#).

Graduate Certificates in Mechanical Engineering

The following graduate certificates are offered in Mechanical Engineering:

- [Design and Manufacturing Engineering](#)
- [Structural Dynamics and Acoustic Modeling Techniques](#)
- [Microelectromechanical Systems/Nanoelectromechanical Systems \(interdisciplinary\)](#)
- [Composites and Materials](#)
- [Renewable Energy Engineering](#)
- [Integrated Engineering Systems \(interdisciplinary\)](#)
- [Nanotechnology \(interdisciplinary\)](#)

[Apply for graduate certificate](#)

Design & Manufacturing Engineering

Contact: Dr. Sammy Shina
978 934-2950
sammy_shina@uml.edu

This 12 credit certificate program is aimed at educating engineers in modern design and manufacturing practices for developing world class products at the highest customer satisfaction and quality, at lowest cost and within engineering project budgets and schedules. It has a strong practice oriented curriculum and is taught by experienced faculty drawn from both academia and senior engineers and managers of high technology companies.

Required Courses:

- 22.573 Manufacturing Systems Engineering
- 22.574 Design for Reliability Engineering

Choose Two of the Following Courses:

- 22.571 Collaborative Engineering and Quality
- 22.575 Industrial Design of Experiments
- 22.576 Engineering Project Management
- 22.579 Robotics
- 10.523 Electronic Material Processes

Structural Dynamic Modeling Techniques

Contact persons:

Peter Avitabile
978-934-3176
peter_avitabile@uml.edu

Christopher Niezrecki
christopher_niezrecki@uml.edu
978-934-2963

This certificate is aimed at educating engineers in very critically needed techniques for modeling structural dynamic applications. In all undergraduate curriculums accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, the materials presented bring the student to a firm comprehension and understanding of static design configurations but does not go beyond this point to address the practical reality of structural dynamic response for meaningful design configurations. Therefore, many new or practicing engineers are not prepared to address these types of problems. This suite of courses in this certificate provides materials that have strong, practical relevance and provides tools and techniques to address these structural dynamic applications. Both hands-on and product oriented practice will be emphasized.

A total of four courses (12 credits) are required for the certificate with one required course (which must be either 22.550 Advanced Vibrations or 22.515 Structural Dynamic Modeling Techniques).

The courses in this certificate are:

- 22.550 Advanced Vibrations
- 22.515 Structural Dynamic Modeling Techniques
- 22.513 Finite Element Analysis I
- 22.516 Experimental Modal Analysis
- 22.517 Structural Dynamics
- 22.518 Signal Processing
- 22.524 Fundamentals of Acoustics
- 22.603 Special Topics in Structural Dynamics and Modal Analysis
- 22.611 Matrix Methods

MEMS/NEMS (Microelectromechanical Systems/Nanoelectromechanical Systems)

Contact persons:

Hongwei Sun
hongwei_sun@uml.edu
978-934-4391

Byungki Kim
byungki_kim@uml.edu
978-934-2568

This 12-credit certificate program will provide an interdisciplinary education and training for engineers who will work in the fast growing MEMS/NEMS industry with microsystems design methods, advanced microfabrication, packaging and assembly techniques, VLSI circuits design and fabrication, nanoelectronics, nano-assembly and integration, material processing. Both hands-on and product oriented practice will be emphasized.

Choose four courses with at least one course from Group 1 and at least one course from Group 2.

Group 1

- 22.557 Microsystem Design
- 22.553 MEMS & Microsystems

Group 2

- 16.710 Special Topics in Nanoelectronics
- 10.524 Self Assembly and Nanotechnology

Group 3

- 10.523 Electronic Material Process
- 16.502 VLSI Design
- 16.504 VLSI Fabrication

Composites and Materials

Contact persons:

Julie Chen
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978-934-2992

Emmanuelle Reynaud
Emmanuelle_Reynaud@uml.edu
978-934-2961

James Sherwood
james_sherwood@uml.edu
978-934-2992

This certificate is aimed at educating engineers in the design, manufacture and structural analysis of composite materials. The use of composite materials is growing in the transportation, defense and recreational industries, and thus there is a need for engineers with expertise in composite materials. The design of composites is explained through classical laminate theory and micro- and mesomechanics. Various methods such as resin-transfer molding, compression molding, are discussed. Structural analysis of composites is presented using classical laminate theory and finite element methods with applications in the determination of structural stiffness, ultimate failure, fracture and fatigue. Both hands-on and product oriented practice will be emphasized.

Choose any four courses from the following list with at least one course from Group 1 and at least one course from Group 2.

Group 1

- 22.578 Advanced Materials
- 22.591 Mechanical Behavior of Materials

Group 2

- 22.596 Composit Materials
- 22.697 Structural Applications of Composite Materials

Group 3

- 22.514 Finite Element Analysis of Composites
- 22.570 Polymer Nanocomposites
- 22.597 Processing of Composites
- Material processing course from Plastics Engineering with permission of certificate coordinators

Renewable Energy Engineering

Contact person:

John Duffy
john_duffy@uml.edu
978-934-2968

This 12 credit certificate provides engineers and scientists with a rigorous but practical grounding in the fundamentals of renewable energy systems for design, research, development and manufacture. The certificate is part of a long-standing interdisciplinary graduate degree program in renewable energy engineering with experienced faculty. The courses address topics ranging from green building technologies (basic insulation and efficiency, passive solar heating and cooling, daylighting, solar hot water) to photovoltaic and wind systems, solar electrolyzers and fuel cells to stochastic process modeling of irradiation.

Choose any four classes from the following list with at least one of the four being 22.521 Solar Engineering Fundamentals or 22.527 Solar Systems Engineering. Other suitable courses may be used for the certificate with the permission of the coordinator.

- 22.521 Solar Engineering Fundamentals (online)
- 22.527 Solar Systems Engineering (online)
- 22.504 Energy Systems Design Workshop
- 16.528 Alternative Energy Systems
- 22.528 Photovoltaic Manufacturing

- 95.537 Geometrical Optics
- 95.538 Physical Optics
- 95.577 Solid State Electronic and Optoelectronic Devices
- 10.528 Advanced Transport Phenomena
- 87.572 Energy and the Environment
- 24.509 Dynamic Systems Analysis

Other suitable courses may be used as electives for the certificate with prior permission of the coordinator.

Integrated Engineering Systems

Applied Physics, Computer Engineering, Computer Science, Electrical Engineering, Materials Engineering, Mechanical Engineering, Plastics Engineering departments

Contact:

Dr. Craig Armiento
craig_armiento@uml.edu
 978-934-3395

As companies increasingly undertake engineering projects that bring together a wide range of disciplines for manufacturing an integrated product, it is often necessary to assemble teams of experts in these various disciplines, and prepare managers who have a fundamental, overall understanding of several different engineering areas. The certificate is designed to respond to the need for trained professionals who are responsible for managing complex engineering systems integrating algorithms, information, software and hardware. Completion of certificate courses in areas complementary to the individual's specific training will serve as an important starting point for engineering managers (and prospective managers) who need to solve complex interdisciplinary problems at the interfaces of electrical, computer, mechanical, materials engineering, and computer science and applied physics.

The program consists of six clusters:

1. Applied Physics
2. Computer Engineering
3. Computer Science
4. Electrical Engineering
5. Materials Engineering
6. Mechanical Engineering

Within each cluster, there are a number of carefully selected courses ranging from introductory graduate level to more advanced, specialized electives.

Students must successfully complete four courses (12 credits), one or two of which may be taken in their area of expertise. The remaining courses must be taken in separate and different cluster areas. Courses are selected in consultation with one (or more) graduate program coordinators to best meet the student's needs in terms of background, interests, and work requirements. It may be necessary for students to take prerequisite course(s) if they do not have appropriate backgrounds for a particular cluster course.

CLUSTER AREAS AND DESIGNATED COURSES:

APPLIED PHYSICS

- 95.553 Electromagnetism I
- 95.554 Electromagnetism II
- 95.540 Image Processing (4 credits)
- 95.578 Integrated Optics: Wave Guide and Lasers
- 95.535 Introduction of Quantum Mechanics I
- 95.547 Laser Physics and Applications
- 95.538 Physical Optics and Waves
- 95.577 Solid State Electronic and Opto-Electronic Devices
- 95.521 Statistical Thermodynamics

COMPUTER ENGINEERING

- 16.550 Advanced Digital System Design
- 16.561 Computer Architecture Design
- 16.581 Computer Vision and Digital Image Processing
- 16.510 Digital Signal Processing
- 16.572 Embedded Real-Time Systems
- 16.575 FPGA Logic Design Techniques
- 16.552 Microprocessors Systems II and Embedded Systems
- 16.582 Network Design: Principles, Protocols, and Applications
- 16.573 Operating Systems and Kernel Design for Computer Engineers
- 16.521 Real Time DSP
- 16.502 VLSI Design

- 16.504 VLSI Fabrication

COMPUTER SCIENCE

- 91.561 Computer Security I
- 91.562 Computer Security II
- 91.563 Data Communications I
- 91.564 Data Communications II
- 91.549 Mobile Robots
- 91.515 Operating Systems I
- 91.516 Operating Systems II
- 91.548 Robot Design
- 91.523 Software Engineering I
- 91.524 Software Engineering II

ELECTRICAL ENGINEERING

- 16.528 Alternative Energy Sources
- 16.506 Antenna Theory and Design
- 16.532 Computational Electromagnetics
- 16.513 Control Systems
- 16.529 Electric Vehicle Technology
- 16.507 Electromagnetic Waves and Materials
- 16.512 Electronic Materials
- 16.519 Engineering of Submicron Machines
- 16.590 Fiber Optic Communications and Networks
- 16.543 Introduction to Communication Theory
- 16.509 Linear System Analysis
- 16.505 Microwave Electronics
- 16.533 Microwave Engineering
- 16.515 Power Electronics
- 16.584 Probability and Random Processes
- 16.571 Radar Systems
- 16.517 MMIC Design and Fabrication

MATERIALS ENGINEERING

- 26.544 Advanced Plastics Materials
- 10.506 Interfacial Science and Engineering and Colloids
- 10.507 Material Science and Engineering
- 26.503 Mechanical Behavior of Polymers
- 10.523 Nanodevices and Electronic Materials
- 10.527 Nanomaterials Science and Engineering
- 10.541 Nanostructural Characterization by SEM, TEM, and AFM
- 26.518 Plastics Product Design

MECHANICAL ENGINEERING

- 22.512 Applied Finite Element Analysis
- 22.571 Concurrent Engineering and Quality
- 22.523 Cooling of Electronic Equipment
- 22.574 Design for Reliability Engineering
- 22.516 Experimental Modal Analysis
- 22.524 Fundamentals of Acoustics
- 22.575 Industrial Design of Experiments
- 22.573 Manufacturing Systems Engineering
- 22.591 Mechanical Behavior of Materials
- 22.515 Modal Analysis- Theoretical Methods
- 22.579 Robotics
- 22.562 Solid Mechanics
- 22.527 Solar Systems Engineering
- 22.550 Vibrations

Nanotechnology

Civil & Environmental, Mechanical, Plastics Engineering departments

Contact:

Dr. Jackie Zhang
jackie_zhang@uml.edu

The program will provide students with a fundamental knowledge of nanotechnology and is intended to respond to the increasing demand for trained professionals in nanoscience and technology. The certificate is designed for students with a background in chemistry, physics, biology, or any branch of engineering who want nanotechnology and nanomanufacturing workforce preparation. Students may focus on a concentration area based on their interests and background. Courses in each concentration area are carefully designed to provide both analytical and practical competence. Students may take any combination from the electives list.

Core Course: (required)

- 25.550 Introduction to Nanotechnology

Core Courses: (Choose one)

- 10.541 Nanostructural Characterization by SEM, TEM, and AFM
- 84.510 Electron Microscopy of Advanced Materials
- 84.525 Analysis of Advanced Materials

Elective Courses: (choose two courses)

Materials

- 10.506/527 Interfacial Science and Engineering and Colloids
- 22.578 Advanced Materials
- 26.513 New Plastics Materials
- 26.598 Smart Polymers

Manufacturing

- 10.523 Electronic Materials Processing
- 10.524 Self-assembly and Nanotechnology
- 10.535 Cell & Microbe Cultivation
- 10.545 Isolation & Purification of Biotech Products
- 16.504 VLSI Fabrication
- 25.551 Nanomanufacturing I
- 25.526 Nanoscale Plastics Processing
- 26.502 New Plastics Processing Techniques

Design and Devices

- 16.502 VLSI Design
- 16.512 Electronic Materials
- 16.508 Quantum Electronics for Engineers

Health and Environmental Impacts

- 19.503 Toxicology and Health
- 19.514 Aerosol Science
- 19.525 Industrial Hygiene and Ergonomics 19.557 Toxic Use Reduction
- 19.610 Exposure Assessment
- 19.617 Measurements of Airborne Contaminants

Doctoral Program

Doctoral Programs in Mechanical Engineering

The UMass Lowell Department of Mechanical Engineering offers two doctoral degree tracks with two options each.

- **Doctor of Philosophy (Ph.D.)**
 - [Option in Mechanical Engineering](#)
 - [Option in Energy Engineering](#)
- **Doctor of Engineering (D.Eng.)**
 - [Option in Energy Engineering](#)

D.Eng. and Ph.D. Mechanical Engineering Option

The intent of the Doctor of Philosophy and Doctor of Engineering programs is to prepare engineers for leadership positions in industry, academia and government. The programs include advanced graduate course work in engineering and allied subjects and research, culminating in a doctoral dissertation. The Ph.D. degree is oriented more towards academic research, while the D.Eng. degree is oriented more toward industry.

Admission Requirements

Applicants must have an M.S. degree, or have completed fifteen credit hours of graduate study in engineering, or its equivalent, with a minimum grade point average of 3.25.

Students may apply for transfer of up to 24 semester credits in acceptable graduate engineering courses (with grade of B or better) towards the doctoral program, upon approval by the Department Graduate Coordinator.

In cases where a student has an M.B.A., or has completed the Business Administration Minor for Engineering students, in addition to a B.S. in engineering or its equivalent, portions of the management component of the Doctor of Engineering program may be waived upon review by the administering department.

One of the letters of recommendation submitted as part of the graduate school application should be from a mechanical engineering department faculty member willing to act as thesis advisor.

Degree Requirements

A total of 63 credit hours of graduate level courses are required for both the Ph.D. and D.Eng. degrees. These credits are composed of the following three components:

- 33 approved credit hours of graduate level engineering courses, which must include the doctoral core, described below.
- For the D.Eng. degree 9 credit hours of approved management-type courses, and for the Ph.D. degree 9 credit hours of approved engineering or technical courses.
- 21 credit hours of doctoral dissertation. The Ph.D. degree must involve a traditional research-based dissertation. The D.Eng. degree can involve a dissertation that involves an industry-based project.

In addition to this 63 semester hours of approved graduate courses and thesis:

- The student is required to be in full-time residency at the University for at least one year.
- The student must have a minimum grade point average of 3.25 in order to graduate.
- Students are required to take a doctoral qualifying examination.
- Students must take a doctoral candidacy (thesis defense) examination.

Doctoral Core Requirement

- Students must satisfy the following doctoral core requirement:
- One course in solid mechanics (approved by grad coordinator)
- One course in thermal fluids (approved by grad coordinator)
- Two courses in advanced mathematics (approved by grad coordinator)
- Four courses from one of the following concentrations.

Mechanics & Materials Concentration:

22.512 Applied Finite Elements
22.513 Finite Element Analysis I
22.562 Solid Mechanics I
22.578 Advanced Materials
22.591 Mechanical Behavior of Materials
22.596 Composite Materials
22.597 Processing of Composites
22.601 Special Topics: Mechanics/Materials
22.614 Finite Element Analysis II
22.615 FEA of Composites
22.644 Plates and Shells
22.697 Structural Applications of Composite Materials

Thermofluids Concentration:

22.540 Heat Conduction
22.542 Convective Heat and Mass Transfer
22.545 Advanced Industrial Heat and Mass Transfer
22.546 Computational Fluids I
22.549 Cooling of Electronic Equipment
22.553 MEMS & Microsystems
22.583 Advanced Aerodynamics
22.602 Special Topics: Thermofluids
10.528 Advanced Transport Phenomena

Energy Concentration:

22.521 Fundamentals of Solar Utilization
22.527 Solar Energy Engineering
24.509 Dynamic Systems
16.528 Alternate Energy Sources

10.528 Advanced Transport Phenomena
24.505 Reactor Physics
24.507 Reactor Engineering and Safety Analysis

Vibrations/Dynamics/Controls Concentration:

22.513 Finite Element Analysis I
22.515 Modal Analysis
22.516 Experimental Modal Analysis
22.517 Structural Dynamics
22.518 Data Acquisition and Signal Processing
22.524 Fundamentals of Acoustics
22.550 Vibrations
22.554 Dynamic Systems and Controls
22.603 Special Topics: Vibration Dynamics
22.611 Matrix Methods

Manufacturing Concentration:

22.512 Applied Finite Elements
22.549 Cooling of Electronic Equipment
22.553 MEMS & Microsystems
22.556 Stochastic Processes
22.571 Collaborative Engineering
22.572 Manufacturing Processes
22.573 Manufacturing Systems
22.574 Design for Reliability Engineering
22.575 Industrial Design of Experiments
22.576 Engineering Project Management
22.577 Event Driven Manufacturing
22.579 Robotics
22.604 Special Topics: Manufacturing Engineering

Management Courses for the Doctor of Engineering Degree

D.Eng. students are required to take 9 credits of graduate management courses from the following list:

22.576 Engineering Project Management (3 credits)
26.507 Plastics Industry Organization (3 credits)
26.514 Statistics for Six Sigma (3 credits)
26.515 Lean Plastics Manufacturing (3 credits)
26.537 Business Law for Engineers (3 credits)
26.540 Commercial Development of Polymeric Systems (3 credits)
26.590 Survey of Intellectual Property (3 credits)
60.501 Financial Accounting (2 credits)
61.501 Business Finance (2 credits)
62.501 Marketing Fundamentals (2 credits)
63.501 Operations Fundamentals (2 credits)
66.501 Organizational Behavior (2 credits)
66.511 Global Enterprise & Competition (2 credits)
66.615 New Venture Creation (3 credits)

Qualifying Examination

Students must take the doctoral qualifying examination at the end of their first year of study. This examination tests basic competency at the undergraduate level. The student is permitted two attempts at passing the qualifying examination. Students who fail the qualifying examination the first time must retake the exam at its next scheduled offering. Students failing the doctoral exam twice will automatically be dismissed from the doctoral program. Those who do not take the examination at the prescribed time may lose all their financial support, if any, and may be dismissed from the doctoral program.

Candidacy Examination and Dissertation Proposal

The research work for the dissertation shall be conducted under the supervision of a departmental faculty advisor and a committee of two others. Students are required to submit and defend a dissertation proposal before a Department Doctoral Committee. Students may register for no more than six credit hours of research in preparing a formal dissertation proposal. This proposal, and the student's ability to perform the research, must be orally defended before the student's doctoral committee and other interested parties. This constitutes the candidacy examination.

Upon passing this examination, and completing all course requirements, the student becomes a candidate for the D.Eng./Ph.D. degree and may register for additional research credit with the advisor's approval.

Masters Program

Master's Program in Mechanical Engineering

[Degree Requirements](#)

[Mechanical Engineering Concentrations](#)

- Mechanics & Materials Concentration
- Thermofluids Concentration
- Energy Concentration
- Vibrations/Dynamics/Controls Concentration
- Design and Manufacturing Concentration
- Out-of-Department Concentrations

[Energy Engineering Option](#)

[ME-Based Graduate Certificates](#)

The Department of Mechanical Engineering offers both an Master of Science in Engineering (MSE) program and a combined BSE/MSE program. These programs offer a choice of either a thesis option or a non-thesis option. To receive the MSE degree requires a minimum of thirty (30) credit hours of acceptable graduate work, including nine (9) credit hours of research for the thesis option.

The entrance requirement for the MSE program is a BSE in Mechanical Engineering, or other engineering discipline, at an acceptable grade point average. Students with a non-ME bachelor's degree can be required to take up to 5 undergraduate ME courses in order to ensure that the student has adequate background knowledge.

The student may register for thesis credits after submitting a thesis agreement signed by his/her thesis advisor to the graduate coordinator. Upon completing the thesis, the student is required to defend it orally before a committee of three faculty members including the advisor. The committee members must receive a completed version of the thesis manuscript at least 14 days before the thesis is defended.

Degree Requirements

All MSE degree candidates must satisfy each of the following five requirements. No course can count towards more than one requirement:

1. Three (3) credit hours of advanced mathematics from the following list:

- a. 92.530 Applied Math I
- b. 92.545 Partial Differential Equations
- c. 24.539 (10.539) Mathematical Methods for Engineers

2. Three (3) credit hours of solid mechanics courses from the following list:

- a. 22.562 Solid Mechanics I
- b. 22.513 Finite Element Analysis I

3. Three (3) credit hours of thermofluid courses from the following list:

- a. 22.542 Convective Heat and Mass Transfer
- b. 10.528 Advanced Transport Phenomena
- c. 22.581 Advanced Fluids
- d. 22.546 Computational Thermofluids I

4. Nine (9) credit hours of course work in a Mechanical Engineering Concentration.

5. Either a. or b. below:

a. Thesis Option: Nine (9) credit hours of MS thesis, Plus, three (3) credit hours of course work approved by the thesis advisor.

b. Non-Thesis Option: Twelve (12) credit hours of course work approved by the graduate coordinator. Nine (9) of these credits may be taken in an Out-of-Department Concentration. In their first year non-thesis students must submit a plan of study to the graduate coordinator and obtain his/her approval. Any change to the submitted plan requires the approval of the graduate coordinator.

Mechanical Engineering Concentrations

Mechanics & Materials Concentration:

- 22.512 Applied Finite Elements
- 22.513 Finite Element Analysis I
- 22.557 Microsystem Design
- 22.562 Solid Mechanics I
- 22.570 Polymer Nanocomposites
- 22.578 Advanced Materials
- 22.591 Mechanical Behavior of Materials
- 22.596 Composite Materials
- 22.597 Processing of Composites
- 22.601 Special Topics: Mechanics/Materials

22.614 Finite Element Analysis II
22.615 FEA of Composites
22.644 Plates and Shells
22.697 Structural Applications of Composite Materials

Thermofluids Concentration:

22.540 Heat Conduction
22.542 Convective Heat and Mass Transfer
22.545 Advanced Industrial Heat and Mass Transfer
22.546 Computational Fluids I
22.549 Cooling of Electronic Equipment
22.553 MEMS & Microsystems
22.583 Advanced Aerodynamics
22.584 Ocean Engineering
22.602 Special Topics: Thermofluids
10.528 Advanced Transport Phenomena

Energy Concentration:

22.521 Fundamentals of Solar Utilization
22.527 Solar Energy Engineering
24.509 Dynamic Systems
16.528 Alternate Energy Sources
10.528 Advanced Transport Phenomena
24.505 Reactor Physics
24.507 Reactor Engineering and Safety Analysis

Vibrations/Dynamics/Controls Concentration:

22.513 Finite Element Analysis I
22.515 Modal Analysis
22.516 Experimental Modal Analysis
22.517 Structural Dynamics
22.518 Data Acquisition and Signal Processing
22.524 Fundamentals of Acoustics
22.550 Vibrations
22.554 Dynamic Systems and Controls
22.557 Microsystem Design
22.603 Special Topics: Vibration Dynamics
22.611 Matrix Methods

Design and Manufacturing Concentration:

22.512 Applied Finite Elements
22.549 Cooling of Electronic Equipment
22.553 MEMS & Microsystems
22.556 Stochastic Processes
22.557 Microsystem Design
22.571 Collaborative Engineering
22.573 Manufacturing Systems
22.574 Design for Reliability Engineering
22.575 Industrial Design of Experiments
22.576 Engineering Project Management
22.577 Event Driven Manufacturing
22.579 Robotics
22.604 Special Topics: Manufacturing Engineering

Out-of-Department Concentrations:

Non-thesis students can take nine (9) credit hours in an Out-of-department Concentration which will normally consist of nine (9) credit hours from one of the graduate certificates listed below. Students can suggest their own out-of-department concentration, but prior approval must be obtained from the graduate coordinator.

Courses from one of the following graduate certificates are acceptable:

Applied Statistics
Biomedical Engineering
Biotechnology & Bioprocessing
Communications Engineering
Elastomeric Materials
Energy Conversion
Environmental Biotechnology

Environmental Risk Assessment
Foundations of Business
Identification & Control of Ergonomic Hazards
Integrated Engineering Systems
Materials Sciences & Engineering
Medical Plastics Design & Manufacturing
Microwave and Wireless Engineering
Modeling, Simulation, and Control of Systems and Processes
Molecular & Cellular Biotechnology
Nanotechnology
New Venture Creation
Plastics Design
Plastics Materials
Plastics Processing
Stochastic Systems
Sustainable Infrastructure for Developing Nations
Telecommunications
VLSI & Microelectronics

Energy Engineering Option

The University offers a Master of Science degree in Energy Engineering. This unique area of concentration represents a separate multidisciplinary program that is administered jointly by the Mechanical Engineering Department (Solar Option) and the Chemical and Nuclear Engineering Department (Nuclear Option). The Energy Engineering Program has two M.S. degree options: Renewable (Solar) Engineering and Nuclear Engineering. Students interested in either of these program options should refer to the catalog section focused specifically on the [Energy Engineering](#) Program.

ME-Based Certificate Programs

Non-degree candidates who have a BS in engineering or a physical science are encouraged to apply to take a [graduate certificate](#) in which the ME department participates. A paper certificate will be awarded upon successful completion.

[Bachelor's-Master's Program](#)

Mechanical Engineering

Department of Mechanical Engineering

The UMass Lowell Department of Mechanical Engineering offers the following graduate programs:

- [Doctor of Philosophy](#) (Ph.D.)
 - Option in Mechanical Engineering
 - Option in Energy Engineering
- [Doctor of Engineering](#) (D.Eng.)
 - Option in Mechanical Engineering
 - Option in Energy Engineering
- [Master of Science in Mechanical Engineering](#) (M.S. Eng.)
- [Master of Science in Energy Engineering - Renewable \(Solar\) Option](#)
- [Graduate Certificates](#)
 - Design Manufacturing Engineering
 - Integrated Engineering Systems
 - Nanotechnology
- [Bachelor's/Master's Program](#)

The admission requirements of the University are to be followed for all degree programs in Mechanical Engineering. The student is required to submit official transcripts for all prior college level studies, official score report for the Graduate Record Examination Aptitude Test, and three letters of recommendation. Applicants for Master or Doctor of Engineering Degrees in Mechanical Engineering must be in possession of a bachelor's degree in engineering or equivalent. Mechanical Engineering graduates can also apply for the Ph.D. degree in Applied Physics.

Certificate Programs

Graduate Certificates in Plastics Engineering

The UMass Lowell Department of Plastics Engineering offers eight graduate certificates in a wide variety of topics.

- [Commercial Development for Plastics Engineers](#)
- [Elastomeric Materials](#)
- [Medical Plastics Design and Manufacturing](#)

- [Plastics Design](#)
- [Plastics Engineering Fundamentals](#)
- [Plastics Materials](#)
- [Plastics Processing](#)
- [Sustainable Polymeric Materials and Additives](#)

About Graduate Certificates

All Plastics Engineering graduate certificates are comprised of four courses (12 graduate credits) designed to provide specific knowledge and expertise vital to today's changing and complex needs in the workplace. In all cases courses may be applied toward a degree program provided they meet transfer credit requirements.

Note: Courses used as credit towards one Plastics Engineering Certificate may not count towards another Plastics Engineering Certificate.

Requirements to Complete a Graduate Certificate

The four courses must be completed within a five year period with a minimum 3.0 grade point average, and with no more than 3 credits below a B. Courses completed for one certificate may not be used for another certificate, but can be used for the graduate degrees.

Certificate Application Process

Individuals must complete a simplified application, provide an official undergraduate transcript indicating that a baccalaureate degree has been awarded, and submit a nominal application fee. GRE's are not required.

[Download Graduate Certificate Application Form](#) (pdf)

For more information visit the [Plastics Engineering Department](#) website.

Commercial Development for Plastics Engineers

Department of Plastics Engineering

Contact:

Dr. Stephen McCarthy

978-934-3417

stephen_mccarthy@uml.edu

Admission to this 12 credit program is open to candidates with a B.S. in Engineering or a related field.

Courses previously used for another Plastics Engineering Certificate may not be used for a second Plastics Engineering certificate. Students who wish to continue with their education may apply all of these courses to any one of the Plastics Engineering Graduate M.S. Degree Programs or our D.Eng. Degree Program.

Required Courses (Six credits):

- 26.514 Statistics for Six Sigma
- 26.537 Business Law for Engineers

Elective Courses (any two of the following courses - total of six credits):

- 26.515 Lean Plastics Manufacturing
- 26.540 Commercial Development of Polymeric Systems
- 26.590 Survey of Intellectual Property
- 26.607 Supply Chain Management
- 22.576 Engineering Project Management
- 66.516 New Product Development Processes
- 66.615 Foundations of New Venture Creation

Elastomeric Materials

Plastics Engineering Department

Contact:

Dr. Stephen McCarthy

978-934-3417

stephen_mccarthy@uml.edu

This 12 credit certificate program is designed for students who have attained a bachelor's degree and need additional knowledge in elastomeric materials. Admission to the program is open to candidates with a B.S. in Engineering or a related field.

Courses previously used for another Plastics Certificate may not be used for a second Plastics Certificate. The Plastics Engineering

Department makes every attempt to offer many of these courses during the evening to accommodate the schedules of working adults.

Required Courses (Six credits):

- 26.535 Rubber Technology
- 26.595 Thermoplastic Elastomers

Elective Courses (choose two - total of six credits):

- 26.549 Design with Elastomers
- 26.550 Processing with Elastomers
- 26.596 Plastics, Elastomers and Additives from Renewable Resources
- 26.506 Polymer Structure, Properties, and Applications

Medical Plastics Design and Manufacturing

Department of Plastics Engineering

Contact:

Dr. Stephen McCarthy
978-934-3417

stephen_mccarthy@uml.edu

The use of plastics in medical products and medical devices is rapidly increasing. The Plastics Engineering Department at UMass Lowell is continuing its leadership role in Plastics Engineering Education by responding to industry's need for Medical Plastics training. This 12 credit program will provide knowledge needed for the development of new "engineering intensive" medical products which combine complex material compositions, designs, and manufacturing processes. The certificate program is intended for medical professionals, engineers and technologists working in the medical products industry.

Required Courses (Six credits):

- 26.553 Medical Device Design I
- 26.575 Biomaterials

Elective Courses (choose two - total of six credits):

- 26.554 Medical Device Design II
- 26.579 Problems in Biomaterials (Directed Study)
- 26.675 Biomaterials II
- 10.555 Biopharmaceutical GMP and Licensing (Offered by the Chemical Engineering Department)
- IB.500 Introduction to Biomedical Engineering & Biotechnology (Offered by the Biomedical Engineering program)

Plastics Design

Plastics Engineering Department

Contact:

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The certificate program is designed for students who have attained a bachelor's degree and need more plastics design background. The Plastics Engineering Department makes every attempt to offer many of these courses during the evening to accommodate the schedules of working professionals. Graduates who have already completed these course requirements can receive a retroactive certificate.

Required Courses (Six credits):

- 26.503 Mechanical Behavior of Polymers
- 26.518 Plastics Product Design

Elective Courses (choose two - total of six credits):

- 26.506 Polymer Structure, Properties, and Applications
- 26.541 Computer Applications in Plastics
- 26.549 Design with Elastomers
- 26.551 Computer Aided Extrusion Die Design
- 26.552 Design of Polymer Processing Machinery
- 26.553 Medical Device Design I
- 26.554 Medical Device Design II
- 26.576 Advanced Mold Design
- 26.585 Computer Aided Engineering and Design I
- 26.586 Computer Aided Engineering and Design II

- 26.618 Structural Product Design

Plastics Engineering Fundamentals

Plastics Engineering Department

Contact:

Dr. Stephen McCarthy

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This 12-credit certificate program is designed for students who have attained a Bachelor's degree and want more plastics materials, processing and design background. Admission to the program is open to candidates with a B.S. in Engineering or a related field. There is no application fee and the graduate record exam (GRE) is not required for admission. Courses previously used for another Plastics Certificate may not be used for a second Plastics Certificate. However, certificate courses may be applied to appropriate graduate degrees if students want to continue their education. The Plastics Engineering Department makes every attempt to offer many of these courses during the evening so that students having full time jobs can complete the certificate program. Many of these courses are also available on-line.

Required Courses (Six credits):

- 26.544 Advanced Plastics Materials
- 26.578 Advanced Plastics Processing

Elective Courses (choose two of the following - total of six credits):

- 26.503 Mechanical Behavior of Polymers
- 26.506 Polymer Structure, Properties, and Application
- 26.518 Product Design
- 26.576 Advanced Mold Design

Plastics Materials

Plastics Engineering Department

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This 12 credit certificate program is designed for students who have attained a Bachelor's degree and need more plastics materials background. The Plastics Engineering Department makes every attempt to offer many of these courses during the evening to accommodate the schedules of working professionals. Graduates who have already completed these course requirements can receive a retroactive certificate.

Required Courses (Six credits):

- 26.544 Advanced Plastics Materials
- 26.506 Polymer Structure, Properties, and Applications

Elective Courses (choose two - total of six credits):

- 26.505 Polymer Structure II (Continuation of 26.506)
- 26.511 Polymer Blends and Multiphase Systems
- 26.512 Plastics Foams
- 26.513 New Plastics Materials
- 26.532 Adhesives and Adhesion
- 26.533 Coatings Science and Technology
- 26.540 Commercial Development of Polymeric Systems
- 26.542 Colloidal Nanoscience and Nanoscale Engineering
- 26.547 Materials for Renewable Energy and Sustainability
- 26.559 Elements of Packaging
- 26.565 Engineering Thermosetting Resins
- 26.566 Polymeric Material Systems Selection
- 26.580 Polymer Science I
- 26.589 Polymer Nanocomposites
- 26.596 Plastics, Elastomers and Additives from Renewable Resources
- 26.610 Plastics Industry Development

Plastics Processing

Plastics Engineering Department

Contact:

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This 12-credit certificate program is designed for students who have attained a bachelor's degree and need more plastics processing background. The Plastics Engineering Department makes every attempt to offer many of these courses during the evening to accommodate the schedules of working professionals. Graduates who have already completed these course requirements can receive a retroactive certificate.

Required Courses (Six credits):

- 26.578 Advanced Plastics Process Engineering
- 26.509 Plastics Processing Theory I

Elective Courses (choose two - total of six credits):

- 26.506 Polymer Structure, Properties, and Applications
- 25.510 Plastics Processing Theory II
- 26.518 Plastics Product Design
- 26.521 Lean Plastics Manufacturing
- 26.523 Screw Design Principles
- 26.524 Process Analysis, Instrumentation, and Control
- 26.526 Nanoscale Plastics Processing
- 26.550 Processing with Elastomers
- 26.551 Computer Aided Extrusion Die Design
- 26.552 Design of Polymer Processing Machinery
- 26.585 Computer Aided Engineering and Design I
- 26.588 Injection Molding

Sustainable Polymeric Materials and Additives

Plastics Engineering Department

Contact:

Dr. Stephen McCarthy
978-934-3417
stephen_mccarthy@uml.edu

The Department of Plastics Engineering offers this program as a stand alone, four course graduate certificate in "Sustainable Polymeric Materials and Additives. This certificate program is designed for students who have attained a Bachelor's degree in science or engineering and want to enhance their knowledge of renewable materials and additives, but are not ready to commit to completion of a Plastics Engineering Master's degree. Admission to the program is open to candidates with a B.S in Engineering or a related field. The Graduate Record Exam (GRE) is not required for admission. Courses previously used for another Plastics Engineering Certificate may not be used for a second Plastics Engineering certificate. However, these certificate courses may be applied to appropriate graduate degrees with the permission of the appropriate academic department if students want to continue their education.

Required Courses (6 credits):

- 26.596 Plastics, Elastomers and additives from Renewable Resources
- 26.533 Coatings Science and Technology

Elective Courses (any two of the following 3 credit courses - total of 6 credits):

- 26.547 Materials for Renewable Energy and Sustainability
- 26.575 Biomaterials
- 10.535 Cell and Microbe Cultivation
- 84.563 The Chemistry of Natural Products

Doctoral Programs

Doctoral Programs in Plastics Engineering

The UMass Lowell Department of Plastics Engineering offers two doctoral degree options:

- **Doctor of Engineering (D.Eng.)**
Plastics Engineering Option
- **Doctor of Philosophy (Ph.D.)**
Plastics Engineering Option

In addition the Plastics Engineering Department has a joint program with the Chemistry Department. It offers a joint Polymer Science/Plastics Engineering Ph.D. degree. The degree is awarded by the Chemistry Department, not the Department of Plastics Engineering. This degree option is a good fit for students interested in polymer synthesis and polymer characterization.

Plastics Engineering Doctoral Programs

The two Doctoral Plastics Engineering programs have equivalent admission requirements and differ primarily in their course requirements.

Ph.D. in Engineering, Plastics Engineering Option

The Ph.D. degree program is designed to produce qualified professionals for technical and research positions in the plastics industry, for technical positions in government, and for teaching careers in colleges and universities. This degree is awarded by the College of Engineering. The goal of the Ph.D. program is to develop decision-making engineers with sound theoretical and technical research knowledge in the areas of plastics materials, design, and processing research and development.

The Doctor of Engineering in Plastics Engineering

The D.Eng. Plastics Engineering degree program is designed to produce qualified professionals for technical and management positions in the plastics industry, as well as for technical or administrative positions in government and for teaching careers in colleges and universities. The goal of the Doctor of Engineering program is to develop decision-making engineers with sound theoretical and technical research knowledge who are design and development oriented and who also have a firm background in engineering management. This degree has a management component that is not required for the Ph.D., with fewer technical courses. This interdisciplinary program encompasses study in materials, design, processing, mathematics, computer science, and management.

Admission Requirements

Graduates with a B.S. in Engineering (e.g. Plastics, Mechanical, Chemical, Materials...) and high academic standing may apply for admission to either of the doctoral programs. Technical graduates who do not have a B.S. in "Engineering" but have a science degree may request admission to the program with the understanding that they will also be required to take and pass the "General Fundamentals of Engineering Exam" given by the National Council of Examiners for Engineering and Surveying. Admission to the program will be based on review by the Graduate Admissions Office and by the Admissions Committee of the Plastics Engineering Department.

Plan of the Doctoral Programs

Each student entering the program must develop a plan of study in consultation with his or her advisory committee. After taking at least one year of graduate courses, the student will take a qualifying examination covering all the basic elements of plastics engineering. A student who performs well on this examination will be reviewed by the Admissions Committee of the Plastics Engineering Department and admitted to degree candidacy. He or she will then complete the remaining course work, seminars and labs, do a research proposal, conduct research and prepare a written dissertation, and present an oral defense of the research before the dissertation committee.

Qualifying Examination

The qualifying examination for both doctoral programs will be administered in September (and in January if there is sufficient demand for a second exam). It will be administered as two (2) four hour long examinations, covering the following topics: plastics processing, plastics design, plastics properties, and plastics materials with a total of four questions in each subject area for a total of 16 questions. One of the two exams is open book and one is closed book. In order to pass the exams, students must pass at least two of the four questions in each subject area, and pass at least eleven questions. Any changes to the format will be indicated by the doctoral coordinator when the specific examination date is announced. The student will receive an overall exam grade of pass or fail based on the stated criteria. A student who fails the exam on a marginal basis may make a second attempt the next time the exam is administered. All decisions of the Plastics Engineering Department regarding passing of the qualifying exam are final.

Dissertation Proposal

Once the student has passed the qualifying exam, he or she will submit a dissertation proposal and defend the proposal before the Doctoral Committee. Upon approval, the student's name will be submitted to the College Doctoral Committee and the Registrar's Office as a candidate for the Doctor of Engineering or the Doctor of Philosophy degree.

Transfer Credit

Up to 24 credits in graduate engineering courses are transferable to either the Doctor of Engineering or Doctor of Philosophy programs upon approval by the department's Doctoral Committee.

Other Requirements

A student must maintain high academic standing throughout the pursuit of the degree. He or she must spend at least one year at the University with full-time graduate student status to fulfill the university residence requirement.

Course Requirements for the D.Eng. Plastics Engineering Degree

The following courses are required for the D.Eng. degree:

26.544 Advanced Plastics Materials (3 credits)

26.578 Advanced Plastics Processing (3 credits)
26.574 Physical Properties Laboratory (1 credit)
26.572 Plastics Processing Laboratory (1 credit)
26.503 Mechanical Behavior of Polymers (3 credits)
26.506 Polymer Structure, Properties and Applications (3 credits)
26.509 Plastics Processing Theory I (3 credits)
26.518 Plastics Product Design (3 credits)
26.548 Numerical and Analytical Methods (3 credits)
26.585 Computer Aided Engineering and Design (3 credits)
26.XXX Current Topics Plastics Seminar (1 credit)
26.XXX Engineering Elective (3 credits)
26.XXX Engineering Elective (3 credits)
Engineering Management Courses (9 credits)
Doctoral Research Dissertation (21 credits)
TOTAL: 63 credits

Engineering Management Courses for the D.Eng. Program

Doctor of Engineering students are required to take 9 credits of graduate engineering management courses from the College of Management or from the list of courses immediately below offered within the College of Engineering.

26.507 Plastics Industry Organization (3 credits)
26.516 Six Sigma (3 credits)
26.521 Lean Plastics Manufacturing (3 credits)
26.537 Business Law for Engineers (3 credits)
26.540 Commercial Development of Polymeric Systems (3 credits)
26.590 Survey of Intellectual Property (3 credits)
22.576 Engineering Project Management (3 credits)

Approved management graduate courses from the College of Management for D.Eng. students. These courses run for a duration of 8 weeks.

60.501 Financial Accounting (2 credits)
61.501 Business Finance (2 credits)
62.501 Marketing Fundamentals (2 credits)
63.501 Operations Fundamentals (2 credits)
66.501 Organizational Behavior (2 credits)
66.511 Global Enterprise & Competition (2 credits)*
66.615 New Venture Creation* (3 credits)

*Pre-requisites are required for these classes.

Course Requirements for the Ph.D. in Engineering, Plastics Engineering Option

The following courses are required for the Ph.D. degree:

26.544 Advanced Plastics Materials (3 credits)
26.578 Advanced Plastics Processing (3 credits)
26.574 Physical Properties Laboratory (1 credit)
26.572 Plastics Processing Laboratory (1 credit)
26.503 Mechanical Behavior of Polymers (3 credits)
26.506 Polymer Structure, Properties and Applications (3 credits)
26.509 Plastics Processing Theory I (3 credits)
26.518 Plastics Product Design (3 credits)
26.548 Numerical and Analytical Methods (3 credits)
26.585 Computer Aided Engineering and Design (3 credits)
26.XXX Current Topics Plastics Seminar (1 credit)
26.XXX Engineering Elective (3 credits)
26.XXX Engineering Elective (3 credits)
26.XXX Engineering Elective (3 credits)
26.XXX Engineering Elective (3 credits)
26.XXX Engineering Elective (3 credits)
Doctoral Research Dissertation (21 credits)

TOTAL: 63 credits

Special Notes

Students having a Plastics Engineering B.S. Degree:

Students who have a B.S. Degree in Plastics Engineering from UMass Lowell are not required to take the Physical Properties Lab (26.574) and Plastics Processing Lab (26.572). However, these students must still meet the 42 course credit hour program requirement.

Students who have a B.S. Degree in Plastics Engineering from UMass Lowell or an equivalent program may elect to test out of Advanced Plastics Materials (26.544) and Advanced Plastics Processing (26.578). However, these students must still meet the 42 course credit hour program requirement by substituting other Plastics Engineering Graduate Courses

Ph.D. Polymer Science/Plastics Engineering Option

A doctoral program in Chemistry with an option in Polymer Science/Plastics Engineering is offered jointly with the Polymer Science group in the Department of Chemistry. This program is designed to provide the student with a background in advanced course work and laboratory techniques which will prepare him or her to carry out, under the guidance of experienced scientists, an original, independent investigation leading to an acceptable contribution to the body of contemporary knowledge. Further details of the program are described in the [Chemistry](#) section of this catalog.

Masters Programs

Master's Programs in Plastics Engineering

Master of Science in Engineering Degree Programs (MS Eng)

The Department of Plastics Engineering has recently restructured its MSE Degree Program. Plastics Engineering MSE graduate students accepted into the program beginning in the Fall of 2005 must follow either the "Thesis Option" Curriculum or the "Non-thesis Option" Curriculum described in the following sections.

Graduate students enrolled in the Thesis Option MSE Program prior to the Fall of 2005 may elect to follow either the new "thesis" or "non-thesis" program requirements described below, or those in effect at the time they were accepted into the degree program. Most MSE Plastics Engineering students opt for the 30 credit hour thesis option MSE degree program. The 33 credit hour non-thesis MSE degree program is intended for part time graduate students working full time jobs as practicing engineers.

[Thesis Option](#)

- [Admission Requirements and Prerequisites](#)
- [Graduate Student Advising](#)

[Non-thesis Option](#)

- [Admission Requirements and Prerequisites](#)
- [Graduate Student Advising](#)

Thesis Option

This graduate program offers professional training at the master's level designed to provide the opportunity for the study of more advanced theory and practice in plastics materials, design and processing. The department also offers graduate training in the areas of rubber and elastomer technology, medical plastics, coatings, and adhesives. The graduate programs are also designed to broaden the background of experienced members of the profession to help them keep up with the latest fundamental developments in these fields.

The Department of Plastics Engineering offers a Master of Science in Engineering (M.S.E.) in Plastics Engineering. More than 800 graduate students have received Plastics Engineering degrees since the graduate program was established in 1968. Most M.S.E. Plastics Engineering students opt to enroll in the 30 credit hour research oriented thesis option M.S.E. program. A smaller percentage elect to enroll in the 33 credit hour non-thesis M.S.E. option. Students who have enrolled in the thesis option Plastics Engineering M.S.E. program must complete at least 24 course credits and 6 thesis credits as outlined in the program requirements section below. Students may transfer as many as 12 science or engineering graduate course credits from other universities or from courses completed when in non-degree status at UMass Lowell provided they are approved by the Plastics Engineering Department's M.S.E. program coordinators. (For University regulations regarding [transfer credit](#) and other regulations, see [Graduate Policies](#) in the on-line catalog.) The thesis option M.S.E. degree will be awarded upon the satisfactory completion of 30 credit hours of study as outlined below.

Graduate students enrolled in the Thesis Option M.S.E. Program prior to the Fall of 2005 may elect to follow the either the new program requirements (thesis or non-thesis program) described below, or those in effect at the time they were accepted into the degree program. The new thesis option M.S.E. program requirements are:

Requirement 1 Complete the cluster of "core course" requirements as described in the detailed program description that follows.

The following courses (9 credit hours) are required for all students.

26.544 Advanced Plastics Materials 3 credits
26.578 Advanced Plastics Processing 3 credits
26.xxx Current Topics Plastics Seminars (1) 1 credit
26.574 Physical Properties Laboratory 1 credit
26.572 Plastics Processing Laboratory 1 credit
Total 9 credits

Special notes for students having a Plastics Engineering B.S. Degree:

Students who have a B.S. Degree in Plastics Engineering from UMass Lowell are not required to take the Physical Properties Lab

(26.574) and Plastics Processing Lab (26.572). However, these students must still meet the 24 course credit hour program requirement by substituting other Plastics Engineering Graduate Courses.

Students who have a B.S. Degree in Plastics Engineering from UMass Lowell or an equivalent program may elect to test out of Advanced Plastics Materials (26.544) and Advanced Plastics Processing (26.578). However, these students must still meet the 24 course credit hour program requirement by substituting other Plastics Engineering Graduate Courses

Requirement 2 Complete the course requirements for one or more of the department's graduate "Certificates" as an "area of specialization." Some of the certificate course requirements may also be core requirements. The course requirements for each graduate certificate are also outlined below.

[Note: The Graduate Certificate in Plastics Engineering Fundamentals does not satisfy Requirement 2 for the thesis option M.S.E. Plastics Engineering Program.]

(a.) Graduate Certificate in "Plastics Design"

Required Courses:

26.503 Mechanical Behavior of Polymers
26.518 Plastics Product Design

Elective Courses (any two of the following):

26.506 Polymer Structure, Properties, and Applications
26.523 Screw Design Principles
26.541 Computer Applications in Plastics
26.549 Design with Elastomers
26.551 Computer Aided Extrusion Die Design
26.552 Design of Polymer Processing Machinery
26.576 Advanced Mold Design
26.585 Computer Aided Engineering and Design I
26.586 Computer Aided Engineering and Design II

(b.) Graduate Certificate in "Plastics Materials"

Required Courses:

26.544 Advanced Plastics Materials
26.506 Polymer Structure, Properties, and Applications

Elective Courses (any two of the following):

26.505 Polymer Structure II
26.511 Polymer Blends and Multiphase Systems
26.512 Porous Polymers
26.513 New Plastics Materials
26.540 Commercial Development of Polymeric Systems
26.553 Polymers in Medicine I
26.559 Elements of Packaging
26.565 Engineering Thermosetting Resins
26.566 Polymeric Material Systems Selection
26.580 Polymer Science I
26.596 Plastics, Elastomers and Additives from Renewable Resources

(c.) Graduate Certificate in "Plastics Processing"

Required Courses:

26.578 Advanced Plastics Process Engineering
26.509 Plastics Processing Theory I

Elective Courses (any two of the following):

26.506 Polymer Structure, Properties, and Applications
26.510 Plastics Processing Theory II
26.518 Plastics Product Design
26.521 Lean Plastics Manufacturing
26.523 Screw Design Principles
26.524 Process Analysis, Instrumentation, and Control
26.526 Nanoscale Plastics Processing
26.550 Processing with Elastomers
26.551 Computer Aided Extrusion Die Design
26.552 Design of Polymer Processing Machinery
26.585 Computer Aided Engineering and Design I

(d.) Graduate Certificate in "Medical Plastics Design and Manufacturing"

Required Courses:

26.553 Polymers in Medicine I
26.575 Biomaterials

Elective Courses (any two of the following):

26.554 Polymers in Medicine II
26.579 Problems in Biomaterials - Directed Study
26.675 Biomaterials II
10.555 Biopharmaceutical GMP and Licensing *
* Offered by the Chemical Engineering Department

IB500 Introduction to Biomedical Engineering & Biotechnology **
** Offered by the Biomedical Engineering Department

(e.) Graduate Certificate in "Elastomeric Materials"

Required Courses:

26.535 Rubber Technology
26.595 Thermoplastic Elastomers

Elective Courses (any two of the following):

26.549 Design with Elastomers
26.550 Processing with Elastomers
26.506 Polymer Structure, Properties, and Applications
26.596 Plastics, Elastomers and Additives from Renewable Resources

Requirement 3 Complete the requirements for an additional number of Elective Plastics Engineering Graduate Courses such that the "total" course credit hours is at least 24 credit hours (not counting thesis credits).

Core Courses + Non-Core Certificate Courses + Electives Courses = 24 Credits

Up to two elective courses from other engineering departments may be substituted for Plastics Engineering courses if approved by the graduate coordinator.

Requirement 4 Complete the mandatory 6 Credit Hour Thesis requirement. The thesis research is conducted under the supervision of a three member advisory committee (see "Thesis Committee" below). Upon completion of the thesis research work, the student must prepare the written thesis manuscript and defend the work in an oral presentation such that all three committee members approve of the work.

Thesis Committee

As soon as a student has chosen an area of research, a Thesis Committee is selected by the student and his or her research advisor in accordance with the policy of the department. The Thesis Committee shall consist of at least three members, at least two of whom shall be from the student's major department. One member of the committee shall be the student's thesis advisor. An outside expert, such as the supervisor of a research project conducted at an industrial setting or a faculty member from another institution, may be a member of the committee, but that individual must possess academic credentials which would qualify him or her to serve as a member of the University of Massachusetts Lowell faculty.

24 Course Credit Hours + 6 Thesis Credits = 30 Credit Hours Total

(Requirements 1, 2, 3) (Requirement 4)

The M.S.E. degree, and the appropriate Graduate Certificate (the area of specialization), will be awarded upon satisfactory completion of 30 credit hours of study as outlined. More detailed descriptions of the "Thesis Option" requirements are given below.

Admission Requirements and Prerequisites:

Admission to the program is open to candidates with a B.S. in Plastics Engineering or a related engineering or science field. The prerequisite math requirements include Calculus II and Differential Equations. Applicants must also take the Graduate Record Examination (GRE), provide three Letters of Reference, an Official Transcript, and a Statement of Purpose as per the UMass Lowell Graduate Admissions Policy. You can apply online at www.uml.edu/grad.

The foundation "Plastics" courses required in previous years are no longer required. Students who have taken these foundation graduate courses in the past can receive some graduate course credit for these courses as outlined above.

The Plastics Engineering Department makes every attempt to offer as many of these courses as possible during the evening so that students having full time jobs can complete the degree program. A listing of evening graduate courses for the next few semesters is

given on <http://plastics.uml.edu>.

Non-matriculated students (with an appropriate B.S. Degree) may begin taking courses without application to the M.S.E. Plastics Engineering Program. However, it is recommended that students apply to the M.S.E. Program as soon as possible (i.e. prior to taking too many course credits) since there is no guarantee of acceptance into the M.S.E. Program. In addition, no more than 12 credit hours taken as a non-matriculated student can be transferred into the M.S.E. Program upon acceptance.

Graduate Student Advising:

One of the graduate coordinators will be the academic advisor for students enrolled in the non-thesis M.S.E. Plastics Engineering Degree Program. The advisor will help the student remedy deficiencies in prerequisites, select electives of most value, and plan the overall study program efficiently. The thesis advisor will be the chairperson of the thesis advisory committee that will guide the student in the thesis research and supervise the completion of the thesis requirement. Once an advisor is selected, the student and advisor should complete the Departmental Advising Form, indicating the thesis topic. Both the student and advisor must sign this form before the student can register for thesis credits. This form is available in the Plastics Engineering Department Office (B204) and should be submitted to the graduate program coordinator.

Non-thesis Option

This graduate program offers professional training at the master's level designed to provide the opportunity for the study of more advanced theory and practice in plastics materials, design and processing. The department also offers graduate training in the areas of rubber and elastomer technology, medical plastics, coatings, and adhesives. The graduate programs are also designed to broaden the background of experienced members of the profession to help them keep up with the latest fundamental developments in these fields.

The Department of Plastics Engineering offers a Master of Science in Engineering (M.S.E.) in Plastics Engineering. Most M.S.E. Plastics Engineering students enroll in the thesis option program. However, some students, especially those students working full time days elect to enroll in the non-thesis M.S.E. option. This option was established in the Fall of 2004. Students enrolled in the non-thesis M.S. Plastics Engineering option must complete a total of 33 course credits as outlined in the course requirements section below. Students may transfer as many as 12 science or engineering graduate course credits from other universities or from courses completed when in non-degree status at UMass Lowell provided they are approved by the Plastics Engineering Department's M.S.E. program coordinators. (For University regulations regarding [transfer credit](#) and other regulations, see [Graduate Policies](#) in the on-line catalog.) The non-thesis option M.S.E. degree will be awarded upon the satisfactory completion of 33 credit hours of study as outlined. More detailed descriptions of the "Non-thesis Option" requirements are given below.

Requirement 1 Complete the "core course" requirements listed below.

The following courses (18 credit hours) are required for all students.

26.503 - Mechanical Behavior of Polymers 3 credits
26.544 - Advanced Plastics Materials 3 credits
26.578 - Advanced Plastics Processing 3 credits
26.506 - Polymer Structure Properties and Applications 3 credits
26.518 - Plastics Product Design 3 credits
26.xx - Current Topics Plastics Seminars (Materials, Design, etc.) 1 credit
26.574 - Physical Properties Laboratory 1 credit
26.572 - Plastics Processing Laboratory 1 credit
Total 18 credits

Special notes for students having a Plastics Engineering B.S. Degree:

Students who have a B.S. Degree in Plastics Engineering from UMass Lowell are not required to take the Physical Properties Lab (26.574) and Plastics Processing Lab (26.572). However, these students must still meet the 33 credit hour program requirement by substituting other Plastics Engineering Graduate Courses.

Students who have a B.S. Degree in Plastics Engineering from UMass Lowell or an equivalent program may elect to test out of Advanced Plastics Materials (26.544) and Advanced Plastics Processing (26.578). However, these students must still meet the 33 credit hour program requirement by substituting other Plastics Engineering Graduate Courses.

Requirement 2 Complete the course requirements for one or more of the department's graduate "Certificates". Some of the certificate course requirements may also be core requirements. The course requirements for each graduate certificate are also outlined below.

[Note: The Graduate Certificate in "Plastics Engineering Fundamentals" does not satisfy Requirement 2 for the thesis option M.S.E. Plastics Engineering Program. However, all courses of the Certificate transfer into the M.S. Plastics Engineering program should students wish to continue their education.]

The Plastics Engineering Department offers the following graduate certificates:

- (a.) Plastics Design
- (b.) Plastics Materials
- (c.) Plastics Processing
- (d.) Medical Plastics Design and Manufacturing

(e.) Elastomeric Materials

(f.) Commercial Development for Plastics Engineering

(g.) Sustainable Polymeric Materials and Additives

Requirement 3 Complete the requirements for an additional number of elective plastics graduate courses such that the "total" credit hours (Core Courses + Certificate + Electives) is 33 credits. Up to two elective courses from other engineering departments may be substituted if approved by the graduate coordinator.

The M.S.E. degree, and the appropriate Graduate Certificate (the area of specialization), will be awarded upon satisfactory completion of 33 credit hours of study as specified above. This non-thesis M.S.E. degree is an alternative to the more traditional 30 credit thesis option M.S.E degree.

Admission Requirements and Prerequisites:

Admission to the program is open to candidates with a B.S. in Plastics Engineering or a related engineering or science field. The prerequisite math requirements include Calculus II and Differential Equations. Applicants must also take the Graduate Record Examination (GRE), provide three Letters of Reference, an Official Transcript, and a Statement of Purpose as per the UMass Lowell Graduate Admissions Policy. You can apply online at www.uml.edu/grad.

The foundation "Plastics" courses required in previous years are no longer required. Students who have taken these foundation graduate courses in the past can receive some graduate course credit for these courses as outlined above.

The Plastics Engineering Department makes every attempt to offer as many of these courses as possible during the evening so that students having full time jobs can complete the degree program. Return to the home page for a listing of evening graduate courses for the next few semesters.

Non-matriculated students (with an appropriate B.S. Degree) may begin taking courses without application to the M.S.E. Plastics Engineering Program. However, it is recommended that students apply to the M.S.E. Program as soon as possible (i.e. prior to taking too many course credits) since there is no guarantee of acceptance into the M.S.E. Program. In addition, no more than 12 credit hours taken as a non-matriculated student can be transferred into the M.S.E. Program upon acceptance.

Graduate Student Advising:

One of the graduate coordinators will be the academic advisor for students enrolled in the non-thesis M.S.E. Plastics Engineering Degree Program. The advisor will help the student remedy deficiencies in prerequisites, select electives of most value, and plan the overall study program efficiently.

Full Time vs. Part Time Status

Both the Thesis and Non-thesis Option M.S.E. Plastics Engineering Programs are open to full time and part time students. Many of the courses required for these programs are offered at night so that engineers working at local companies can take advantage of the programs. Students taking fewer than 9 credits in a semester are considered part time, while those taking 9 or more credits are considered full time students. Graduate students must maintain full time student status in order to be eligible for teaching assistant (T.A.) or research assistant positions (R.A.).

Funding Policy - Plastics Engineering Graduate Students

Teaching Assistant Positions:

The Department of Plastics Engineering has a limited number of "Teaching Assistant Positions" (T.A.) and "Research Assistant" Positions (R.A.) available for full time Masters and Doctoral Plastics Engineering Graduate Students. Only those students who have applied and have been accepted into the respective programs will be considered for such a position.

Most of the T.A. positions awarded by the department are "half" T.A. positions which provide a 9 credit tuition waiver and 9 credit fee waiver for in-state students, along with a stipend. Out-of-state students receive the 9 credit tuition waiver, a fee reduction and a stipend. A departmental committee selects the T.A.'s during the spring semester for the following September. It is recommended that interested candidates should visit the campus and meet with a Graduate Coordinator prior to June 1. T.A. applications are available in Ball 204 or at <http://plastics.uml.edu>.

Research Assistant Positions:

Unlike T.A. positions that are awarded by the Plastics Engineering Department, R.A. positions, either "full time" or "half time", are awarded by individual faculty who conduct funded research. Accepted students must correspond with the individual faculty to inquire about R.A. positions. Faculty research interests are listed in the Faculty section of the department web site. It is recommended that applicants interested in obtaining R.A. funding should send a letter and resume to those faculty having similar research interests.

Many of the full time graduate students enrolled in the Department of Plastics Engineering do not receive T.A. or R.A. funding, especially during their first year of study. Many students are able to arrange funding during their second year after completing much of their coursework and after having time to interact with the various faculty members; however, there is no guarantee of funding.

[Bachelor's-Master's Program](#)

Plastics Engineering

Department of Plastics Engineering

The UMass Lowell Department of Plastics Engineering offers following Graduate Programs:

- [Doctor of Engineering \(D.Eng.\)](#)
Plastics Engineering Option
- **Doctor of Philosophy (Ph.D.)**
[Plastics Engineering Option](#)
[Polymer Science/Plastics Engineering Option](#) (This joint program is offered through the Chemistry Department. It is a good fit for students interested in polymer synthesis and polymer characterization.)
- [Master of Science in Engineering \(M.S.E.\)](#)
- [Graduate Certificates:](#)
 - Commercial Development for Plastics Engineers
 - Elastomeric Materials
 - Integrated Engineering Systems [Interdisciplinary]
 - Medical Plastics Design and Manufacturing
 - Nanotechnology [Interdisciplinary]
 - Plastics Design
 - Plastics Engineering Fundamentals
 - Plastics Materials
 - Plastics Processing
- [Bachelor's-Master's \(BS/MS\) Program](#)

About the Plastics Engineering Department

The Plastics Engineering Department at UML is an internationally recognized leader in plastics engineering research and education. Founded in 1954 as the first of its kind, it continues to offer the only accredited Plastics Engineering program in the U.S. Over 2,500 graduates are working in leadership positions the plastics industry worldwide. The department offers a number of degree programs in Plastics Engineering, ranging from a Bachelor of Science (B.S.) to a Doctorate in Engineering (D.Eng.), as well as a number of other options, in order to fit a wide variety of career goals.

The department is staffed by 20 full-time faculty who conduct research in areas as diverse as nanomanufacturing and green polymeric materials. Close faculty connections to industry ensure that students develop an understanding of current issues in the field, while working relationships with other departments emphasize the increasingly interdisciplinary nature of modern scientific research. The Plastics Engineering Department at UML maintains 20,000 square feet of dedicated laboratory space where students have an opportunity to work with and conduct research using the latest manufacturing, design, materials formulation and testing technologies.

The Plastics Engineering Department at UMass Lowell - over 50 years of academic and research excellence!

Bachelor's to Master's Programs

Earn Two Degrees in as Little as Five Years

[Eligibility](#)

[Course Credits](#)

[How to Apply](#)

In order to encourage outstanding UMass Lowell undergraduate degree students to continue their studies towards an advanced degree, qualified students may apply for the Bachelor's to Master's Degree Option (Bachelor's to Master's programs include the Fast Track to Teaching and Plus 1 programs.)

This option carries distinct benefits. Graduate Record Examination (GRE) scores are not required (except in the Graduate School of Education), GMAT is waived for applicants for the Masters in Business Administration (MBA) with a 3.2 or higher GPA and the application fee is waived. In addition, many departments offer course credit benefits. (For detailed information regarding specific course credit benefits, please see the Graduate Coordinator in the respective master's degree granting department.)

Eligibility

Any UMass Lowell undergraduate junior or senior with a grade point average of 3.0 or better may apply to a Master's degree program at UMass Lowell under the Accelerated Bachelor's to Master's Degree Option. However, to be accepted into this option the following minimum conditions must be met (individual departments may have more stringent requirements):

1. The student must have a cumulative grade point average of 3.0 or above at the time the baccalaureate degree is conferred in order to maintain eligibility for this option.
2. The student must apply for and receive his/her baccalaureate degree before matriculating into the graduate program.
3. Once accepted a student is expected to begin his/her graduate studies in the semester immediately following conferral of the baccalaureate degree unless the student submits a written request for deferral. A student is allowed to defer for a maximum of one year from the date of acceptance. For example, if accepted for the Spring 2009 semester, an individual can defer to either the Fall

2009 or Spring 2010 semesters. A student defers acceptance by submitting a written request to the Office of [Graduate Admissions](#). All deferral requests must specify which semester the student wishes to enroll. Any applicant accepted to the Bachelor's to Master's Degree Option who opts not to enroll in at least one course within the graduate department to which they have been accepted in the semester immediately following conferral of the bachelor's degree and who does not submit a deferral request forfeits his/her rights to benefits under this program. Should the student decide to begin his/her studies at a later time he/she will be required to take the GRE, pay an application fee, and have his/her application reassessed.

Course Credits

The graduate degree granting department may allow course credit benefits; however, the following requirements apply:

1. Any graduate courses taken by a baccalaureate degree student that are credited towards the Master's degree must have been obtained with a grade of B or better.
2. **Only** courses of 500 level or higher may count toward the Master's degree.
3. As defined by the graduate degree granting department, a maximum of 12 graduate credits (500 level or above) may be used for the master's degree provided these graduate credits were taken in excess of the university minimum of 120 baccalaureate degree credits, **or** a maximum of up to six credits of graduate (500 level or higher) courses may be used by a student in the Accelerated Bachelor's to Master's Degree Option for both the graduate and undergraduate degrees.
4. Students must petition to have specific courses (500 level or above) taken during their undergraduate career apply towards their graduate degree via an Academic Petition.

How to Apply

Applicants are requested to use the standard paper application form and submit requisite materials to the [Office of Graduate Admissions](#) (Dugan Hall - South Campus), normally in the second semester of their third year as an undergraduate (up until the last day of classes in their final semester before graduation). Application forms and details on applying may be obtained by contacting the Graduate Admissions Office at 978-934-2390 or [downloaded](#) (pdf).

Doctoral Degree Credit Requirements

COLLEGE/PROGRAM	COURSE/SEMINAR CREDITS	DISSERTATION CREDITS	TOTAL CREDIT REQUIREMENT
COLLEGE OF SCIENCES			
CHEMISTRY (Ph.D.) All Options	27-30	18	45-48
COMPUTER SCIENCE (Ph.D.) All Options	18	24	42 (Beyond M.S.)
PHYSICS (Ph.D.) All Options	36-45	15-24	60
POLYMER SCIENCE (Ph.D.)	27	18	45
GRADUATE SCHOOL OF EDUCATION			
EDUCATION (Ed.D.)	36	12	48 (Beyond M.Ed.)
MATHEMATICS & SCIENCE EDUCATION	36	12	48 (Beyond M.Ed.)
LEADERSHIP IN SCHOOLING	36	12	48 (Beyond M.Ed.)
LANGUAGE ARTS & LITERACY	36	12	48 (Beyond M.Ed.)
FRANCIS COLLEGE OF ENGINEERING			
ELECTRICAL (Ph.D. & D.Eng.)	42	21	63
MECHANICAL (Ph.D. & D.Eng.)	42	21	63
CHEMICAL (Ph.D. & D.Eng.)	42	21	63

CIVIL & ENVIRONMENTAL (Ph.D. & D.Eng.)	42	21	63
ENERGY (Ph.D. & D.Eng.)	42	21	63
PLASTICS (Ph.D. & D.Eng.)	42	21	63
COLLEGE OF HEALTH SCIENCES			
NURSING (Ph.D.)	48	12	60 (Beyond M.S.)
NURSING (Post Master's Doctorate in Nursing Practice)	41	0	41 (Beyond M.S.)
PHYSICAL THERAPY (D.PT.)	82	13[Clinical Experience]	95 (Beyond Bachelor's)
WORK ENVIRONMENT (Sc.D.)	6-18	12-24	30 (Beyond M.S.)
UMASS INTERCAMPUS			
BIOMEDICAL ENGINEERING & BIOTECHNOLOGY (Ph.D.)	33	30	63 (Beyond Bachelor's)
MARINE SCIENCES & TECHNOLOGY (Ph.D.)	36	18	54 (Beyond Bachelor's)

Doctoral Degree Requirements

Doctoral Degree Requirements

- [Doctoral Research](#)
- [Dissertation Committee](#)
- [Dissertation Credits](#)
- [Dissertation Preparation](#)
- [Dissertation Defense](#)
- [Doctoral Degree Requirements](#)
- [Procedure for Opting Out with a Master's Degree](#)

Doctoral Research

In addition to the other requirements of the University, a candidate for a doctoral degree must complete an acceptable dissertation. The dissertation must satisfy the following criteria:

1. It should demonstrate the candidate's intellectual competence and maturity in the field of concentration;
2. It should make an original and valid contribution to knowledge; and
3. It should be an individual achievement and the product of independent research.

Although doctoral dissertations may result from a project involving collaboration of several scholars, the individual contribution of each doctoral candidate must be substantial, clearly identifiable, and presented separately. The Committee will judge the completed dissertation in terms of the candidate's ability to review and make critical use of the literature; to formulate a problem, develop appropriate methodology, and work systematically toward a solution; and to summarize the material or data and draw conclusions from them. The writing should be of publishable quality.

Dissertation Committee

After a student has chosen an area of research and a research supervisor, a Dissertation Committee is selected by the student and his or her research advisor in accordance with the policy of the department. The Dissertation Committee shall consist of at least three members, one of whom is the research supervisor and at least two of whom shall be from the student's major department. An outside expert from industry or another university may be a member of the committee, but that individual must possess academic credentials which would qualify him or her to serve as a member of the University of Massachusetts Lowell faculty. The responsibilities of the Dissertation Committee shall be to:

1. Approve the research topic;
2. Supervise the progress of the dissertation;
3. Read, evaluate, and approve or disapprove of the written dissertation;
4. Hear, evaluate and approve or disapprove of the oral defense of the dissertation;
5. Report the completion of all dissertation requirements to the department and the Registrar's Office.

The [Thesis Guide](#) is available on the University Registrar's website at www.uml.edu/docs/thesis_guide_tcm18-3515.pdf.

Dissertation Credits

If the graduate student requires the use of University resources to continue his or her dissertation but has completed the required number of credits for doctoral research, he or she may sign up for 3, 6, or 9 credits of [Continuing Graduate Research](#) (see [General Policies](#)).

Graduate students who have completed all the requirements except the writing and defense of the dissertation and who do not need to use university resources must register for [Continued Matriculation](#) (CM.601.201) and pay a fee each semester until they graduate.

Note: International students on F-1 or J-1 visas must be registered for a minimum of nine credits each semester. Contact the International Students and Scholars Office for more information.

Dissertation Preparation

Every graduate student who completes a dissertation is required to bear the cost of binding two copies of the manuscript for the University's files. Copywriting is optional and available for an additional fee.

Dissertation Defense

One week prior to the dissertation defense, announcements of the defense, listing the graduate student's name, dissertation title, and place and time of the defense, must be submitted to the chairperson of the department, the college dean, the Registrar's Office and posted and distributed throughout the University. The defense is open to the public.

Doctoral Degree Requirements

The doctoral degree is conferred upon graduate students who have met all the requirements listed below:

1. The student must successfully complete the graduate courses in the major field, including the GPA requirement, and the number of course and dissertation credits required by the particular program.
2. If indicated, the language requirement specified by the major department must be satisfactorily completed.
3. A qualifying examination, oral and/or written, conducted by the major department, must be passed before any work is begun on the dissertation. If the student fails the qualifying examination he or she may, at the discretion of the department, be permitted a second and final opportunity. At this point, having completed steps 1 through 3, the student is admitted to candidacy for the doctorate.
4. A dissertation based upon the results of original research, and which is satisfactory to the Dissertation Committee of the major department, must be completed.
5. A final oral dissertation defense conducted by the Dissertation Committee, based primarily upon, but not necessarily limited to, the contents of the candidate's dissertation must be passed. The examination cannot be scheduled until all members of the Dissertation Committee have had seven working days in which to read the dissertation. The oral examination is to be conducted by the Dissertation Committee, whose membership may be augmented by the non-voting faculty. In order to pass the defense, the candidate may not receive more than one dissenting vote from the members of the Dissertation Committee.
6. All financial obligations (tuition, fees, and expenses) must be satisfied as evidenced by the completion and submission of a Graduate Degree Clearance form to the Registrar's Office.

Procedure for Opting Out with a Master's Degree

Students accepted into a doctoral program who elect to instead obtain the master's degree and leave the university must follow the following procedure:

1. The student must file an Academic Petition requesting to be changed from the doctorate to the master's degree program.
2. The student must complete all required courses for the master's degree, compile a minimum 3.0 grade point average, successfully defend his/her thesis, and complete the clearance process at the Registrar's Office.
3. All graduate courses (and undergraduate course work used for graduate credit), whether taken for the original doctoral program or for the master's degree, will be included in the grade point average and listed on the student's graduate transcript.

Master's Degree Credit Requirements

COLLEGE/PROGRAM		COURSE or SEMINAR CREDITS	THESIS or PROJECT CREDITS	TOTAL CREDIT REQUIREMENT
COLLEGE OF SCIENCES				
BIOLOGICAL SCIENCES (M.S.)	Thesis	18-24	6-12	30
	Project	24-27	3-6	30
	Non-Thesis	30	0	30
	PSM options	37	0	37
CHEMISTRY (M.S.)	Thesis	18	12	30
	Non-Thesis	30	0	30
	Thesis	24	6	30

COMPUTER SCIENCE (M.S.)	Non-Thesis	30	0	30
	Thesis	27	6	33
COMPUTER SCIENCE (MS) ENTREPRENEURSHIP option	Non-Thesis	33	0	33
	Thesis	24	6	30
MATHEMATICS (M.S.) [all options except PSM]	Non-Thesis	30	0	30
	PSM	37	0	37
MATHEMATICS (M.S.) PSM option	Thesis	18-24	6-12	30
	Project	27	3	30
PHYSICS (M.S.)	Thesis	21	9	30
	Project	27	3	30
RADIOLOGICAL SCIENCES (M.S.)	Thesis	27	3	30
	PSM option	34	0	34
COLLEGE OF FINE ARTS, HUMANITIES & SOCIAL SCIENCES				
CRIMINAL JUSTICE (M.A.)	Thesis	27	6	33
	Non-Thesis	33	0	33
ECONOMIC & SOCIAL DEVELOPMENT OF REGIONS (M.A.)	Thesis	27	6	33
	Project	27	3	30
MUSIC EDUCATION (M.M.)	Thesis	27	3	30
	Non-Thesis	30	0	30
MUSIC TEACHING (M.M.)	Thesis	27	3	30
	Non-Thesis	30	0	30
PSYCHOLOGY (M.A.)	Thesis	30	6	36
	Non-Thesis	36	0	36
	Project	33	3	36
SOUND RECORDING TECHNOLOGY (M.M.)	Thesis	27	3	30
	Non-Thesis	30	0	30
GRADUATE SCHOOL OF EDUCATION				
CAGS		30	0	30 (Beyond M.S.)
CURRICULUM & INSTRUCTION (M.ED)		30	0	30

EDUCATIONAL ADMINISTRATION (M.ED)		30	0	30
READING & LANGUAGE (M.ED)		30	0	30

FRANCIS COLLEGE OF ENGINEERING

CHEMICAL (M.S.E.)	Thesis	24	6	30
	Project	27	3	30
CIVIL (M.S.E.)	Thesis	24	6	30
	Non-Thesis	30	0	30
	Project	27	3	30
COMPUTER (M.S.E.)	Thesis	24	6	30
	Non-Thesis	33	0	33
	Project	30	3	33
ELECTRICAL (M.S.E.)	Thesis	24	6	30
	Non-Thesis	33	0	33
	Project	30	3	33
ENERGY (M.S.E.)	Thesis	24	6	30
	Non-Thesis	30	0	30
	Project	27	3	30
ENVIRONMENTAL STUDIES (M.S.)	Thesis	24	6	30
	Non-Thesis	30	0	30
	Project	27	3	30
ATMOSPHERIC SCIENCES (Concentration)	Thesis	24	6	30
	Non-Thesis	30	0	30
MECHANICAL (M.S.E.)	Thesis	21	9	30
	Non-Thesis	30	0	30
	Thesis	24	6	30

PLASTICS (M.S.E.)				
	Non-Thesis	33	0	33

COLLEGE OF HEALTH SCIENCES

CLINICAL LABORATORY SCIENCES (M.S.)	Thesis	24	8	32
	Non-Thesis	30	0	30
	Project	27	4	31
	PSM option	34	0	34
HEALTH MANAGEMENT and POLICY (M.S.) [all options]	Thesis/Project	33	3	36
NURSING (M.S.) [all options]	Thesis/Project	39	3	42
WORK ENVIRONMENT (M.S.)	Thesis	30	6	36
	Project	33	3	36
	PSM options	36	0	36

MANNING SCHOOL OF BUSINESS

BUSINESS ADMINISTRATION (M.B.A.) [all options]	Non-Thesis	42	0	42
INNOVATION AND TECHNOLOGICAL ENTREPRENEURSHIP (M.S.)	Non-Thesis	30	0	30

UMASS INTERCAMPUS

BIOMEDICAL ENGINEERING & BIOTECHNOLOGY (M.S.)	M.S. - included within Ph.D. track	28	3	31
	M.S. -PSM option	34	0	34
MARINE SCIENCES & TECHNOLOGY (M.S.)	Thesis	26	4	30
	Non-Thesis	33	0	33
	PSM option	34	0	34

GRADUATE CERTIFICATES

Most Graduate Certificates are 12 Credits each.		12	0	12 (Beyond B.S.)
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[Note: While most graduate certificates are 12 credits, some are as many as 18 credits. Courses completed for one graduate certificate may not be used for another graduate certificate.]

Master's Degree Requirements

- [Advising](#)
- [General Requirements for the Master's Degree](#)
- [Research Option for the Master's Degree](#)
- [Research Project](#)
- [Thesis](#)
 - [Thesis Committee](#)
 - [Thesis Preparation](#)
 - [Thesis Defense](#)

Students Continuing on to a Doctoral Program

Advising

An entering graduate student should meet with the departmental graduate coordinator as soon as possible after arrival on campus. The coordinator will:

1. Help design and then approve the student's complete program leading to the master's degree.

2. Recommend course credits from within and outside the University for transfer into the student's degree program.
3. Monitor the student's progress toward the degree, which must be completed within a five-year time period in most programs (See [Time for Limit for Degree Completion](#)).

General Requirements for the Master's Degree

To be recommended for a master's degree, a candidate must satisfy all requirements of the University and the specific requirements of the department in which he or she is enrolled. The requirements of the University are listed below, and the specific requirements established by the various departments may be found in the section describing the particular [programs](#).

A candidate for the master's degree must complete the following within five years of matriculation in order to receive the degree: (Note: Master's degrees which require 45 or more credits have a limit of six years.)

1. A course of study designed by the department in which he or she is enrolled and approved by the University. The course of study must have a minimum of 30 credit hours of graduate work including, where applicable, a thesis or project in the student's chosen field.
2. A student must successfully pass an oral or written examination on his or her complete master's program if required by the department.
3. Satisfactory grades in all subjects offered for the degree must be earned (See [Academic Standing](#)).
4. All financial obligations, including tuition, fees, and expenses, must be satisfied as evidenced by completion and submission of a signed Graduate Degree Clearance form to the Registrar's Office.

Research Option for the Master's Degree

If required by the program, a student must complete a master's project or a thesis. The proposal must be approved by the department in which the student is enrolled and the final project or thesis must be of graduate level quality.

Project

The project must consist of a scholarly investigation, such as a review, report, synthesis, design or experiments in the student's field resulting in a comprehensive written document. Usually, if a student chooses the project option, he or she is required to take additional course credits. Each project is awarded only three to four credits and is intended to be completed within the time limit of one semester. If the work for a project is not completed by the end of the semester, the instructor will give the student an Incomplete which is to be treated the same as an incomplete for a regular course.

Thesis

The requirements for a thesis are much more extensive, including the completion of acceptable research and its defense before a thesis committee. The completed thesis must conform to the format specified in the "Thesis Guide" (www.uml.edu/docs/thesis_guide_tcm18-3515.pdf) which is available in the Registrar's Office. The time required for completion may vary; if a student has not completed the thesis by the end of the semester, but is making satisfactory progress, he or she is given the grade of "PR". If the student requires the use of university resources to continue thesis research, but has completed the required number of credits for the master's thesis, he or she may sign up for 3, 6, or 9 credits of Continuing Graduate Research (see [Course Descriptions](#)). However, if the student is not using University resources, but is in the process of writing the thesis, he or she may register for [Continued Matriculation](#) for the semester(s) during which the work is completed. Continued Matriculation is available to international students only under special circumstances. International students should contact the [International Student Office](#) (www.uml.edu/isso/) for more information and to make sure they comply with visa and immigration regulations.

Upon successful completion of the thesis, the grade of "S" will be awarded for the all semesters in which the student is registered for thesis research. Only the Registrar's Office can issue this grade.

Thesis Committee

As soon as a student has chosen an area of research, a Thesis Committee is selected by the student and his or her research advisor in accordance with the policy of the department. The Thesis Committee shall consist of at least three members, at least two of whom shall be from the student's major department. One member of the committee shall be the student's thesis advisor. An outside expert, such as the supervisor of a research project conducted at an industrial setting or a faculty member from another institution, may be a member of the committee, but that individual must possess academic credentials which would qualify him or her to serve as a member of the University of Massachusetts Lowell faculty. The responsibilities of the Thesis Committee shall be to:

1. Approve the research topic.
2. Supervise the progress of the thesis.
3. Read, evaluate and approve or disapprove of the written thesis.
4. Hear, evaluate and approve or disapprove of the oral defense of the thesis.
5. Report the completion of all thesis requirements to the department and the Registrar's Office.

Thesis Preparation

Every graduate student who completes a thesis is required to bear the cost of binding two copies of the manuscript for the University's files. Copy writing is optional and available for an additional fee.

Thesis Defense

One week prior to the thesis defense, announcements of the defense listing the candidate's name, thesis title, and place and time of the

defense, must be submitted to the chairperson of the department, the college dean, and the Registrar's Office, and posted and distributed throughout the University. The defense is open to the public.

For Students Continuing on to a Doctoral Program

Students accepted into a master's degree program who decide to continue on for the doctorate but want to first complete their master's degree must adhere to the following procedure.

1. The student must complete all required courses, compile a 3.0 grade point average, and successfully defend his/her thesis, if required.
2. The student must complete the Registrar's Office clearance process for the master's degree.
3. A student is prohibited from enrolling in doctoral research until he or she has completed the clearance process for the master's degree.
4. The student must then apply to the doctoral program by completing the standard Graduate Admissions application process.
5. Official admission into a doctoral program and receipt of a letter of acceptance are contingent upon completion of the clearance process for the master's degree.

Undergraduate Majors

UMass Lowell's 120 [undergraduate majors](#) include sound recording technology, nursing, criminal justice, robotics, English, plastics engineering and entrepreneurship. Additionally, many departments offer [minors](#). Some programs allow you to earn a [bachelor's and master's degrees](#) in as little as five years.

Graduate Certificates in Clinical Laboratory & Nutritional Sciences

The UMass Lowell Department of Clinical Laboratory and Nutritional Sciences offers three graduate certificate programs.

- [Clinical Pathology](#)
- [Nutritional Sciences](#)
- [Public Health Laboratory Sciences](#)

[Download Graduate Certificate Application Form](#) (pdf)

Clinical Pathology

Clinical Laboratory and Nutritional Sciences Department

Contact:

Dr. Alease Bruce
978-934-4481
alease_bruce@uml.edu

Clinical Pathology combines the theoretical and technical knowledge of human anatomy and physiology, clinical chemistry, genetics, immunology, microbiology, hematology, histocompatibility, cellular pathology and other fields as they pertain to the diagnosis, monitoring and prevention of disease.

The 12 credit Graduate Certificate in Clinical Pathology is a unique program that was developed for medical laboratory personnel, medical professionals, nurses, biologists and biochemists who are interested in expanding and updating their knowledge in clinical pathology. Personnel employed in the biomedical and biotechnology industries are another population of students who will benefit from this certificate program.

Required Courses:

[30.550](#) Human Development and Pathophysiology*
[36.551](#) Advanced Pathophysiology*

Electives - Choose 2:

[32.504](#) Health Data Analysis*
[36.553](#) Advanced Clinical Biochemistry
[36.580](#) Clinical Applications of Molecular Genetics*
[36.613](#) Infectious Disease*
[36.615](#) Medical Parasitology

[*courses are offered both on-campus and online.]

Nutritional Sciences

Clinical Laboratory and Nutritional Sciences Department

Contact:

Dr. Garry J. Handelman

978-934-4503

garry_handelman@uml.edu

Current emphasis on dietary concerns in the areas of science or medicine and society-at-large demonstrate the need for post-baccalaureate programs in the nutritional sciences. This 12 credit certificate program is designed for the health professional (e.g. medical technologist, clinical lab scientist, biologist, nurse, physician, physical therapist, exercise physiologist, athletic trainer, personal trainer) currently employed with experience in a health career or related science field. Students must present evidence that they have baccalaureate degree in any one of the above or related fields.

Required Courses:

36.506 Biochemistry of Lipids
36.563 Vitamins and Minerals
36.572 Nutrition and Gene Expression
36.582 Seminar in Advanced Nutrition

Public Health Laboratory Sciences

Contact:

Dr. Alease Bruce

978-934-4481

alease_bruce@uml.edu

This 12 credit certificate program will help to satisfy a critical and timely need for qualified public health laboratory scientists. Students must take a total of 4 courses consisting of 2 required courses and 2 electives. The student must meet with the coordinator of this program to select the electives that best fit their educational needs.

Required Courses (from the Department of Clinical Laboratory and Nutritional Sciences)

Offered Online only - two courses for a total of six credits

36.541 Introduction to Public Health and the Public Health Laboratory
36.613 Infectious Disease

Elective Courses (from the Department of Clinical Laboratory and Nutritional Sciences and Department of Work Environment)

Online Courses

32.504 Health Data Analysis
19.508 Principles and Practices of Biological Safety
19.516 Laboratory Environmental Health and Safety
36.580 Clinical Applications of Molecular Genetics

On Campus Courses

36.640 Quality Assurance, Control and Improvement in the Clinical and Public Health Laboratory
19.506 Principles of Environmental Health
19.619 Measurement of Chemical Exposures
19.503 Toxicology and Health

For qualified individuals, the 12 earned graduate credits are transferable to an appropriate graduate degree program with the approval of the graduate program coordinator.

Master of Science in Clinical Laboratory Sciences

The UMass Lowell Department of Clinical Laboratory and Nutritional Sciences offers a Master of Science in Clinical Laboratory Sciences with the choice of five concentrations and one option:

Concentrations:

- [Clinical Research](#)
- [Clinical Administration](#)
- [Health Informatics](#)
- [Nutritional Sciences](#)
- [Public Health Laboratory Sciences](#)

Option:

- [Professional Science Master's](#)

Degree Requirements

The Master of Science degree program in Clinical Laboratory Sciences requires the successful completion of a minimum of 30

semester hours of graduate level courses. These include 15 credit hours of core courses and either: A) a non-project/non-thesis option where 15 course credits are selected from a concentration area. B) A project option where a student takes 4 credit hours of Graduate Project and 12 course credits from a concentration area (research or administration) or C) a thesis option consisting of 8 course credit hours of thesis (full time students only) and 9 course credits from a concentration area. There is no formal foreign language requirement. Students may petition to transfer up to 12 graduate course credits of related content from other programs and this requires approval by the department Graduate Coordinator and the department graduate faculty committee. The MS Program in Clinical Laboratory Sciences with Professional Master's Option (PSM) requires 34 total credits (see below).

Part-Time Study

Students are allowed to matriculate on a part-time basis and most professionally employed students that pursue the MS degree in Clinical Laboratory Sciences do so. Most classes meet once per week and are scheduled in the evening or online for student convenience.

Bachelor's-Master's Program

Program of Studies

Core Curriculum

The core curriculum includes the following courses (15 credits) and must be taken by each program student:

- 30.550 Human Development and Pathophysiology (3cr)
- 36.640 Quality Assurance, Control and Improvement in the Clinical and Public Health Laboratory (3cr)
- 36.575 Topics in Clinical Laboratory Sciences (3cr)
- 36.553 Advanced Clinical Chemistry (3cr)
- 36.580 Clinical Applications of Molecular Genetics (3cr)

Concentration Areas

A. Clinical Research

Students selecting this concentration are expected to have prior certification or a sound preparation in the biological sciences and chemistry. In addition to the core curriculum, students must take the following prescribed elective:

- 36.551 Advanced Pathophysiology (3cr)

Students selecting the project or thesis options take Project (4cr) or Thesis (8cr) and either 12 or 9 credits respectively from departmental course offerings or from courses approved by the Graduate Coordinator and dept graduate committee. Students not selecting the project or thesis options are required to take 12 graduate course credits in addition to the core curriculum and the Advanced Pathophysiology course.

Students not selecting the project or thesis options are required to take 15 graduate course credits in addition to the core curriculum.

*Note: Other graduate level courses from outside of the Clinical Laboratory Master's Program may be used as electives with graduate coordinator pre-approval.

B. Clinical Administration

Students selecting this concentration must have a clinical certification approved by the chairperson of the Department of Clinical Laboratory and Nutritional Sciences. In addition to the core curriculum, students must take the following graduate Health Administration courses:

- 32.502 Organizational Behavior in Health Care (3cr)
- 32.514 Health Care Management (3cr)
- 32.607 Health Care Information Systems (3cr)
- 32.625 Health Policy (3cr)

Students selecting the project or thesis options take Project (4cr) or Thesis (8cr) and either 12 or 9 credits respectively of graduate Health Administration course offerings listed. Students not selecting the project or thesis options are required to take the four concentration courses listed and an additional 3cr department elective.

*Note: Other graduate level courses from the Health Services Administration Program may be substituted for these courses with graduate coordinator approval. Students not selecting the project or thesis options are required to take 15 graduate course credits in addition to the core curriculum.

C. Health Informatics

This concentration is intended for students with a background in health who wish to be prepared to apply current information technology to the management of health care services and information. Students must possess a baccalaureate degree and basic computer skills. In addition to the core curriculum, students must take an additional 3cr department elective and the following graduate Health Informatics courses:

32.607 Health Care Information Systems (3cr)
32.531 Health Informatics (3cr)
32.632 Health Information System Planning (3cr)
32.633 Healthcare Database Design (3cr)

Students not selecting the project or thesis options are required to take 15 graduate course credits in addition to the core curriculum.

D. Nutritional Sciences

This concentration is designed for students with a baccalaureate degree in an allied health or biological sciences field who wish to enhance their understanding of nutrition and health promotion. In addition to the core curriculum, students must take the following graduate Nutritional Sciences courses:

36.572 Nutrition and Gene Expression (3cr)
36.506 Biochemistry of Lipids (3cr)
36.563 Vitamins and Minerals (3cr)
36.582 Seminar in Advanced Nutrition (3cr)

Students also select Project (4 Cr) or Thesis (8 Cr) and either 12 or 9 credits respectively from departmental course offerings or from courses approved by the department chair, graduate coordinator or graduate committee. Students not selecting the project or thesis options are required to take 15 graduate course credits in addition to the core curriculum. The four graduate Nutritional Sciences Courses offered also comprise the Graduate Certificate in Nutritional Sciences. Students may apply for this certificate program without official matriculation in the Master's degree program.

Students not selecting the project or thesis options are required to take 15 graduate course credits in addition to the core curriculum.

E. Public Health Laboratory Sciences

This concentration is intended for qualified students with a background in Clinical Laboratory Sciences, Community Health, Environmental Health, Health Administration, Work Environment, Biological Sciences or Chemistry who would like to help satisfy a critical need for qualified public health scientists

Students must possess a baccalaureate degree and basic computer skills.

In addition to the core curriculum, students in this concentration must take the required course, Introduction to Public Health and the Public Health Laboratory, and an additional 4 courses. Three of these courses must be selected from one of the following areas.

Required Course - Department of Clinical Laboratory and Nutritional Sciences

36.541 Introduction to Public Health and the Public Health Laboratory (3 cr)

Concentrations/Elective Courses (credits)

Infectious Disease and Quality Control - Department of Clinical Laboratory and Nutritional Sciences

- 36.613 Infectious Disease (3 cr)
- 36.615 Medical Mycology and Parasitology Lecture (3 cr)
- 36.511 Medical Bacteriology Lecture (3 cr)
- 36.515 Clinical Virology/Serology Lab (3 cr)
- 36.641 Quality Assurance, Control and Improvement the Clinical and Public Health Laboratory (3 cr)

Health Management and Policy - Department of Community Health and Sustainability

- 32.514 Health Care Management (3 cr)
- 32.502 Organizational Behavior in Health Care (3 cr)
- 32.626 Leadership and Change (3 cr)
- 32.604 Health Data Analysis (3 cr)

Health Informatics - Department of Community Health and Sustainability

- 32.607 Healthcare Information Systems (3 cr)
- 32.632 Healthcare Information System Planning (3 cr)
- 32.633 Healthcare Database Design (3 cr)

Environmental Testing - Department of Work Environment

- 19.575 Intro to Biostatistics and Epidemiology (3 cr)
- 19.573 Bioaerosols in Health and Biodefense (3 cr)
- 19.506 Introduction to Environmental Health (3 cr)
- 19.622 Biomarkers for Occupational & Environmental Health (3 cr)

Professional Sciences Masters Option

This degree option (34 total credits) contains approximately 2/3 science (24 credits) and 1/3 business/communication (9 credits) courses and a 1 credit internship experience with reflective seminar (34 credits program total). The 5 required scientific core courses are the same. Three Department elective courses may be selected from the following:

STEM Elective Courses (9 cr), choose any three

- 36.734 MS Project in Clinical Laboratory Sciences (3)
- 36.551 Advanced Pathophysiology (3)
- 36.531 Clinical Immunohematology (3)
- 36.615 Medical Mycology and Parasitology (3)
- 36.506 Biochemistry of Lipids (3)
- 36.572 Nutrition and Gene Expression (3)
- 36.582 Seminar in Advanced Nutrition (3)
- 36.563 Vitamins and Minerals (3)
- 36.565 Lab Methods in Nutrition Assessment (3)
- 36.541 Introduction to Public Health and the Public Health Laboratory (3)

(Other Graduate level courses outside of the Department of Clinical Laboratory & Nutritional Sciences will be considered to be included on an individual basis.)

PLUS courses (Business and Communication 9 credits)

PLUS Required Courses (3 credits)

66.688 Advanced Professional Communication(or equivalent)

PLUS Elective Courses (choose minimum of 6 total credits)

- 62.501 Marketing Fundamentals
- 66.501 Organizational Behavior
- 64.650 Innovation and Emerging Technology
- 66.630 New Product Development
- 62.630 Market Research for Entrepreneurs
- 66.635 Project Management
- 61.640 Financing Innovation and Technical Ventures

(Additional PLUS course choices will be available from a list of approved courses provided by the PSM Coordinating Committee to include additional qualified courses from the College of Management as well as online courses from other UMass campuses).

Professional Experience (1 credit)

36.770 Professional Internship and Seminar

A Professional Internship is required for students in this program and is expected to be a minimum of 350 hours and have 3-6 month duration. The internship is designed to provide students with an opportunity to obtain real-world experience in business, government agencies, non-profit organizations or research laboratories. Internships or research project experiences will typically take place in Clinical, Pharmaceutical, Diagnostic, Biotechnological or Medical Device Companies or Institutions. Research experience can also be obtained at the University or other Research Centers. Given the number of full time faculty in the department, the University will assist the Department of Clinical Laboratory and Nutritional Sciences and the students with arranging corporate internships. To be eligible for the Professional Internship, students will be required to have 1) completed a minimum of 12.0 credits of STEM courses, 2) completed a minimum of 6.0 credits of PLUS courses, 3) attained an overall minimum GPA of 3.0 and 4) Department permission. Since most program students will have a scientific background and are in a scientific Master of Sciences Program, Professional Internships with a business will be most desirable. Consideration will be given for students that have previous or current professional employment experience, however, in these cases, a new project experience will be required that adds to the student's current set of skills. All students will be required to submit a final written report and give oral presentation on their work at a Seminar. All post-internship students will participate in this seminar. All Professional Internships require department faculty supervision. Students should register for 36.770 during the final semester of internship participation.

Department of Clinical Laboratory & Nutritional Sciences

The UMass Lowell Department of Clinical Laboratory and Nutritional Sciences offers the following graduate programs:

- **Master of Science in Clinical Laboratory Sciences Concentrations:**
 - Clinical Research
 - Clinical Administration
 - Health Informatics
 - Nutritional Sciences
 - Public Health Laboratory Sciences
- Option:
 - Professional Science Master's Option

- **Graduate Certificates:**
 - [Clinical Pathology](#)
 - [Nutritional Sciences](#)
 - [Public Health Laboratory Sciences](#)
- [Bachelor's-Master's Program](#)

Program Philosophy

The Master of Science degree program in Clinical Laboratory Sciences provides medical technologists and individuals with medical, biological or biochemical backgrounds with specialized knowledge in the clinical laboratory sciences. The mission of the program is to allow individuals to expand their understanding of the clinical sciences and be able to apply state-of-the-art research techniques to the advancement of diagnostic technology. Knowledge of such skills will permit upward mobility into entry level supervisor positions and dissemination of clinical information in educational settings. Students may choose from concentrations in research, health administration, health informatics and nutritional sciences.

Faculty in the Department of Clinical Laboratory and Nutritional Sciences have extensive research track records. Many are recognized nationally and internationally as experts in their fields and participate in professional organizations, holding office at local and national levels. Department faculty are successful in obtaining research funding and are very productive in publishing their research findings in peer-reviewed scientific journals.

Program Intent

Each student upon completion of the program is expected to:

1. Integrate knowledge, demonstrate competencies and develop advanced skills from specialized areas in clinical research, management and informatics.
2. Demonstrate advanced abilities to make decisions necessary for management and supervision of a clinical laboratory.
3. Demonstrate knowledge and utilization of research methodology.
4. Utilize research to evaluate technology in clinical laboratory sciences.
5. Collaborate with members of other health care specialties.
6. Show evidence of continuous professional growth and leadership.

Admission Requirements

1. Baccalaureate degree from an accredited university or college with a recommended GPA of 3.0 or better.
2. Sound preparation in the biological or clinical sciences with chemistry background for the research concentration. Official score report for the Graduate Record Examination Aptitude Test (GRE).
3. For Clinical Administration concentration: clinical certification required.
4. For Clinical research concentration, sound preparation in biological or clinical sciences required, to include successful completion of a course in biochemistry or equivalent.
5. Three letters of recommendation pertaining to academic ability and professional performance.

Program Requirements

The student must possess basic statistical and computer skills prior to admission, or may complete without credit within the graduate program of study, an introductory course in computers and a course in statistics prior to the third semester. Skill level can be determined through discussion with the Graduate Coordinator.

Graduate Certificate Programs in Health Informatics and Management

HI+M Certificate Requirements

The Health Informatics and Management (HI+M) program offers four-course Graduate Certificates in three different areas:

1. [Health Management](#)
2. [Health Informatics](#)
3. [Health Policy](#)

Many students complete one of these Certificates before seeking admission to the HI+M Master's degree program, as the Certificate courses are accepted as credits toward the Master's degree. Moreover, students who complete a Graduate Certificate with a grade point average of 3.5 or better are not required to take the Graduate Record Exam in applying for admission to the MS program. UMass Lowell is one of the largest accredited online education providers in New England. As developed under a blended learning grant from the Alfred P. Sloan Foundation and its Sloan-C initiative, the HI+M program offers graduate studies in a new blended format that offers the "best of both worlds"—combining face-to-face and online classes—providing a more accessible program of study for busy healthcare and IT professionals.

Admission Requirements

1. Official transcript indicating graduation from an accredited baccalaureate institution.

2. A one-page statement of purpose indicating career plans, interests and objectives in pursuing a graduate degree.
3. A professional resume.
4. TOEFL scores must be submitted if a citizen of a non-English speaking country and have not earned an academic degree in the United States (Minimum 600 paper-based, 250 computer-based, or 100 Internet-based).
5. A personal interview, either in-person or via phone.

Although a background in health is not required for admission, applicants with significant health industry experience are given preference when program capacity is limited. For other applicants, one's academic record and professional work experience are especially important. Applications can be submitted and evaluated at any time. We nevertheless recommend that those seeking admission for the Fall semester have applications complete by May 15, and that those seeking admission for the Spring semester have applications complete by December 15. All application materials go to Graduate Admissions.

Health Management Certificate

The Health Management Certificate is offered primarily as a continuing education opportunity for health industry professionals interested in pursuing career advancement. It teaches core skills required in healthcare management and helps students gauge interest and prospects for continuing with a full 12-course MS program.

Required Courses:

- 32.511 Healthcare Finance
- 32.514 Healthcare Management

Elective Courses (choose two):

- 32.502 Organizational Behavior in Healthcare
- 32.506 Quantitative Methods in Healthcare Management
- 32.531 Health Informatics
- 32.607 Healthcare Information Systems
- 32.512 Operations Analysis and Quality Improvement
- 32.515 Applied Health Economics
- 32.616 Law and Ethics in Healthcare
- 32.625 Health Policy
- 32.527 Planning and Marketing in Healthcare
- 32.626 Leadership in Healthcare
- 32.627 Socioeconomic Inequalities in Health
- 32.632 Health Information Systems Planning
- 32.633 Healthcare Database Design
- 32.635 Healthcare Project Management
- 32.638 Strategic Planning in Healthcare and HIT

Health Informatics Certificate

The Health Informatics Certificate is primarily meant to provide healthcare professionals with the requisite skills and understanding required to support health IT initiatives where they already work.

Required Courses:

- 32.531 Health Informatics
- 32.607 Healthcare Information Systems

Elective Courses (choose two):

- 32.632 Health Information Systems Planning
- 32.633 Healthcare Database Design
- 32.635 Healthcare Project Management
- 32.638 Strategic Planning in Healthcare and HIT

Health Policy Certificate

The Health Policy Certificate is offered as a continuing education opportunity for healthcare and public health professionals interested in pursuing career advancement within public health agencies, non-profit community organizations and NGOs.

Required Courses:

- 32.625 Health Policy
- 32.672 Socioeconomic Inequalities in Health

Elective Courses (choose two):

- 32.506 Quantitative Methods in Health Management
- 32:515 Applied Health Economics
- 32.607 Healthcare Information Systems
- 32.616 Law and Ethics in Healthcare

For General Questions

Jacqui Hawk, Corporate Outreach Coordinator
 University of Massachusetts Lowell
 Division of Online and Continuing Education
 E-mail: Jacqueline_Hawk@uml.edu
 Phone: 978-934-2141

For Program-Specific Questions

A. James Lee, Ph.D.
 Associate Professor
 Department of Community Health & Sustainability
 College of Health Sciences
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Master of Science in Health Informatics and Management

- [Program Objectives](#)
- [Admission Requirements](#)
- [Degree Requirements](#)
- [Capstone Project Requirement](#)
- [Other Questions](#)

The Health Informatics and Management Program offers a master's degree in the following concentrations:

- [Health Management](#)
- [Health Informatics](#)

Program Objectives

At the local, national and regional level, our healthcare system confronts new challenges in coping with the many changes in technology, information systems, financing and management. For many health industry professionals seeking career advancement, a Master's Degree is often required. Moreover, according to the Bureau of Labor Statistics, the employment of medical and health services managers is predicted to grow faster than average through 2018.

The Health Informatics and Management (HI+M) program predominantly enrolls mid-career professionals working within health provider and other health-related organizations. Many students complete a Graduate Certificate before seeking admission to the Master's Degree program, and the Certificate courses are accepted as credits toward the Master's Degree.

UMass Lowell is one of the largest accredited online education providers in New England. As developed under a blended learning grant from the Alfred P. Sloan Foundation and its Sloan-C initiative, the HI+M program offers graduate studies in a new blended format that offers the "best of both worlds" – combining face-to-face and online classes – and provides a more accessible program of study for busy professionals.

Admission Requirements

1. Official transcript indicating graduation from an accredited baccalaureate institution.
2. Three letters of recommendation addressing academic ability and professional performance.
3. A page-length Statement of Purpose indicating career plans, interests and objectives in pursuing a graduate degree.
4. A professional resume.
5. Acceptable scores on the Graduate Record Examination (GRE). If a student has already completed an HI+M Graduate Certificate program with a grade point average of 3.5 or better, the GRE is not required.
6. TOEFL scores must be submitted if the applicant is a citizen of a non-English speaking country and has not earned an academic degree in the United States. (Minimum score of 600 paper-based, 250 computer-based, or 100 Internet-based).
7. A personal interview, either in-person or via phone.

Although a background in health is not required for admission, applicants with significant health industry experience are given preference when program capacity is limited. For other applicants, one's academic record and professional work experience are especially important. Applications can be submitted and evaluated at any time. We nevertheless recommend that those seeking admission for the Fall semester have applications complete by May 15, and that those seeking admission for the Spring semester have applications complete by December 15. All application materials go to Graduate Admissions.

Degree Requirements

Thirty-six credits (eleven 3-credit courses, plus a 3-credit Capstone Project) are required to obtain the Master's Degree. The specific course requirements are indicated below, separately for Health Informatics and Health Management. Some course substitutions may be allowed based on prior academic and work experience.

Health Management Concentration:

Health Informatics students are required to take the following six courses:

- 32.502 Organizational Behavior in Healthcare
- 32.511 Healthcare Finance
- 32.512 Operations Analysis and Quality Improvement
- 32.514 Healthcare Management
- 32.616 Law and Ethics in Healthcare
- 32.733 Capstone Project

Health Informatics students additionally take the following six Health Informatics courses:

- 32.531 Health Informatics
- 32.607 Healthcare Information Systems
- 32.632 Health Information Systems Planning
- 32.633 Healthcare Database Design
- 32.635 Healthcare Project Management
- 32.638 Strategic Planning in Healthcare and HIT

Health Informatics Concentration:

Health Management students are required to take the following nine (9) courses:

- 32.502 Organizational Behavior in Healthcare
- 32.506 Quantitative Methods in Healthcare Management
- 32.607 Healthcare Information Systems
- 32.511 Healthcare Finance
- 32.512 Operations Analysis and Quality Improvement
- 32.514 Healthcare Management
- 32.616 Law and Ethics in Healthcare
- 32.625 Health Policy
- 32.733 Capstone Project

Health Management students additionally take three of the following courses as electives:

- 32.515 Applied Health Economics
- 32.527 Planning and Marketing in Healthcare
- 32.626 Leadership in Healthcare
- 32.627 Socioeconomic Inequalities in Health
- 32.632 Health Information Systems Planning
- 32.633 Healthcare Database Design
- 32.635 Healthcare Project Management
- 32.638 Strategic Planning in Healthcare and HIT

Capstone Project Requirement

Near the end of their Master's Degree program, students register for Capstone Project and complete an independent study under faculty supervision. The Capstone Project applies concepts and skills learned in the program, and culminates in a substantial business-type report. Many students complete a Capstone related to their work. For students who don't work, Capstone internships can be arranged. All Capstone students present their findings at a semester-end program event that is open to all.

For General Questions

Jacqui Hawk, Corporate Outreach Coordinator
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Division of Online and Continuing Education
E-mail: Jacqueline_Hawk@uml.edu
Phone: 978-934-2141

For Program-Specific Questions

A. James Lee, Ph.D.
Associate Professor

Department of Community Health & Sustainability

The UMass Lowell Department of Community Health and Sustainability offers the following graduate programs:

- [Master of Science in Health Informatics and Management](#)
 - Health Informatics Option
 - Health Management Option
- Graduate Certificates
 - [Health Informatics](#)
 - [Health Management](#)
 - [Health Policy](#)

Philosophy

The Department of Community Health and Sustainability offers science based programs at both the undergraduate and graduate level to support and advance the health professions.

The mission of the department is to prepare individuals to become public health professionals and researchers who work to create a sustainable future. Our approach provides the foundation for the design, implementation, and evaluation of policies, programs, and technologies, with a curriculum and research focus based on the physiological and social determinants of health. Our programs encompass the areas of Community and Environmental Health, Health Management, Health Informatics and Health Policy.

Post-Master's Doctorate in Nursing Practice (DNP) Program

Purpose of the DNP Program

The **purpose** of the DNP program is to educate nurse practitioners who not only provide quality primary care to patients, but who assume leadership roles in the health care system, and have the knowledge and skills necessary to propose solutions to improve patient care and health care outcomes. This can be achieved by nurses who have strong patient care knowledge and skills obtained at the MS level, and also knowledge and skills in evaluation research, health policy, organizational leadership and financing, evidence-based practice and health care informatics. The DNP is expected to have a positive impact on the sustainability of the health care system by having advanced education in areas necessary to improve health care delivery using an evidence-based approach.

The curriculum in the Post-Masters DNP program will be 2 academic years full-time in length, adding 33 credits of post-masters education. Part-time study is available. In addition to classroom and on-line experiences, students will complete practica hours that are related to, but not limited to, completion of a scholarly project. A scholarly project is completed that includes an evidence-based intervention to improve practice or patient outcomes and an evaluation of the evidence-based intervention.

Program Objective:

The **objective** of the DNP program at the University of Massachusetts Lowell is to prepare nurse leaders who propose, implement and evaluate positive evidence-based changes in health care. The graduate of the post-MS DNP program in Nursing will build on the foundation of nursing achieved by Master's prepared nurse practitioners who are board certified clinicians.

Admission Criteria

Students admitted to the post-MS DNP program will hold a MS degree in nursing with preparation as a nurse practitioner. Certification as a nurse practitioner is also required.

Specific application requirements include:

- Application to the DNP program submitted to the Graduate Admissions office
- Resume
- Prior official transcripts from undergraduate and graduate programs
- Current RN/APRN licensure in any state and eligibility for RN/APRN license in Massachusetts
- National certification as an advanced practice nurse
- Three letters of recommendation (1 academic recommendation preferred)
- Interview with nursing faculty to assess fit of candidate's goals with program
- Minimum cumulative GPA of 3.0 on a 4.0 scale in a Master's degree program in Nursing
- Written narrative of professional goals
- TOEFL if appropriate

Priority application deadline is February 1. Admission is competitive. Applications received after that date will be reviewed on a space available basis.

Course of Study -- (33 credits)

Semester I

- **32.512** Operations Analysis for Quality Improvement (3 cr.)
- **33.770** Evidence Appraisal (3 cr.)
- **33.707** Epidemiology of Health Promotion (3 cr.)

Total: 9 credits

Semester II

- **33.717** Evaluation Research (3 cr.)
- **32.506** Quantitative Methods in Health Management (3 cr.)
- **33.774** Scholarly Project Design (3 cr.)*

Total: 9 credits

Semester III

- **33.772** Scholarly Project and Practicum (3 cr.)*
- **33.771** Advanced Nursing Leadership and Management (3 cr.)*
- **xx.xxx** Elective in Informatics and Management or Nursing (3 cr.)

Total: 9 credits

Semester IV

- **33.773** Evidence Dissemination, Advocacy & Policy (3 cr.)*
- **32.607** Healthcare Information Systems (3 cr.)

Total: 6 credits

Elective (for Semester III)

Students may choose an elective 3-credit course from the following School of Nursing offerings:

- 32.627 Socioeconomic Inequalities in Health
- 32.514 Healthcare Management
- 32.511 Healthcare Finance
- 33.553 Geropsychiatric and Mental Health Nursing
- 33.554 Palliative and End of Life Nursing Care
- 33.716 Qualitative Methods
- 33.702 Theoretical Foundations of Health Promotion
- 33.706 Measurement in Health and Behavioral Research
- 33.713 Curriculum and Teaching in Nursing
- 33.602 Clinical Psychopharmacology
- 33.703 Research in Nursing and Health Promotion
- 33.709 Intervention Research in Health Promotion & Nursing
- 33.701 Philosophy of Science

Other courses with approval of advisor

*Courses 33.770, 33.771, 33.772, 33.773 and 33.774 must be taken in sequence over 4 consecutive semesters

Above is the course sequence for full time course of study. A course sequence for part time study is also available.

Contact:

Angela Nannini, FNP, Ph.D.

978-934-4938

Angela_Nannini@uml.edu

Doctoral Program in Nursing

The Doctor of Philosophy in Nursing Program at UMass Lowell provides study in health promotion. Graduates will advance knowledge in health promotion for individuals, families, groups, and communities.

[The Ph.D. Program](#)

[Admission Requirements](#)

[Degree Requirements](#)

[Course of Study](#)

The Ph.D. Program

The goals of the Ph.D. program are to develop nurse scholars who (a) demonstrate leadership roles as researchers, clinical scientists and educators; (b) create new knowledge in the area of health promotion; and (c) improve the health of diverse populations through the development, implementation and evaluation of health promotion interventions and strategies.

The Ph.D. program was established in 1996 as a collaborative effort with the University of Massachusetts Boston Nursing Ph.D. program that provides study in health policy. Two programs share some faculty resources and scholarly activities.

Admission Requirements

Students who wish to apply for admission to the Ph.D. program must submit a graduate admission application form. The graduate application form can be obtained from the UMass Lowell [Graduate Admissions Office](#).

Additional requirements include:

1. A master's degree and/or B.S. degree in nursing with a minimum G.P.A. of 3.3 (Applicants who hold a non-nursing master's degree but have a B.S. in nursing, who have established professional records in nursing, and who show potential for success in the Ph.D. program will be considered for admission on an individual basis)
2. A current Massachusetts R.N. license or eligibility (International students may waive this requirement and will be evaluated on an individual basis);
3. A minimum of two years of professional nursing experience;
4. Evidence of successful completion of a graduate course in statistics, which may include multivariate and bivariate analysis;
5. An official report of scores on the general aptitude sections of the Graduate Record Exam (GRE) within the past five years;
6. Two official transcripts of all previous academic records (both graduate and undergraduate);
7. A personal statement about the applicant's interest in the program and professional goals;
8. Three letters of recommendation including at least two from individuals who can assess the applicant's academic preparation for doctoral work.

The Ph.D. Admissions Committee is chaired by the Ph.D. Program Director and comprised of at least two faculty members who teach in the graduate program. The Admission Committee will interview applicants and make the final decision. There are three types of decisions: (1) Accept, (2) Accept with conditions, or (3) Denied.

The application process is described as follows:

- Applicants log onto [Graduate Admissions website](#) to obtain all required application forms and documents.
- Prepare application documents.
- Submit all required application documents to the UML Graduate Admissions.
- The Graduate Admissions Office forwards all applicant documents to Director of Ph.D. Program in Nursing.
- Ph.D. Admission Committee reviews all applicants.
- Ph.D. Admission Committee conducts interview.
- Ph.D. Admission Committee decides acceptance or denial of the applicant.
- The Decision is submitted to Graduate Admissions.
- Applicant receives a letter from Graduate Admissions for either acceptance or denial.
- Accepted students will receive a official letter from Director of the Ph.D. Program.

Degree Requirements

The doctoral program in health promotion requires a total of 60 semester credits beyond the master's degree. These credits are distributed as follows:

COURSES	CREDITS
Nursing Core Courses	9
Health Promotion Courses	9
Research Core Courses	27*
Cognate Courses	9
Elective Courses	6
Total Credits	60 credits

*Includes 12 dissertation credits

Course of Study

NURSING CORE	CREDITS
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33:701 Philosophy of Science	3
33:703 Research in Nursing and Health Promotion	3
33:709 Intervention Development in Nursing and Health Promotion	3
Total Credits	9 credits

RESEARCH CORE	CREDITS
33:710 Statistics I	3
33:704 Research Methods I	3
33. 706 Research Methods II[1]	3
33:711 Statistics II	3
33:716 Qualitative Methods	3
33:753[2] Dissertation 33:753 Dissertation 33:753 Dissertation 33:753 Dissertation	12
Total Required	27 credits

HEALTH PROMOTION CORE	CREDITS
33:707 Epidemiology of Health Promotion	3
33:702 Theoretical Foundation for Health Promotion	3
33:712 Research Apprenticeship in Health Promotion	3
Total Required	9 credits
COGNATES[3]	
Total Required	9 credits
ELECTIVES	
Total Required	6 credits
Total Program Credits Required:	60 credits

[1] 33.714 Advanced statistics course at UMB and 33.717 Evaluation Research course are considered as an option for Research Method II course.

[2] 33.753, 33756, and 33.759 are dissertation course numbers. 33.753 is a 3 credit-dissertation course number; 33:756 for 6 credits/semester and the course number 33:759 for 9 credits/semester.

[3] Cognate courses (9 credit hours) are designed for students to study specifically in their area of research interest. Department of Nursing offers the course Curriculum and Teaching in Nursing ? 33.713 to prepare doctoral students for the role of nurse educator. Students shall consult with their advisors and the Ph.D. Program Director for selection of cognate courses.

Nursing Qualifying Examination

Students must pass a Nursing Qualifying Examination (NQE) at the completion of the first thirty-six credits of required core course work before enrolling in subsequent courses. Upon successful completion of the NQE and all required course work, the student will be designated a candidate for the Ph.D. in Nursing.

Dissertation

Dissertation planning may be initiated in the first year, but formal work begins following successful completion of the Nursing Qualifying Examination. At this time a Dissertation Committee is formed to direct the student's research. The dissertation requirement is designed to demonstrate that the student has acquired a substantial body of knowledge related to the selected field of study, has developed the ability to use appropriate data analysis methods, and has contributed to the advancement of nursing knowledge related to health care policy or health promotion, and the student's dissertation work must be original.

Health Promotion Studies

Studies in health promotion, concentrated at UMass Lowell will prepare graduates to conduct research studies that target behavioral and social factors as areas of intervention for health promotion and disease prevention at the individual, group, family and community levels. Faculty and students will engage in research that develops, implements and evaluates interventions of health promotion. Graduates will be prepared for careers as researchers, clinical scientists, and educators who:

1. Create change in health care delivery through the development and implementation of health promotion programs/interventions.
2. Extend the knowledge base of nursing in health promotion through research and theory development.
3. Contribute to health promotion policy development and evaluation at local, regional, and national levels.

4. Develop and implement health promotion interventions to achieve high levels of wellness in target populations.
5. Assume leadership roles in the identification and resolution of health promotion needs across the lifespan.

Health Promotion Program of Studies

Core Courses:

Philosophy of Science 3 credits
Research in Nursing and Health Promotion 3 credits
Intervention Development in Health Promotion 3 credits
TOTAL: 9 credits

Research Courses:

Statistical Methods 6 credits
Research Methods 6 credits
Qualitative Methods 3 credits
Dissertation 12 credits
TOTAL: 27 credits

Concentration Courses:

Epidemiological Foundations of Health Promotion 3 credits
Theoretical Foundations for Health Promotion and Nursing 3 credits
Research Apprenticeship in Health Promotion 3 credits
TOTAL: 9 credits

Cognate Courses

Three 3-credit courses selected to complement the individual student's academic focus
TOTAL: 9 credits

Elective Courses

TOTAL: 6 credits

Cumulative Total: 60 credits

Contact

This Ph.D. program is offered jointly by the Boston and Lowell campuses of the University of Massachusetts. Faculty from both campuses participate according to the focus of the respective campus Nursing Departments: Boston - Health Policy; Lowell - Health Promotion. For more information on the faculty for this joint program, please contact the Graduate Program Coordinator:

Barbara Mawn, PhD, RN

Director, PhD Program in Nursing
Professor
978-934-4485
barbara_mawn@uml.edu

Master of Science in Nursing

The UMass Lowell School of Nursing offers a master's program in nursing that emphasizes depth of knowledge and excellence in nursing in three areas of specialization: [Adult Psychiatric-Mental Health Nursing](#), [Adult/Gerontological Nursing](#) and [Family Health Nursing](#).

[Program of Study](#)

[Program Outcomes](#)

[Admission and Degree Requirements](#)

[Curriculum](#)

[Areas of Specialization](#)

Program of Study

The objectives of the master's program curriculum are to provide advanced practice nursing education which focuses on:

1. Health promotion of individuals, families and groups from diverse populations;
2. Management of health problems in collaboration with client, families, and health professionals;
3. Leadership in the profession; and
4. Research utilization for evidence-based practice.

The graduate program is designed for a four-semester, two-calendar year schedule, although part-time study is possible. Within each major area of specialization all students are prepared with knowledge and skills necessary for leadership in a variety of settings. Methods of inquiry, research and scholarly techniques are integral parts of the curriculum.

Program Outcomes

The master's degree program educates graduates who are prepared to:

1. Practice in the advanced nursing role of the specialty
2. Collaborate with clients, peers, and other health professionals
3. Demonstrate leadership in the profession of nursing.

Admission and Degree Requirements

Requirements for the master's program are:

- A baccalaureate degree with a major in nursing from an accredited program,
- An undergraduate scholastic average of 3.0 or better,
- An introductory course in statistics,
- License to practice nursing in the Commonwealth of Massachusetts and professional nursing experience,
- A resume,
- Three letters of recommendation pertaining to academic ability and professional competency with one preferably from a Baccalaureate faculty member. The others should be from professional supervisors. Professional supervisors titles must be included.
- Written Statement: On one or two separate sheets of paper and in 750 words or less, please reflect on your past professional nursing experience and describe your immediate and long-range goals, including your professional aspirations as an advanced-practice nurse,
- Computer literacy,
- Official transcripts, and
- Completed application and fees.

A minimum of 42 credits of course work is required for graduation with an MS for all students. A research project or a thesis is required for graduation.

Students may be admitted for part-time study. Part-time students must meet the same admission requirements for graduate study as full-time students. Part-time students will meet with their assigned advisor and plan a schedule for their program of studies. All admitted students are advised to contact their assigned advisors for program of study recommendations and to register for courses during University advisement periods.

Transfer of credits for non-matriculated students: Non-matriculated students may take a maximum total of 12 graduate credits (4 courses) earned with a grade of B or better prior to matriculation which may be applied toward the MS degree. Those taken at another accredited institution may be transferred if appropriate to the MS degree program in nursing and after approval by the faculty of record for the UMass Lowell course and the petition signed by the Graduate Coordinator. To qualify as a transfer the course must have been taken within 5 years prior to the date of matriculation. Transfer of credits may not be granted for Advanced Health Assessment, Clinical courses or for clinical practica.

Admission is competitive. Priority deadlines are **April 30** for fall admission and **November 1** for Spring Admission. Applications received after these dates, if there are openings, will be reviewed on a case-by-case basis. Applicants will be notified of the outcome of the admissions process within three weeks of the application deadline.

Additional Information

Students must carry CPR certification. Evidence of such must be provided. In addition, entering students are required to submit proof of immunizations, a PPD, and immunizations.

Curriculum

Semester I

- 33.600 Theoretical Foundations for Nursing (3 credits)
- 30.550 Human Development & Pathophysiology (3 credits)
- 33.552 Social, Cultural & Policy Issues in Health Care (3 credits)

33.651 Advanced Health Assessment and Diagnostic Reasoning (3 credits)

TOTAL: 12 credits

Semester II

Specialty Theory I (4 credits)

Specialty Practicum I (3 credits)

33.559 Advanced Pharmacology (3 credits)

TOTAL: 10 credits

Semester III

Specialty Theory II (4 credits)

Specialty Practicum II (3 credits)

33.601 Research for Evidence-Based Practice (3 credits)

TOTAL: 10 credits

Semester IV

Specialty Theory and Practicum III (4 credits)

Elective (3 credits)

33.733 Project -or- 33.734 Thesis (3 credits)

TOTAL: 10 credits

Areas of Specialization

- **Adult/Gerontological Nursing**

This specialty focuses on promoting health of adults and older adults during the process of normal aging and identifying and treating common health problems. Students develop advanced skills in communicating with adults and older adults, health assessment, health teaching and nursing intervention and evaluation. Students are prepared as nurse practitioners and eligible to sit for the gerontological nurse practitioner certification exam.

Specialty courses:

33.610 Adult/Gerontological Nursing I

33.613 Adult/Gerontological Nursing Practicum I

33.611 Adult/Gerontological Nursing II

33.614 Adult/Gerontological Nursing Practicum II

33.612 Adult/Gerontological Nursing III

- **Family Health Nursing**

This specialty focuses on facilitating the health practices of families during the process of normal development and identifying and treating common health problems across the life span. Students develop advanced skills in communicating with families, health assessment, health teaching and nursing intervention and evaluation. Students are prepared as nurse practitioners and are eligible to sit for the family nurse practitioner certification exam.

Specialty Courses:

33.660 Family Health Nursing I

33.663 Family Health Nursing Practicum I

33.661 Family Health Nursing II

33.664 Family Health Nursing Practicum II

33.662 Family Health Nursing III

- **Adult Psychiatric/Mental Health Nursing**

In a health promotion, risk-prevention framework, the NP/CS blended program is designed to prepare advanced practice psychiatric mental health nurses with the ability to perform comprehensive health assessments. The program prepares advanced practice nurses as competent therapists who care for individuals, families, and groups in a variety of settings. Students are prepared to sit for the Adult Psychiatric/Mental Health Clinical Specialist, and/or Nurse Practitioner certification exams.

Specialty Courses:

33.620 Adult Psychiatric/Mental Health Nursing I

33.623 Adult Psychiatric/Mental Health Nursing Practicum I

33.621 Adult Psychiatric/Mental Health Nursing II

33.624 Adult Psychiatric/Mental Health Nursing Practicum II

33.622 Adult Psychiatric/Mental Health Nursing III

Nursing Doctoral Degrees

The Department of Nursing at UMass Lowell offers two doctoral programs:

- [Nursing \(Ph.D.\)](#)
- [Post-Master's Doctorate in Nursing Practice Program \(DNP\)](#)

Graduate Certificates in Nursing

The School of Nursing offers the following graduate certificates:

- [Adult Psychiatric and Mental Health Nursing](#) (Post-Master's)
- [Disability Outcomes](#) (interdisciplinary)
- [Geropsychiatric and Mental Health Nursing](#) (On Hold)
- [Nursing Education](#) (On Hold)
- [Palliative and End-of-Life Nursing Care](#) (On Hold)
- [Sleep and Sleep Disorders in Health and Disease - Online](#) (On Hold)

[How to Apply: Application and Registration](#)

Adult Psychiatric and Mental Health Nursing Certificate (Post-Master's)

School of Nursing

Betty Morgan, Ph.D. - Coordinator
 Telephone: 978-934-4462
betty_morgan@uml.edu

This 18- credit post-Masters certificate in adult psychiatric and mental health nursing provides MS-prepared nurse practitioners and clinical nurse specialists with the knowledge and skills necessary to care for adults with psychiatric and mental health issues. Those who complete the certificate are eligible to sit for the national certification examination for nurse practitioners and/or clinical nurse specialists in adult psychiatric and mental health nursing.

Applications to this certificate should be submitted to the Graduate Admissions Office with MS and BS transcripts. A goal statement and 3 recommendations should be submitted to the Director of the MS and Certificate Programs in the School of Nursing. Licensure to practice as a registered nurse in Massachusetts and an interview by a nursing faculty member is required.

Evidence from an official graduate transcript that documents successful completion of the following prerequisite graduate courses with a grade of B or better is required:

- Theoretical Foundations of Advanced Practice
- Advanced Health Assessment
- Advanced Pathophysiology
- Research
- Social, Cultural, & Policy Issues in Health Care (or equivalent)
- Advanced Pharmacology

Pre-requisite or co-requisite: 33.602 Clinical Psychopharmacology

Specialty Courses

33.620 Adult Psychiatric/Mental Health Nursing I (didactic) (4 credits Spring Semester)

33.623 Adult Psychiatric/Mental Health Nursing Practicum I (3 credits Spring Semester)

33.621 Adult Psychiatric/Mental Health Nursing II (didactic) (4 credits Fall Semester)

33.624 Adult Psychiatric/Mental Health Nursing Practicum II (3 credits Fall Semester)

33.622 Adult Psychiatric/Mental Health Nursing III (4 credits Spring Semester)

Didactic and practicum courses must be taken concurrently and in sequence over a 3-semester period beginning in a Spring semester.

Disability Outcomes

Departments and programs participating in the certificate include Physical Therapy, Work Environment, Nursing, and Biomedical Engineering and Biotechnology

Sean Collins, Ph.D. - Coordinator
sean_collins@uml.edu

In the prevention and management of chronic disability, this certificate is designed to augment the preparation of researchers and/or clinicians with an appreciation of the interactions among personal attributes, clinical disease features, and socioeconomic and working

conditions. Students will examine the 'state of art' theoretical perspectives in disability outcomes. They will develop advanced knowledge and skills in their chosen areas of expertise, including disability evaluation; design and conduct of epidemiologic studies of disease outcomes and their risk factors; evaluation and control of relevant environmental factors that affect work and health outcomes; and development and analysis of strategies for the improvement of disease outcomes, based on public and private policy alternatives.

This 12 credit certificate is designed for students with a background in engineering, public health, clinical services, community programs or psychology. Through the program students complete a core of six credits in courses specifically oriented to Disability Outcomes and six additional elective credits (chosen with their advisor) in the participating departments (see below).

Required Courses: (3 credits each)

34.510 Models and Measurement in Disability
19.579 Disability Outcomes and Interventions

Elective Courses: (3 credits each - choose two courses)

19.575 Introduction to Epidemiology and Biostatistics
19.638 Methods of Work Analysis
19.542 Human Factors
19.610 Exposure Assessment
19.643 Healthy Work Organization
32.604 Health Data Analysis
32.625 Health Policy
33.552 Social, Cultural and Policy Issues in Health Care
33.601 Research for Evidence-Based Practice

Or other electives with approval of the Certificate Program Coordinator.

Geropsychiatric and Mental Health Nursing (this program is on hold as of May 2013)

School of Nursing

Ruth Remington, Ph.D. - Coordinator
Telephone: 978-934-4423
ruth_remington@uml.edu

The certificate is for the post-baccalaureate nurse who wants to develop greater knowledge and skills in the assessment and nursing care of older adults who are experiencing common mental health and psychiatric problems of late life. Instruction focuses on pathology, psychopharmacology, and behavioral management strategies in nursing care of older adults. Application of other relevant topical areas will include social, cultural and policy issues in health care, applying theory to practice, evidence-based practice, and pathophysiology. Students who complete the certificate are encouraged to apply for advanced practice role preparation as an Adult Psychiatric Mental Health Nurse Practitioner/Clinical Nurse Specialist, Family Nurse Practitioner, or Adult/Gerontological Nurse Practitioner (GNP) through the UMass Lowell Master's program in Nursing.

Required Courses:

33.552 Social, Cultural and Policy Issues in Health Care
33.558 Geropsychiatric and Mental Health Nursing

Elective Courses: (choose one)

30.550 Human Development and Pathophysiology
-or-
36.551 Advanced Pathophysiology

(choose one)

33.600 Theoretical Foundations for Nursing
-or-
33.601 Research for Evidence-Based Practice

Nursing Education (this program is on hold as of May 2013)

School of Nursing and Graduate School of Education (Interdisciplinary)

Ruth Remington, Ph.D. - Coordinator
Telephone: 978-934-4423
ruth_remington@uml.edu

The certificate responds to the growing need for professional nurses who have specialty education in teaching methods and curriculum. It is intended for nurses who hold a master's degree, a doctoral degree, or are matriculated in a doctoral program. The courses emphasize teaching/learning principles, curriculum and instruction, and evaluation research in higher education.

Required Courses:

01.610 Theories of Learning

-or-

01.701 Cognition and Information Processing: Theories of Learning, Development and Instruction

33.713 Curriculum and Teaching in Nursing

33.717 Evaluation Research

Elective Course: (choose one)

01.607 The Adult Learner

04.643 The Skillful Teacher

05.642 Principles of Supervision

06.625 Teaching of Writing

33.777 Independent Study: Practicum in Nursing Education

Palliative and End-of-Life Nursing Care (this program is on hold as of May 2013)

School of Nursing

Ruth Remington, Ph.D. - Coordinator

Telephone: 978-934-4423

ruth_remington@uml.edu

Palliative and end-of-life nursing care is evolving in response to individual, professional, and societal needs related to the experience of life-limiting, progressive illness. The certificate is designed for the post-baccalaureate nurse who wants to develop advanced knowledge and skills in the evidence-based assessment and nursing care of individuals and families across the lifespan in need of palliative and end-of-life care. Instruction will focus on assessment and communication at end-of-life, symptom management, pharmacology, pathophysiology, cultural and spiritual sensitivity, principles of hospice and palliative care, and ethical, legal, regulatory and policy issues surrounding care and its reimbursement, all with the goal of enhancing quality of life. Students who complete the certificate are encouraged to apply for advanced practice role preparation as an Adult Psychiatric/ Mental Health Nurse Practitioner/Clinical Nurse Specialist, Family Nurse Practitioner, or Adult/Gerontological Nurse Practitioner through the University of Massachusetts Lowell Master's program in Nursing.

Required Courses:

33.554 Palliative and End-of-Life Nursing Care

33.552 Social, Cultural and Policy Issues in Health Care

Elective Courses: (choose one)

33.559 Advanced Pharmacology

-or-

30.550 Human Development and Pathophysiology

-or-

36.551 Advanced Pathophysiology

(choose one:)

33.600 Theoretical Foundations for Nursing

-or-

33.601 Research for Evidence-Based Practice

Sleep and Sleep Disorders in Health - Online (this program is on hold as of May 2013)

Coordinator: Geoffry Phillips McEnany

978-934-4409

Geoffry_PhillipsMcEnany@uml.edu

This 12-credit online certificate program in sleep and chronobiology aims to respond to the NIH call to facilitate learning for health professionals in the areas of clinical and theoretical dimensions of sleep and chronobiology. The courses in the certificate program aim to provide the student with fundamental information in the normative mechanisms of sleep as well as biological and environmental

influences in sleep and wakefulness across the lifespan. From this foundation, additional course work focuses on diagnosis and intervention in sleep dysregulation with a particular focus on the formal sleep disorders. State-of-the-science intervention strategies are addressed from both the behavioral and pharmacologic perspectives.

Admission Requirements: Master of Science degree in nursing, social work, psychology or other health-related disciplines.

Required Courses:

- 33.685 Introduction to Clinical Dimensions of Sleep & Chronobiology (3 credits)
- 33.686 Diagnosis & Differential Diagnosis across Sleep Disorders (3 credits)
- 33.687 Clinical Assessment & Intervention in Sleep Dysregulation (3 credits)
- 33.688 Scholarly Project/Capstone (3 credits)

Total: 12 credits

School of Nursing

The School of Nursing offers the following graduate programs:

- [Doctoral Program](#) (Ph.D.)
- [Post-Master's Doctorate in Nursing Practice \(DNP\) Program](#)
- [Master's of Science in Nursing](#)
- Graduate Certificates:
 - [Adult Psychiatric and Mental Health Nursing](#)
 - [Disability Outcomes](#) (interdisciplinary)
 - [Gerontological Nursing](#) (closed as of May 2013)
 - [Geropsychiatric and Mental Health Nursing](#) (closed as of May 2013)
 - [Nursing Education](#) (closed as of May 2013)
 - [Palliative and End-of-Life Nursing Care](#) (closed as of May 2013)
- [Bachelor's-Master's Program](#)

Philosophy

The philosophy of the School of Nursing reflects beliefs regarding person, environment, health, nursing, and education. People have unique, individual qualities and basic needs for respect, worth, and recognition of personal dignity. They have the right to make choices and establish goals, which influence and are influenced by the environment. Health is a dynamic state of physiological, psychological, social and spiritual well being. Nursing is a health care discipline guided by professional standards of care to support individuals, families, groups and communities in the promotion of health throughout the life span.

Education is a self-actualizing, creative, lifetime endeavor involving values clarification, progressive systematic inquiry, critical analysis and judgment. The bachelor's nursing program incorporates a liberal education with generalized preparation in professional nursing. The master's program is predicated upon a baccalaureate nursing education and prepares individuals as advanced practice nurses. The doctoral program builds on both the generalized preparation in professional nursing and the specialist preparation at the master's level to prepare nurse scholars in health promotion.

Graduate Certificate Program in Physical Therapy

The Department of Physical Therapy offers a graduate certificate program in:

- [Disability Outcomes](#)

[Graduate Certificate Application Form](#) (pdf)

Disability Outcomes

Departments and programs participating in the certificate include Physical Therapy, Work Environment, Nursing, and Biomedical Engineering and Biotechnology

Dr. Sean Collins, P.T., Sc.D., C.C.S.

sean_collins@uml.edu

In the prevention and management of chronic disability, this certificate is designed to augment the preparation of researchers and/or clinicians with an appreciation of the interactions among personal attributes, clinical disease features, and socioeconomic and working conditions. Students will examine the 'state of art' theoretical perspectives in disability outcomes. They will develop advanced knowledge and skills in their chosen areas of expertise, including disability evaluation; design and conduct of epidemiologic studies of disease outcomes and their risk factors; evaluation and control of relevant environmental factors that affect work and health outcomes; and development and analysis of strategies for the improvement of disease outcomes, based on public and private policy alternatives.

The certificate is designed for students with a background in engineering, public health, clinical services, community programs or psychology. Through the program students complete a core of six credits in courses specifically oriented to Disability Outcomes and six additional elective credits (chosen with their advisor) in the participating departments (see below).

Required Courses (3 credits each):

34.510 Models and Measurement in Disability
19.579 Disability Outcomes and Interventions

Elective Courses (3 credits each):

[choose two courses]

19.575 Introduction to Epidemiology and Biostatistics
19.638 Methods of Work Analysis
19.542 Human Factors
19.610 Exposure Assessment
19.643 Healthy Work Organization
32.604 Health Data Analysis
32.625 Health Policy
33.552 Social, Cultural and Policy Issues in Health Care
33.601 Research Utilization

Or other elective with approval of the Certificate Program Coordinator.

Doctoral Program in Physical Therapy

The Doctor of Physical Therapy (DPT) program at UMass Lowell prepares individuals for entry into the profession of physical therapy. The fully accredited program requires a baccalaureate degree for admission and a three-year full-time commitment, including part of each summer.

The curriculum provides a comprehensive foundation in the art and science of physical therapy. Methods of instruction include classroom lecture and discussion, small group / problem-based learning, and skill development during laboratory and clinical experiences. Emphasis is placed on the development of clinical decision-making and critical inquiry skills across the curriculum, culminating in the completion of a Final Research Project (done in small groups) that meets peer review standards for presentation and/or publication.

The clinical education program consists of four extended clinical education experiences (each eight weeks in length) and two shorter blocks (one and two weeks in length) for a total of 35 weeks. Students experience a variety of practice settings and patient populations in preparation for general practice.

- [Program Objectives](#)
- [Admission Requirements](#)
- [Course of Study](#)

Program Objectives

The graduate of the entry-level Doctor of Physical Therapy program at the University of Massachusetts Lowell will be prepared to:

1. Exhibit attributes, characteristics and behaviors of professionals.
2. Practice physical therapy in a safe, effective, ethical, autonomous, reflective, culturally sensitive and legal manner.
3. Apply the principles of the scientific method and evidence-based practice to interpret and use professional literature in clinical practice; participate in, plan, and conduct research; evaluate outcomes, new concepts/theories and technologies.
4. Provide skilled planning, direction, organization, and effective management of human, technical, environmental, and financial resources.
5. Provide effective direction and supervision of personnel essential to the provision of high quality physical therapy.
6. Provide appropriate wellness screening, prevention and wellness activities, and the promotion of positive health behaviors.
7. Advocate effectively for patient/clients and facilitate necessary change within the health care delivery system to assure quality health care.
8. Demonstrate commitment to personal and professional development.
9. Successfully complete all courses and capstone projects.
10. Pass the National Physical Therapy Examination.

The program objectives are adapted from the Guide to Physical Therapy Practice, American Physical Therapy Association and Generic Abilities (May et al. Journal of Physical Therapy Education.9:1, Spring 1995).

Admission Requirements

- Bachelor's degree from an accredited university or college.
- An undergraduate grade point average of 3.0 or better.
- An undergraduate grade point average in science courses of 3.0 or better.
- Graduate Record Examination: 870 (old scoring format).

NOTE: for the 2012 Admission Cycle (Class entering in Fall 2012 we will use the ETS Concordance Table to convert any test scores submitted on the new scale to the old scale for assessment of the GRE requirement.

For example: a test score on the new scale of Verbal 150 and Quantitative 150 would equate to an old score total of 1080 (Verbal 450, Quantitative 630).

- Documented personal experience in a physical therapy setting - 35 hours minimum. Form: Certification of Hours (pdf)

- Statement of Purpose
- Three letters of recommendation, including one from a physical therapist.

Admission course prerequisites include:

- Anatomy and Physiology with labs - 2 semesters
- General Chemistry with labs - 2 semesters
- Physics with labs - 2 semesters
- Kinesiology, lab recommended
- Exercise Physiology, lab recommended
- Psychology
- Statistics

The DPT class consists of both external and internal (Exercise Physiology graduates from U Mass Lowell) graduates. Highly qualified juniors in the Exercise Physiology program are accepted into the DPT program under expedited or early admission, pending successful completion of their baccalaureate requirements.

Additional Program Requirements

1. Proof of yearly physical examination by a physician indicating satisfactory general health status and proof of immunization for measles, mumps, rubella, tetanus, polio, diphtheria, tuberculosis, and Hepatitis B is required prior to clinical education experiences.
2. A CORI check (Criminal Offender Record Information) prior to clinical education experiences is required.
3. Costs related to clinical education experiences including transportation, housing, meals and tuition/fees are assumed by the student. Students should expect and plan for out-of-state clinical placements.
4. Professional behavior (defined as Generic Abilities) is required during all academic and clinical education experiences.

Course of Study

[DPT Curriculum](#) (pdf)

[DPT Course Checklist](#) (pdf)

Department of Physical Therapy

The Department of Physical Therapy offers the following graduate programs:

- [Doctorate in Physical Therapy](#)
- [Graduate Certificate in Disability Outcomes](#)

Program Mission

The Mission of the Department of Physical Therapy is consistent with that of the College of Health Sciences and the University of Massachusetts Lowell in that it promotes the concepts of human health and development through:

1. Teaching of theory and practice of physical therapy in classroom and community-based settings by preparing graduates to practice their profession with knowledge, competence, and respect for human well-being.
2. Scholarship in the discovery, application and dissemination of knowledge in physical therapy and health.
3. Public service in partnership with local, regional, and national organizations advancing prevention-based strategies in health.

Program Philosophy

The [faculty](#) of the Department of Physical Therapy believes that individuals have intrinsic worth and a right to optimal health and function. Function is defined as those activities identified by an individual as essential to support physical, social, and psychological well being and to create a personal sense of meaningful living. Physical therapists provide services to patients/clients with impairments, functional limitations, disabilities, or changes in physical function and health status resulting from injury, disease, or other causes. Physical therapists also can prevent the development of impairment, functional limitation, or disability by identifying disablement risk factors and by buffering the disablement process through prevention and wellness strategies.

The physical therapist is professionally educated in a program that synthesizes graduate study with undergraduate knowledge, and experiential learning. The graduate of the Doctor of Physical Therapy program is prepared to function as an ethical and competent practitioner who uses effective clinical decision making and psychomotor skills to provide services to patients/clients. The five elements of patient/client management include examination, evaluation, diagnosis, prognosis, and intervention. The graduate also is prepared to interact and practice in collaboration with a variety of health professionals, provide prevention and wellness services, consult, educate, and engage in critical inquiry. Finally, the graduate is prepared to direct and supervise physical therapy services, including support personnel. Graduates are expected to assume a leadership role in health care and to practice autonomously and cooperatively in a variety of practice settings such as: hospitals, rehabilitation centers, extended care facilities, schools, sports medicine clinics, community health and private practices, and industrial or workplace settings.

The faculty believes that students are active participants in the educational process. As potential professionals, the relationship between students and faculty is one in which there is mutual respect, understanding, and interchange of ideas. The faculty, as experienced professionals, are resource persons, mentors, and role models for the developing professional. The faculty view themselves as

facilitators of the learning process. Students are expected to demonstrate commitment to learning as the basis for continued personal and professional growth, effective interpersonal and communication skills, problem-solving and critical thinking skills, and appropriate professional conduct. Effective use of time and resources, feedback, and stress management strategies are important components of the behaviors of the successful student.

Master of Science in Work Environment - Professional Science Master's (PSM) Options

Professional Science Master's Options in Work Environment

The Work Environment Professional Science Master's Options are 36 credits, interdisciplinary, and problem-focused. Graduates learn to recognize, evaluate and control occupational and environmental health and safety issues. Technical preparation in such fields as statistics, toxicology, aerosol physics, analytical chemistry, and biomechanics is taught with direct applications to the identification, control and elimination of health and environmental hazards. Students also learn the dynamics of the workplace ? the sociology, political science and economics of systems of production.

The Work Environment PSM options follow the same courses as the current master's degree programs with the addition of a one credit internship for students who do not have substantial professional work experience in their field.

Professional Science Master's Option - Occupational & Environmental Hygiene

Professional Science Master's Option - Ergonomics & Safety

Professional Science Master's Option - Epidemiology

Professional Science Master's Option - Cleaner Production & Pollution Prevention

Admission Requirements

The admission requirements are the same as in the current master's degree program:

- Baccalaureate degree from an accredited university or college with a recommended GPA of 3.0 or better.
- Graduate Record Examination Aptitude Test (GRE). For students who graduated from a university in a country where English is not the official language, TOEFL scores should be at least 550 (paper-based), 213 (computer-based), or 79 (internet-based).
- Documentation of good writing ability.
- Prerequisite technical courses (with a grade of C or better) must include:
 - For the Occupational and Environmental Hygiene Program, one semester courses in mathematics (calculus or statistics preferred), general chemistry, organic chemistry, biology and physics.
 - For the Ergonomics & Safety program, one semester courses in mathematics (calculus preferred), biology and physics.
 - For the Epidemiology and Cleaner Production & Pollution Prevention programs, one semester courses in mathematics (statistics preferred) and human biology.
- faculty committee will evaluate each applicant's application materials including GPA, GRE, TOEFL, experience, recommendations and essay. Meeting minimum requirements does not guarantee acceptance. In some cases, applicants who do not meet all entry requirements may be admitted if they have completed 9 credits of Work Environment courses, all with a B+ or better as a non-matriculated student.

Curriculum

STEM Courses (24 credits total)

STEM Required Courses for ALL PSM options (9 Credits):

- 19.503 Toxicology and Health (3 credits)
- 19.525 Introduction to Industrial Hygiene and Ergonomics (3 credits)
- 19.575 Introduction to Occupational Epidemiology and Biostatistics (3 credits)

STEM Required SPECIALIZATION Courses (15 Credits)

Occupational & Environmental Hygiene

- 19.616 Exposure and Risk Assessment (3 credits)
- 19.540 Occupational Safety Engineering (3 credits)
- 19.614 Evaluation of Work Environment Hazards (3 credits)
- 19.615 Solutions to Work Environment Hazards (3 credits)
- 19.619 Measurement of Chemical Exposures 5 (3 credits)

Ergonomics and Safety

- 19.531 Occupational Biomechanics (3 credits)
- 19.540 Occupational Safety Engineering (3 credits)
- 19.638 Methods in Work Analysis (3 credits)
- Plus 2 STEM electives (6 credits)

Cleaner Production/Pollution Prevention

- 19.557 Toxic Use Reduction (3 credits)
- 19.610 Exposure Assessment (3 credits)
- 19.659 Cleaner Production Principles (3 credits)
- Plus 2 STEM electives (6 credits)

Epidemiology

- 19.682 Applied Epidemiologic Methods (3 credits)
- 19.610 Exposure Assessment (3 credits)
- 92.591 Linear Modeling & Regression Methods (3 credits)
- 19.687 Quantitative Models for Health & Environment (3 credits)
- 19.689 Advanced Regression Modeling (3 credits)

(Other Graduate level courses outside of the Department of Work Environment may be chosen as STEM electives with advisory committee approval.)

PLUS courses (9 credits total)

PLUS Required Course for all PSM Options (3 credits):

- 19.500 Analytical Context of the Work Environment

PLUS BUSINESS SPECIALIZATION Courses (6 credits total):

Occupational & Environmental Hygiene

- 19.651 Work Environment Policy and Practice (3 credits)
- 1 PLUS elective (3 credits)

Ergonomics and Safety

- 19.542 Human Factors (3 credits)
- 1 PLUS elective (3 credits)

Cleaner Production/Pollution Prevention

- 19.550 Environmental Law & Policy (3 credits)
- 19.651 Work Environment Policy and Practice (3 credits)

Epidemiology

- 2 PLUS electives (6 credits)

Approved PLUS Elective Courses:

Business of Work Environment:

- 19.542 Human Factors (3 credits)
- 19.550 Environmental Law & Policy (3 credits)
- 19.640 Macroergonomics (3 credits)
- 19.641 Principles of Accident Causation and Prevention (3 credits)
- 19.643 Healthy Work Organization Design (3 credits)
- 19.651 Work Environment Policy and Practice (3 credits)
- 19.654 Work, Technology and Training (3 credits)

Business Fundamentals:

- 62.501 Marketing Fundamentals (3 credits)
- 66.501 Organizational Behavior (3 credits)
- 64.650 Innovation and Emerging Technology (3 credits)
- 66.630 New Product Development (3 credits)
- 62.630 Market Research for Entrepreneurs (3 credits)
- 66.635 Project Management (3 credits)
- 61.640 Financing Innovation and Technical Ventures (3 credits)

(Additional PLUS course choices will be available from a list of approved courses provided by the PSM Coordinating Committee to include additional qualified courses from the College of Management and other relevant departments).

Internship (1 credit)

A Professional Internship is required for students in this program and is expected to be a minimum of 350 hours and have 3-6 month duration. The internship is designed to provide students with an opportunity to obtain real-world experience in business, government agencies, non-profit organizations or research laboratories. Internships or research project experiences will typically take place in industries and government agencies. Research experience can also be obtained at the University or other Research Centers.

To be eligible for the Professional Internship, students will be required to have 1) completed a minimum of 12 credits of STEM courses, 2) completed a minimum of 6 credits of PLUS courses, 3) attained an overall GPA of 3.0 or higher and 4) permission of the Graduate Coordinator. The internship will typically be undertaken in the summer between the first and second years, with continuation into the final year in some cases.

Students that have previous or current professional employment experience may request to waive the internship requirement, however, in these cases, a new project experience will be required that adds to the student's current set of skills.

Capstone Experience - Required for all PSM Options (2 credits)

19.600 (0 credits) and 19.602 (2 credits) are the courses for the Work Environment Capstone. The capstone courses are taken in the second (final) year of the program with 19.600 taken in the Fall and 19.602 in the spring semester.

All students will be required to submit a final written report and give oral presentation on their internship work during the capstone course in their final semester. All post-internship students will participate in this capstone class, as will all professionally employed students who have had the internship waived.

Master of Science Program in Work Environment

The UMass Lowell Department of Work Environment offers a master's program with several areas of specialization:

- [Occupational Ergonomics/Safety](#)
- [Occupational and Environmental Hygiene](#)
- [Epidemiology](#)
- [Work Environment Policy](#)
- [Cleaner Production and Pollution Prevention](#)
- [Professional Science Master's Option - Occupational & Environmental Hygiene](#)
- [Professional Science Master's Option - Ergonomics & Safety](#)
- [Professional Science Master's Option - Epidemiology](#)
- [Professional Science Master's Option - Cleaner Production & Pollution Prevention](#)

Program Information:

- [Admission Requirements](#)
- [Academic Advisor](#)
- [Master's Thesis](#)
- [Master's Project](#)
- [Capstone Course](#)
- [Course Requirements](#)

Admission Requirements

Successful applicants will meet the standards of the [Graduate Admissions](#) at the University of Massachusetts Lowell and, in addition, will have demonstrated the ability and motivation necessary for independent creative work and an interest in issues of the work environment. Strong preference will be given to candidates with both a quantitative academic background and experience in industry, government or health care. At the same time, the faculty of the Department of Work Environment believes that the program (and the profession) is strengthened by admitting students from a wide diversity of backgrounds, and therefore students with non-traditional educational or work backgrounds will be considered carefully. Excellent written communication skills are important in graduate school, as well as in professional careers. For this reason, the Department places special emphasis on documentation of writing ability. The applicant's statement required as part of the [graduate application](#) is one such document, but applicants may also submit other writing samples if they wish.

To be admitted applicants must have a BA or BS with an overall GPA of at least 3.0. Applicants must have a grade of C or better in required, prerequisite technical courses. For the Occupational and Environmental Hygiene Program the technical courses must include at a minimum one semester of: college-level mathematics (calculus or statistics preferred), general chemistry, organic chemistry, biology and physics. For the Ergonomics/Safety program, technical courses must include college level mathematics (calculus preferred), biology and physics. For the Epidemiology, Cleaner Production and Policy programs, technical courses include college level mathematics (statistics preferred) and biology. Applicants who are deficient in their technical course requirements may be admitted with the provision that they meet with their advisor before or during their first semester to make a plan to compensate for any deficiencies.

GRE's are required unless the student has completed a previous American Masters degree. For students who graduated from a university in a country where English is not the official language, TOEFL scores should be at least 550 (paper-based), 213 (computer-based), or 79 (internet-based).

A faculty committee will evaluate each applicant's complete packet of application materials including GPA, GRE, TOEFL, experience, recommendations and essay. Meeting minimum requirements does not guarantee acceptance. In some cases, applicants who do not meet one of our entry requirements may be admitted if other parts of their application outweigh the deficiency. In addition, applicants who do not meet one of our entry requirements may be admitted if they have completed 9 credits of Work Environment Department courses, all with a B+ or better as a non-matriculated student.

An applicant interested in part-time study may wish to first enroll in a Work Environment core course as a non-matriculated student (see

the [Graduate Catalog application procedure](#) for details) to learn more about the program, and so that faculty can get to know the prospective degree candidate as well. A maximum of 4 courses (12 credits) may be taken before matriculating. An applicant who has taken one or more Work Environment courses is strongly encouraged to obtain at least one letter of recommendation from a Work Environment instructor.

Application dates: The Department of Work Environment has rolling admissions, and will consider applications at any time. However, the following points should be considered.

Departmental Financial Assistance: An applicant for full-time study who wishes to be considered for departmental funding should have a completed admissions application (including undergraduate transcripts, letters of recommendation, and GRE scores) submitted to the Office of Graduate Admissions by April 15 for admission the following September. Applications received after that date risk not being considered for departmental funding. Awards are generally announced beginning in June. The Department will try to accommodate students who request an early decision because of the need to respond to competing requests. Please contact the Department if you are in this situation.

Mid-year Admissions: A student may begin in January, the start of the second semester. However, course sequences are designed for the student who starts in September, and so it is more difficult to plan an orderly course schedule beginning in January. Also, departmental funding is not generally available for those starting in January. If a student starting in January wishes to be considered for departmental funding, she/he may apply for the next cycle, starting in September of the same year.

Accelerated Bachelor's-Master's Program

Please see [Accelerated Bachelor's-Master's Program](#) for details.

Academic Advisor

Each graduate student admitted into the Department of Work Environment will be assigned an academic advisor who will assist in the selection of courses and who will develop, with the student, a program which will meet the needs and requirements for the desired concentration. For a master's degree candidate who selects the non-thesis option, the academic advisor will supervise the advanced research project.

Master's Thesis

A student selecting the thesis option will arrange, through the academic advisor, to have a three-member faculty committee appointed at the time a thesis proposal is submitted. At least two of the committee members shall be from the student's area of concentration. The committee is responsible for approval of the proposal. The report on the research work will then be performed primarily under the supervision of the academic advisor. The thesis must be prepared in appropriate form and be presented to the thesis committee for final approval. The student is required to give an oral defense of the thesis before the committee and other faculty members. The completed thesis must conform to the format specified in the "[Thesis Guide](#)," available from the [Registrar's Office](#).

Master's Project

The project will consist of a scholarly investigation, such as a review, report, synthesis or design in the student's field resulting in a written document. Each project is awarded three credits and is intended to be completed within the time limit of one semester. If the work for a project is not completed by the end of the semester, the instructor will give the student a grade of "I" which is to be treated the same as an incomplete for a regular course.

Capstone Course

This three-credit two-semester sequence (19.600/19.601) is designed to provide students with the opportunity to examine a problem in depth and propose a solution to the problem. The product will be a term paper and a public presentation of the proposed approach. Students will be assigned a faculty member to serve as a consultant to the process of developing a solution, although the faculty's role will be to provide guidance and general advice, not detailed directions.

Course Requirements for the Master's Degree

This is a 36 credit program. A core of 15 credits is required of all students in the master's degree program. An additional 21 credits is required for each of the concentrations for students with no prior experience. Requests for waiver of any specific course requirements will be considered on a case-by-case basis and will depend on documentation of equivalent course work at another institution, or upon satisfactory evidence of advanced professional standing.

Core Courses:

One of the following:

19.500 Analytical Context of the Work Environment - 3 credits

Or 19.651 Work Environment Policy and Practice - 3 credits

And

19.503 Toxicology and Health - 3 credits

19.525 Introduction to OEH-IH and Ergonomics - 3 credits

19.575 Introduction to Biostatistics & Epidemiology - 3 credits

19.600 Work Environment Capstone - 0 credits (first of a 3 credit, two-semester sequence)

19.601 Work Environment Capstone - 3 credits

Total required core courses: 15 credits

Areas of Specialization

Occupational Ergonomics/Safety

Ergonomics provides the scientific basis for optimized design of the work environment compatible with the capabilities and limitations of the working population. An ergonomist is trained to recognize, evaluate, and control hazards in the work environment that result from a poor fit between the worker and the work-place; these hazards may result in acute injury, chronic musculoskeletal disorders, or mental/psychosocial "stress." The physical demands of machines, tools, and work methods must accommodate the range in size, strength, mobility, and endurance of the workforce. Information flow must be structured so that the worker can process and respond appropriately without being mentally overstressed to the degree that errors result. Job content and work organization should be designed to optimize skill utilization and learning, physiological and psychological well-being. The option in Ergonomics/Safety is designed to develop an understanding of human anatomy, physiology, and psychology, of industrial hygiene and epidemiology and modern manufacturing technology and work organization, industrial safety. It provides a multidisciplinary background in these basic areas, as well as their application to the practical ergonomics and safety problems that are encountered in industrial and service work environments.

The following courses are required in addition to the core:

19.531 Occupational Biomechanics - 3 credits

19.540 Occupational Safety Engineering - 3 credits

19.542 Human Factors - 3 credits

19.638 Methods in Work Analysis - 3 credits

Electives - 9 credits

The curriculum allows the Ergonomics/Safety students to choose 9 credits in electives. These electives will be selected by each student in accordance with her/his background, interests, and career goals. It is expected that the set of chosen electives will represent a coherent "track" or "option" within the concentration. These choices should be thoroughly discussed with the advisor. Options include a joint concentration with Occupational and Environmental Hygiene; "general practice" in safety and ergonomics; musculoskeletal disorders; and psychosocial strain/work organization.

Occupational and Environmental Hygiene

Occupational and Environmental Hygiene (OEH-IH) is concerned with the protection of worker health through the prevention of occupational illness and injury. Occupational and environmental hygienists accomplish this goal through the recognition, evaluation, control and prevention of chemical, physical, biological, and psychosocial hazards in the work environment. The control of such hazards allows the worker to perform his/her job in a productive manner, free from the debilitating effects of work-related illnesses.

Educational Goals

Graduates will be prepared in the initial diagnosis of exposure problems in the workplace and general environment, in the development of sampling and evaluation strategies to characterize the problem, in field collection and laboratory techniques to measure environmental exposures, and in the development and evaluation of environmental controls and innovative alternatives. A new aspect of our program is to train industrial hygienists to be involved in the design and implementation of more sustainable systems of production.

The OEH-IH program is specifically designed to achieve the following educational objectives:

1. **Technical Competence:** Demonstrate a high level of technical and scientific competence in the application of the fundamentals of recognition, evaluation, control and prevention of occupational and environmental hazards.
2. **Analytic Competence:** Demonstrate the ability to solve complex problems through observation, literature review, measurement and data analysis.
3. **Effective Communication:** Utilize effective oral and written communications to interact with technical and lay audiences around occupational and environmental health issues.
4. **Effective Teamwork:** Work independently and as part of an occupational and environmental health team to address complex problems in occupational and environmental health.
5. **Ethical Practice:** Understand the moral, ethical, legal and professional responsibilities for the protection of occupational and environmental health and integrate an awareness of social and global issues into practice.
6. **Life long Learning:** Understand the need to engage in life-long learning and undertake appropriate activities to address this need, including professional advancement leading to professional certification

The following courses are required in addition to the core:

- 19.540 Occupational Safety Engineering - 3 credits
- 19.614 Evaluation of Work Environment Hazards - 3 credits
- 19.615 Solutions to Work Environment Hazards - 3 credits
- 19.616 Exposure and Risk Assessment - 3 credits
- 19.619 Measurement of Chemical Exposures - 3 credits
- 19.651 Work Environment Policy & Practice - 3 credits
- Elective - 3 credits

The curriculum allows the Occupational and Environmental Hygiene student to choose 3 credits in electives. Each choice should be thoroughly discussed with your advisor.

Epidemiology

Epidemiology is the study of the distribution and determinants of disease in human populations. Today's occupational epidemiologist is called upon to identify previously unsuspected diseases caused by exposure to hazards in the work environment, to assess the health risks of new technologies, to recommend a scientific basis for the setting of occupational standards to protect worker health, and to evaluate the ability of control technologies or other interventions to limit health risks. Epidemiology is a rapidly evolving discipline using increasingly sophisticated statistical methods to quantify the risks of low level, long term exposures to hazardous physical and chemical agents. The field is highly interdisciplinary, drawing on physiology, toxicology, biostatistics, industrial hygiene and ergonomics. To meet the need for epidemiologists in industry, government and academia, the student in the epidemiology concentration will be trained in the full spectrum of epidemiologic methods.

The following courses are required in addition to the core:

- 19.577 Biostatistics for Health Data - 3 credits
- 19.682 Applied Epidemiologic Methods - 3 credits
- 19.687 Quantitative Models in Environmental Health Assessment - 3 credits

One of the following:

19.610 Exposure Assessment - 3 credits

Or 19.614 Evaluation of Work Environment Hazards - 3 credits

Or 19.638 Methods of Job Analysis - 3 credits

And

Electives - 9 credits

In addition to the above requirements, students would choose three additional 3-credit courses in consultation with the advisor. The courses are expected to have some subject area coherence, but would not be otherwise defined.

Courses from which to choose might include:

- 19.540 Occupational Safety Engineering
- 19.542 Human Factors
- 19.634 Cardiopulmonary Effects of Work
- 19.643 Healthy Work Organization
- 19.675 Reproductive Epidemiology
- 19.683 Risk Assessment
- 19.684 Musculoskeletal Epidemiology
- 19.688 Research Synthesis
- 19.685 Injury Epidemiology
- 19.690 Critical Reviews of Occupational Health Standards
- 19.725 Epidemiologic Theory

Work Environment Policy

The policy analyst must understand the interaction between science (and scientific uncertainty) in occupational and environmental health, and the politics of the workplace setting. The fields of occupational and environmental health are integrated by the practical focus on actual workplace conditions: policy is based on the science; engineering and political economy provide the solutions. The Work Environment Policy concentration will provide master's level education to graduates from a wide variety of backgrounds, including the social sciences and law, who wish to be administrators of occupational health and safety programs in the private and/or public sectors, or who wish to be policy analysts in agencies and organizations concerned with affecting environmental health and worker safety and

health.

The following courses are required in addition to the core:

- 19.550 Environmental Law & Policy - 3 credits
- 19.643 Healthy Work Organization - 3 credits
- 19.651 Work Environment Policy and Practice - 3 credits
- 19.655 Economic Analysis - 3 credits
- 19.683 Risk Assessment - 3 credits
- Electives - 6 credits

The Policy student must take 6 elective credits derived from courses agreed upon by the advisor and student.

Cleaner Production and Pollution Prevention

This specialization is one of the few programs of its kind in the country. It combines a working knowledge of the work environment in its core curriculum and an intensive study experience in the principles and techniques of production for sustainability. The sustainable production systems of the future must integrate economic performance with sound environmental policy and strong safeguards for workers and public health. Pollution Prevention or environmentally conscious manufacturing is characterized by sound management, creative and productive design, environmentally friendly products, waste minimization and work organizations that protect health while assuring economic returns.

The following courses are required in addition to the core:

- 19.550 Environmental Law & Policy - 3 credits
- 19.557 Toxic Use Reduction - 3 credits
- One of the following:
 - 19.610 Exposure Assessment - 3 credits
 - Or 19.614 Evaluation of Work Environment Hazards - 3 credits
- And**
 - 19.651 Work Environment Policy and Practice - 3 credits
 - 19.659 Cleaner Production Principles - 3 credits
- Electives - 6 credits

The Cleaner Production student must take 6 elective credits derived from courses agreed upon by the advisor and student.

Doctor of Science in Work Environment

The UMass Lowell Department of Work Environment offers a doctoral program with focuses in industrial hygiene, ergonomics and safety, epidemiology, work environment policy and cleaner production.

Admission Requirements

Doctoral training is built upon the substantial didactic training gained in the master's degree programs. To be eligible for admission to a doctoral program, an applicant will need to demonstrate appropriate undergraduate education with adequate preparation in quantitative sciences. For an applicant who has not obtained a master's degree in work environment or a related field, direct admission to the doctoral program will be possible but will require documentation that the equivalent course work has been completed. He or she will need to provide a minimum of three letters of reference attesting to the ability to perform advanced graduate work and to provide a written statement of career objectives and the relationship of doctoral training to those objectives. Evidence of academic ability must be provided in the form of undergraduate and graduate transcripts detailing an acceptable grade point average (generally a minimum of 3.0, with 3.5 in quantitative sciences). Performance on the Graduate Record Examination Aptitude Test must be at a high level. An applicant who already holds a graduate degree may request waiver of the G.R.E. requirement. Finally, a personal interview will be required in selected cases.

Academic Advisor

For a doctoral candidate, the primary responsibility for evaluating progress will rest with the student's academic advisor along with the Dissertation Committee. Upon matriculation, the student will be assigned an advisor in conjunction with the Graduate Student Coordinator and the student. The advisor must be from among the faculty of the Work Environment Program. Within one semester after completing the core courses, the student must identify a research topic. The advisor will assist the student in complying with all the university requirements in achieving eligibility for the degree.

Requirements for the Doctoral Degree

Degree requirements include: six to eighteen credit hours of courses beyond the master's degree plus twelve to 24 credits of dissertation research for a total of 30 credits. A student with a master's degree from another institution will need to show knowledge in all subject areas required for the equivalent Work Environment master's degree from the University of Massachusetts Lowell. Courses will be selected to prepare each student in one major and two minor fields. The major field must include, at a minimum, six full courses (18 credits), and the minor fields, three courses (9 credits) each. Courses taken for the master's degree may be used to meet these requirements. There is no language requirement. The student will work with a doctoral program advisor to propose a set of courses to meet the requirements and to prepare a preliminary thesis proposal. The Department Graduate Committee (DGC) must approve the list of courses and the preliminary proposal. Following completion of required course work, the student will be eligible to take a written qualifying examination. The exam will be designed to test the knowledge in the major field. Upon meeting the course and written exam requirements, the student must pass an oral qualifying exam based on his or her written dissertation proposal.

Doctoral Dissertation

The doctoral dissertation will be based on a substantial body of original research carried out by the candidate. The selection of the research topic will be the responsibility of the student in consultation with the academic advisor. When the doctoral student has completed all course requirements for the doctoral degree, together, the student and advisor will propose to the DGC a research topic and Dissertation Committee. Once approved, the Committee will meet at least as frequently as every six months to review the student's progress. The Committee will assess whether the student is making adequate progress toward completing the dissertation in the required years of study and will approve the dissertation. The dissertation will, in general, be in the form of three publishable manuscripts and will include an appropriate literature review and overview of the dissertation research. The student is required to give an oral defense of the dissertation before the Committee and other faculty members. The defense is open to the public.

Occupational and Environmental Hygiene

Likely areas of research include exposure assessment, ventilation system design, aerosol science, sampling and analytical methods for airborne contaminants, noise control, techniques for reducing the use of toxic chemicals, and respiratory protection. Required courses include at least one of the seminars in the series 19.611-613, 19.620. A student will normally take two or more of these, depending upon the selected area of research.

Ergonomics/Safety

Areas of doctoral research include field evaluation of ergonomic and safety exposures and hazard surveillance, biomechanical modeling, psychophysical methods for exposure assessment; technical and social factors in the reorganization of work; strategies for injury prevention and control; and evaluation of control measure effectiveness. Required courses include one or more of the advanced seminars in the series 19.630-638, 19.610, 19.612, 19.684, or 19.685. A student will ordinarily take two or more of these, depending upon the selected area of research.

Epidemiology

Required courses include: a graduate course in mathematical statistics (19.690), one in pathophysiology, and additional advanced courses in epidemiology and biostatistics. Examples of areas of research in which doctoral work is encouraged include: respiratory epidemiology, injury epidemiology, exposure modeling for epidemiology, occupational disease surveillance, epidemiology and musculoskeletal disease, and occupational cancer epidemiology.

Work Environment Policy

Examples of areas of research encouraged for doctoral work are: Labor and technology, regulatory policy, occupational health and labor/management programs, economic aspects of risk assessment, health and safety impacts of new technologies, management of chemical information, toxics use reduction, and international health and safety.

Cleaner Production and Pollution Prevention

Examples of areas of research in Cleaner Production include: materials accounting and chemical use reporting, assessment of the effectiveness of third party auditors in promoting pollution prevention, alternatives to risk assessment that encourage workplace redesign, and integration of occupational health and pollution prevention.

Graduate Certificate Programs in Work Environment

The UMass Lowell Department of Work Environment offers graduate certificates in the following areas:

- [Disability Outcomes](#) (interdisciplinary)
- [Diversity in the Workplace](#) (interdisciplinary)
- [Environmental Risk Assessment](#)
- [Identification and Control of Ergonomic Hazards](#)
- [Job Stress and Healthy Job Redesign](#)
- [Laboratory and Biosafety](#)
- [Public Health Laboratory Sciences](#) (interdisciplinary)
- [Radiological Health Physics and General Work Environment Protection](#) (interdisciplinary)

Disability Outcomes

Departments and programs participating in the certificate include Physical Therapy, Work Environment, Nursing, and Biomedical Engineering and Biotechnology

Dr. Sean Collins, P.T., Sc.D., C.C.S.
sean_collins@uml.edu

In the prevention and management of chronic disability, this certificate is designed to augment the preparation of researchers and/or clinicians with an appreciation of the interactions among personal attributes, clinical disease features, and socioeconomic and working conditions. Students will examine the 'state of art' theoretical perspectives in disability outcomes. They will develop advanced knowledge and skills in their chosen areas of expertise, including disability evaluation; design and conduct of epidemiologic studies of disease outcomes and their risk factors; evaluation and control of relevant environmental factors that affect work and health outcomes; and development and analysis of strategies for the improvement of disease outcomes, based on public and private policy alternatives.

The certificate is designed for students with a background in engineering, public health, clinical services, community programs or psychology. Through the program students complete a core of six credits in courses specifically oriented to Disability Outcomes and six additional elective credits (chosen with their advisor) in the participating departments (see below).

Required Courses: (3 credits each)

34.510 Models and Measurement in Disability
19.579 Disability Outcomes and Interventions

Elective Courses: (3 credits each - choose two courses)

19.575 Introduction to Epidemiology and Biostatistics
19.638 Methods of Work Analysis
19.542 Human Factors
19.610 Exposure Assessment
19.643 Healthy Work Organization
32.604 Health Data Analysis
32.625 Health Policy
33.552 Social, Cultural and Policy Issues in Health Care
33.601 Research Utilization

Or other electives with approval of the Certificate Program Coordinator.

Environmental Risk Assessment

Department of Work Environment

Dr. David Kriebel
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david_kriebel@uml.edu

Purpose: This program provides a solid introduction to the methods of risk assessment, with strong emphasis on their limitations and the policy context in which they currently are applied. A student who successfully completes the program of study will be able to critically read and evaluate risk assessments performed by others, as well as carry out original quantitative analyses of new problems. A student who becomes deeply interested in the field will be more than one quarter of the way to earning a master's degree in Work Environment with a concentration in epidemiology.

Who Should Apply: Professionals working in environmental management, environmental health, occupational health, occupational safety, and food and drug safety, will find the program relevant to their work. Government regulatory agencies, consulting firms in the health and environmental field, and corporate risk management teams often produce or use risk assessments. Because of the advanced level of the program, students must bring to it a background of preparation in one of two areas: epidemiology and biostatistics or exposure assessment in either the occupational or environmental health fields. Applicants must have a bachelor's degree in a related field, and strong quantitative skills, including undergraduate mathematics through at least one semester of calculus.

Program

1. Required courses for students with industrial hygiene or exposure assessment background:

19.575 Introductory Biostatistics and Epidemiology
19.576 Intermediate Biostatistics and Epidemiology
19.683 Risk Assessment
19.687 Quantitative Models in Environmental Health Assessment

2. Required courses for students with epidemiology or biostatistics background:

19.525 Introduction to Industrial Hygiene and Ergonomics
19.616 Exposure Assessment
19.683 Risk Assessment
19.687 Quantitative Models in for Environmental Health Assessment

Identification and Control of Ergonomic Hazards

Dr. Bryan Buchholz
978-934-3241
bryan_buchholz@uml.edu

Purpose: The certificate will give an individual the ability to recognize and control ergonomic hazards in the work place. Injuries and illnesses such as low-back injuries, upper extremity cumulative trauma disorders, and workplace stress that are due to ergonomic hazards are prevalent and costly to industry. Ergonomic hazards are present in all industry sectors, including manufacturing, construction, shipping, and service industries. Many companies, especially those smaller in size, will not have an ergonomist on staff, though many will have someone with related responsibilities, such as an industrial hygienist, safety specialist, or occupational nurse. Upon earning the certificate, a student will be more than one-quarter of the way to earning a master's degree in Work Environment with a concentration in ergonomics.

Who Should Apply: The program is designed for health and safety professionals (for example, a safety manager, safety engineer, industrial hygienist, occupational health nurse, occupational physician, or physical therapist) already working in industry. Most students will be working full-time in one of these positions. Most students will have bachelor's degrees in engineering or biological sciences; some of them will have master's degrees in these fields.

Program

Required Courses:

*19.525 Introduction to Industrial Hygiene and Ergonomics
-or-
19.530 Ergonomics and Work

19.531 Occupational Biomechanics
19.638 Methods of Work Analysis

Elective Courses:

19.517 Physical Agents
19.540 Design for Injury Prevention
19.542 Human Factors

Job Stress and Healthy Job Redesign

Dr. Robert Karasek
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robert_karasek@uml.edu

Purpose: The professional will learn to identify social and psychological job-related stressors and to devise strategies to reduce the work environment causes of these hazards thus reducing the escalating magnitude of these problems and improving organizational effectiveness. The program is, in part, a response to rapidly rising levels of Workmen's Compensation cases with job stress components.

Who Should Apply: Personnel managers, occupational rehabilitation professionals, union representatives, occupational health professionals and other service and manufacturing professionals who need state-of-the-art understanding of the social and psychological causes of psychosocial stress hazards at work and solutions focused on reduced health risks and improved job productivity. Other candidates are graduate students at nearby universities who want to take advantage of this unique program at Lowell.

Program: This certificate program is offered in conjunction with the Psychology Department at Lowell. Four, three-credit courses, offered in the evenings or late afternoons, are required.

Three Required Courses:

19.542 Human Factors (Psychosocial Job Stress Hazards)

Either: 47.502 Work and Family Roles in Adulthood
-or- 19.500 Introduction to Work Environment

19.643 Healthy Work Organization Design

Plus one elective chosen from the following:

19.638 Methods in Work Analysis
19.654 Labor and Technology

Laboratory and Biosafety

Dr. Susan Woskie 978-934-3295

Susan_Woskie@uml.edu

Purpose: The MassBiotech Council counts 440 companies, universities and service organization on its membership roles. Each Biotech organization must have an environmental health and safety office that covers biosafety, chemical, radiation and animal safety. It is difficult for companies to find a biosafety professional with an American Biosafety Association (ABSA) certification since there are currently no graduate or undergraduate programs in biosafety in the United States. The Laboratory & Biosafety Certificate introduces students to the fundamentals of biological safety as well as laboratory health and safety. This certificate is designed to be offered online, providing and affordable, accessible, entree to the field.

Who Should Apply: The biotech, biomedical and pharmaceutical sector is rapidly growing in the New England region. The job of a biological safety officer is in many ways similar to that of an Environmental Safety and Health Office, or an Occupational/Industrial Hygienist. It is concerned with protection of workers, and of the environment. Certified biological safety professionals "must develop knowledge of the principles of epidemiology, disease transmission patters, risk-assessment management, disinfection and sterilization, disease, aerobiology and environmental control" (American Biological Safety Association). All applicants for the graduate certificate must have a bachelor's degree in a life sciences discipline from an accredited institution and strong qualitative skills. All applicants must have at least 9 credits of biology courses such as microbiology, cell biology, and/or molecular biology, biochemistry is also recommended.

Required Courses: (Three 3-credit courses)

19.515 Principles and Practices of Biological Safety
19.516 Laboratory Environmental Health and Safety
19.525 Recognition of Work Environmental Hazards: Introduction to Occupational Hygiene and Ergonomics

Elective Courses:

19.573 Bioaerosols in Health and Biodefense
19.618 Risk Management and Training
19.575 Introduction of Biostatistics and Epidemiology
36.613 Infectious Disease (online)
36.515 Clinical Virology and Serology Laboratory
36.511 Medical Bacteriology

Public Health Laboratory Sciences

Interdisciplinary program between the UMass Lowell departments of Clinical Laboratory & Nutritional Sciences, Community Health and Sustainability, Work Environment, and the Commonwealth of Massachusetts Department of Public Health Laboratories

Dr. Alease Bruce
Clinical Laboratory & Nutritional Sciences Department
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alease_bruce@uml.edu

This program will help to satisfy a critical and timely need for qualified public health laboratory scientists. Concern about bioterrorist attacks post 9/11, the threat of disease epidemics from natural disasters, such as the tsunami crisis and Hurricane Katrina, as well as pandemics, such as Avian flu, exemplify circumstances that require appropriately trained public health laboratory personnel.

[Program Requirements](#)

Radiological Health Physics and General Work Environment Protection

Dr. Clayton French
978-934-3286
clayton_french@uml.edu

Purpose: This program provides advanced instruction about radiation and general work environment protections for professionals with health and safety responsibilities.

Who Should Apply: Graduate students majoring in either radiological sciences and protection or work environment are likely candidates for this program. Students should have a bachelor's degree in a quantitative field and college courses in physics, chemistry, calculus and statistics. Many professionals in small to medium-sized industries have responsibility for health and safety with little or no formal instruction. Industries that use radioactive material or radiation and have no formal radiation protection or radiological health physics department often assign these responsibilities to employees who have more general work environment or safety responsibilities. It is also not uncommon for large industries that are licensed to possess and use radioactive material to assign general work environment responsibilities to the radiological health physics staff. Professionals with basic training in both general work environment and radiological health physics are particularly well-suited to work in small and medium-sized industries and to obtain top management

positions responsible for all health and safety-related departments in large industries, government laboratories, and universities. The need for professionals in this field is projected to increase dramatically and continue for decades.

Program

The program is a collaborative endeavor between the university's Physics and Radiological Sciences Program and the Work Environment Program. No other college or university in New England offers this type of program.

This certificate requires **14 credits** of course work earned by taking four courses.

Required Courses:

- 98.501 Radiation Safety and Control I
- 98.502 Radiation Safety and Control II
- 19.525 Introduction to Industrial Hygiene/Ergonomics

Elective Courses (choose 1):

- 19.517 Physical Hazards Evaluation and Control
- 19.518 Engineering Controls and Protective Equipment
- 19.540 Occupational Safety and Health Engineering
- 19.625 Field Evaluations in Work Environments

Department of Work Environment

The UMass Lowell Department of Work Environment offers the following graduate programs:

- [Doctor of Science](#)
- [Master of Science Professional Science Master's Options](#)
- Graduate Certificates:
 - [Disability Outcomes](#)
 - [Diversity in the Workplace](#) (interdisciplinary)
 - [Environmental Risk Assessment](#)
 - [Identification and Control of Ergonomic Hazards](#)
 - [Laboratory and Biosafety](#)
 - [Radiological Health Physics and General Work Environment Protection](#)
 - [Job Stress and Healthy Job Redesign](#)
 - [Public Health Laboratory Sciences](#) (interdisciplinary)

Our programs provide training and research on the identification, characterization and control of chemical, physical, psychosocial, and biological risks associated with work environments as well as in understanding and developing respect for the complex social, political and economic context in which environmental and occupational health problems must be studied and addressed.

Our model of research and education integrates a rigorous scientific methodology with practical collaboration with the region's industry, labor, communities and governments to design safer and cleaner systems of production.

The goal of the graduate program is to prepare professionals with the ability to scientifically evaluate the hazards of production as well as to design efficient alternatives to hazardous exposures.

The Department also has the broader objective of promoting sustainable production: environmentally sound systems of production, healthy work environments, and productive work organizations. The overarching principle is to design production that: is non-polluting; conserving of energy and natural resources; economically efficient; safe and healthful for workers, neighbors, and consumers; and rewarding for employees.

Master of Science

The Master of Science program will prepare graduates with the master's degree to become prevention practitioners in one of five work environment disciplines (occupational and environmental hygiene, occupational ergonomics/safety, epidemiology, work environment policy, and cleaner production and pollution prevention). The Department offers a program leading to the master's degree with thesis option or non-thesis option (project or capstone course). Candidates choosing the thesis option are guided by a committee of three faculty members. The Department also offers a Professional Science Master's options in four Work Environment disciplines.

Accelerated Degree Program

The department participates in the University's effort to encourage outstanding graduate students to begin study toward an advanced degree while still undergraduates. Arrangements are possible for joint programs that combine a bachelor's degree in another department with a master's degree in the Department of Work Environment. Such arrangements are made for eligible students after discussions with graduate coordinators in both departments. Please see [Bachelor's-Master's Program](#) for eligibility and application requirements.

Doctor of Science

The doctoral program is designed to prepare research scientists with a strong orientation towards prevention and applied research. The program includes advanced graduate work in each of the five work environment concentrations (industrial hygiene, occupational ergonomics/safety, occupational epidemiology, work environment policy, and cleaner production and pollution prevention). Candidates will, under the direction of a faculty advisor and dissertation committee, carry out original research culminating in a doctoral dissertation.

College of Health Sciences

The graduate programs of the College of Health Sciences prepare health care providers with specialized knowledge and skills for the roles of practitioner, leader and researcher. The College of Health Sciences is led by [Dr. Shortie McKinney](#).

[Faculty in the College of Health Sciences](#) (pdf)

Graduate Programs Offered

Master of Science (MS) - degree awarded in the following fields:

- [Clinical Laboratory Sciences](#)

Concentrations:

- Clinical Research
- Clinical Administration
- Health Informatics
- Nutritional Sciences
- Public Health Laboratory Sciences

Option

- [Professional Science Master's Option - Clinical Laboratory Sciences](#)

- [Health Informatics and Policy](#)

Concentrations:

- Health Informatics
- Health Management
- Health Policy

- [Nursing](#)

- [Work Environment](#)

Options:

- Occupational and Environmental Hygiene
- Epidemiology
- Ergonomics/Safety
- Work Environment Policy
- Cleaner Production and Pollution Prevention
- Professional Science Master's Option - Occupational & Environmental Hygiene
- Professional Science Master's Option - Ergonomics & Safety
- Professional Science Master's Option - Epidemiology
- Professional Science Master's Option - Cleaner Production & Pollution Prevention

[Doctor of Physical Therapy \(DPT\)](#)

Doctor of Philosophy (PH.D.) - degree awarded in the following field:

- [Nursing](#)

- Health Promotion

[Post-Master's Doctorate in Nursing Practice \(DNP\) Program](#)

Doctor of Science (SC.D.) - degree awarded in the following field:

- [Work Environment](#)

With options in:

- Occupational and Environmental Hygiene
- Epidemiology
- Ergonomics/Safety
- Work Environment Policy
- Cleaner Production and Pollution Prevention

[Graduate certificates](#) are available in some academic majors.

Master's Programs

The UMass Lowell Manning School of Business offers three Master's programs:

- [Master of Business Administration \(MBA\)](#)
- [Master of Science in Innovation and Technological Entrepreneurship \(MSITE\)](#)
- [Master of Science in Accounting](#)

Master of Business Administration (MBA) Degree Program

- [Entrance Requirements](#)
- [Part-time/Full-time Study](#)
- [Admission to MBA Courses](#)
- [Residency Requirement](#)
- [Curriculum Requirements](#)
- [Concentrations](#)

American business is facing a very different internal and external environment today. This environment is characterized by rapid technological change, increased international competitiveness in manufacturing and other sectors, and a labor force which expects a higher quality of work life than did previous generations of employees. These changes directly affect the health and vitality of any region's economy.

The Master of Business Administration (MBA) program is designed primarily as a part-time evening program to serve middle level working professionals and others seeking management careers in business and industry. The program is designed to prepare students to manage effectively in rapidly changing regional, national, and global competitive environments. The MBA program not only requires a thorough understanding of the traditional functional areas of business, but also provides a detailed, integrated examination of issues faced by contemporary managers.

The unifying theme of industry analysis addresses the challenges posed by global competition, such as, accelerated change and complexity of technology, globalization of markets, increasing cultural diversity of human resources, ethical concerns, changing political processes, increasing role of governments in business, evolving organizational structures, and other similar issues. With this philosophical framework as its driving force, the MBA program at the University of Massachusetts Lowell prepares graduates to become leaders in a wide variety of commercial, industrial and governmental settings.

Additionally, three elective courses allow students to tailor their program to their specific professional needs. The awarding of the MBA degree signifies that the student has developed integrative skills in problem solving and decision making and can relate these skills to all functional areas of business. The development of this expertise entails an examination and application of advanced analytical tools.

Entrance Requirements

Application to the MBA program utilizes a rolling admissions policy and is open to students who have earned a 4-year baccalaureate degree. An aptitude for management decision-making and demonstrated academic ability are the most important qualifications for admissions. It is also required that applicants have an adequate mathematics background. Applicants should submit, along with their graduate school application, an official transcript of grades from their undergraduate institution(s), an official Graduate Management Admission Test (G.M.A.T.) score (the Graduate Record Examination is not an acceptable alternative), three letters of recommendation, (letters of recommendation from work related sources are preferred), a resume, and a one-page written statement of academic and career goals. Students for whom English is not their national language must also submit an official score report for the Test of English as a Foreign Language (TOEFL).

Part-time and Full-time Study

MBA students may attend either full-time or part-time. On campus courses meet during the evening hours beginning at 6PM. Most courses are currently also offered in an online format. Courses are offered in the fall, spring, and summer semesters. A minimum full-time course load is considered to be 9 credits. Full-time students usually complete their degree requirements in two years. Part-time students must complete their degree requirements within five years.

Admission to MBA Courses

MBA advanced core courses are open only to Manning School of Business graduate students who are fully matriculated degree candidates.

Residency Requirement

To be recommended for the MBA degree, students are required to complete a minimum of ten courses (30 credits) beyond the Foundations Core in the MBA program at the University of Massachusetts Lowell. Only under special circumstances, and with prior approval, are students permitted to complete courses at other institutions.

Curriculum Requirements

The MBA program consists of twelve credit hours of foundation core courses which may be waived through previous undergraduate work, and thirty credit hours (10 courses) of advanced courses and electives, for a total of 42 credit hours.

Prerequisite Courses:

- Microeconomics (49.201)
- Statistics (49.211)

Foundations Core Courses (8-week Courses):

(six 2-credit courses - 12 credits total)

- 60.501 Financial Accounting
- 61.501 Business Financial Analysis
- 62.501 Marketing Fundamentals
- 63.501 Operations Fundamentals
- 66.501 Organization Behavior
- 66.511 Global Enterprise and Competition

Guidelines for Graduate Equivalency Credit of Foundation Core Courses:

The maximum number of courses that can be given equivalency credit is 12 credits. A student accepted to the UMass Lowell MBA program may request equivalency credit for any of the core courses listed above. These courses may be credited with exemption (meaning a replacement course is not required) if the equivalent undergraduate course work was completed with a grade of "B" or better within the past five years. For courses taken more than five years ago with a grade of "B" or better, a student may take a written exam to demonstrate proficiency. Additionally, up to two courses for 6 credits can be transferred in from an AACSB-accredited MBA program only.

Required Advanced Core Courses:

(seven 3-credit courses - 21 credits total):

- 60.601 Accounting Information for Management Decisions
- 61.601 Corporate Finance
- 62.601 Analysis of Customers and Markets
- 63.601 Management Information Systems
- 64.601 Operations Management
- 66.601 Managing Organization Design and Change
- 66.691 Strategy Formulation and Implementation

Electives or Concentrations:

(three 3-credit courses - 9 credits total):

[Download a Program Outline](#) (pdf)

Concentrations

Students may choose General Business or concentrate in a particular field by taking three electives in a given area. To take electives, students must have completed the foundation core and be matriculated.

Concentrations are offered in:

- Accounting
- Finance
- Information Technology

Elective Credits - Required Total - 15

Other Requirements:

At least 2 of a student's first 4 courses must be from the five Concentration Courses listed above.

It is recommended but not required that at least 2 of a student's Elective Courses (listed above) be in Accounting.

For more information about the Master of Science in Accounting, contact:

Khondkar Karim
MSA Coordinator
Phone: 978-934-2831
Email: Khondkar_Karim@uml.edu

Business Management Curriculum for the Doctor of Engineering (D.Eng.) Program

American competitiveness in world markets requires both technical innovation and the business skills to bring these innovations to

market profitability. The management component of the University of Massachusetts Lowell's Doctor of Engineering Program is designed to complement the technical training of the engineer with knowledge and skills in team management, financial decision making under market uncertainty, sensitivity to market needs, leading edge manufacturing techniques, and winning business strategies.

The philosophy and goals of the management component of the Doctor of Engineering program is to develop a person who can effectively extend the limits of technology both as a member of a professional work team and as a member of a global society. Today's professionals will find that, over their work lives, they will hold several different types of positions in fields using their professional education in the business world, in academia, or in other endeavors. Regardless of the environment, a core of "management" skills will be required for success. The professional must be able to understand the external and internal work environment, understand the criteria that form the basis for decisions, and understand and evaluate the implications of those decisions.

The management curriculum for the Doctor of Engineering program is six 2-credit courses and is intended to provide flexibility for the engineering students. Students may select four of the 2-credit Graduate Certificate courses which most appropriately meet their professional and educational needs. Students are encouraged to complete the remaining two courses to qualify for the Graduate Certificate in the Foundations of Business. These courses do not assume a previous knowledge of business or management subjects by the engineering student.

Graduate Certificates in the College of Management

The College of Management offers graduate certificates in:

- [Foundations of Business](#) (MGFB)
- [New Venture Creation](#) (NVNG)
- [Financial Management](#) (FNMG)
- [Supply Chain and Operations Management](#) (SCOM)

You will need a [Graduate Certificate Application Form](#) (pdf).

Foundations of Business

Laura Christianson
Director of Management Graduate Programs
978-934-2853
Laura_Christianson@uml.edu

The program consists of 2 prerequisites: Micro Economics and Statistics plus the 6 (2 credit) courses listed below that represents an excellent opportunity for people with non-business backgrounds to obtain a graduate business certificate. Graduate students in the certificate program who are subsequently accepted into the UMass Lowell AACSB accredited MBA program may apply certificate courses with grades of B or better to their MBA degree.

Required Core Courses:

12 Credit Hours ? six courses at two credit hours each with prerequisite coursework in Microeconomics (49.201) and Statistics (49.211)

60.501 Financial Accounting
61.501 Business Financial Analysis
62.501 Marketing Fundamentals
63.501 Operations Fundamentals
66.501 Organizational Behavior
66.511 Global Enterprise and Competition

Students must hold an undergraduate degree for admission into a certificate program. A GMAT exam is not required for certificate programs. An undergraduate transcript must be supplied by student when applying.

New Venture Creation

Dr. Steven Tello
978-934-2819
Steven_Tello@uml.edu

This certificate assists the aspiring entrepreneur, inventor and mid-career professional in understanding and applying the process associated with starting a new business or creating new business opportunities within established organizations. This program is specifically focused on the creation of technology-based ventures and is designed to assist professionals with undergraduate and career experience in science, engineering, technology or business fields in better understanding the venture creation process.

The program consists of two required courses (New Venture Creation, Innovation & Emerging Technology) and two electives (selected in consultation with the Program Coordinator). Graduate students in the certificate program who are subsequently accepted into the UMass Lowell MSITE program may apply certificate courses with grades of B or better to their MSITE degree.

Required Courses: (6 Credit hours, two 3 credit courses)

64.640 New Venture Creation
64.650 Innovation & Emerging Technology

Elective Courses (select two in consultation with Program Coordinator): 6 Credit hours, two 3 credit courses

61.640 - Financing Innovation & Technology Ventures
62.630 - Market Research for Entrepreneurs
64.655 - Corporate Entrepreneurship
64.680 - Practicum I New Venture Planning (with Instructor Permission)
66.640 - Managing Entrepreneurial Teams
66.630 - New Product Development
66.635 - Project Management

Admissions Requirements: Undergraduate degree and related experience in science, engineering, technology or business (other areas will be considered in consultation with the program coordinator).

Financial Management

Laura Christianson
Director of Management Graduate Programs
978-934-2853
Laura_Christianson@uml.edu

The Graduate Certificate in Financial Management is a 12 credit program (three two-credit courses and two three-credit courses) designed for non-financial mid-management professionals in the private and public sectors who wish to advance to decision-making positions within their organizations.

Individuals with undergraduate degrees in fields other than business management with finance as the major who wish to acquire additional academic credentials to advance within their organization or who wish to change career paths and improve their competitive position in the job market will benefit from this program. Especially, for many employees working in the technical and scientific fields without any financial background, the Financial Management certificate will provide them with the knowledge needed for decision-making roles within their technical or scientific fields.

Required Courses: (2 credits)

60.501 - Financial Accounting* (2 credits)
61.501 - Business Financial Analysis* (2 credits)
61.502 - Advanced Financial Management (2 credits, Prerequisite: 61.501 - Business Financial Analysis)
61.611 - Financial Decision Making (3 credits, Prerequisite: 61.501 - Business Financial Analysis)
61.691 - International Financial Management**

* Currently offered as graduate courses every semester in both lecture and online course formats.

** Currently offered as needed (typically once a year) for the MBA program in online course format.

Supply Chain and Operations Management

Dr. Yao Chen
978-934-2764
Yao_Chen@uml.edu

This certificate assists individuals who wish to acquire additional academic credentials to advance within their organization or who wish to change their career paths and improve their competitive position in the job market. Especially, for many employees working in the technical and scientific fields without an operations or industrial engineering background, the program will provide them with the knowledge needed for decision-making roles within their technical or scientific fields. The program is to meet the needs of those mid-career professionals in non-operations positions, who require a greater understanding of operations to advance towards decision-making positions in their organizations, to communicate effectively with operations managers, to pursue new careers in industrial engineering or operations management, or to demonstrate the contribution of their unit and/or ideas to the organization's value chain.

The certificate requires students to complete 12 hours of graduate study. This consists of four three-credit Supply Chain and Operations Management courses. Graduate students in the certificate program who are subsequently accepted into the UMass Lowell MBA program may apply certificate courses with grades of B or better to their MBA degree.

Prerequisite Coursework (prior to certificate coursework)

Microeconomics (49.201)
Statistics (49.211)
Operations Fundamentals (63.501)

Required: 3-credit courses

63.671 Operations Management
63.672 Global Supply Chain Management
63.673 Service Management
66.635 Project Management

Admissions Requirements: Undergraduate degree and related experience in science, engineering, technology or business (other areas will be considered in consultation with the program coordinator).

Manning School of Business

The mission of the Manning School of Business is to support regional business development. We accomplish this by engaging our students in affordable, internationally accredited management education programs, innovative course delivery, conducting research that emphasizes the practical application of knowledge, and serving a dynamic community through outreach activities. The Manning School of Business is led by [Dr. Kathryn Carter](#).

Graduate Programs Offered

[Master's Programs:](#)

1. [Master of Business Administration \(MBA\)](#) (available online or on-campus)

- General Business
- Accounting
- Finance
- Information Technology

2. [Master of Science in Innovation and Technological Entrepreneurship](#)

3. Master of Science in Accounting

[Business Management Curriculum for the Doctor of Engineering Program \(D. Eng.\)](#)

[Graduate Certificates:](#)

- Foundations of Business
- Technology Venture Creation
- Financial Management
- Supply Chain and Operations Management

[Manning School of Business Course Listings](#)

Accreditation

All degree programs offered by the Manning School of Business are accredited by the Association to Advance Collegiate Schools of Business - International ([AACSB](#)).

[Faculty in the Manning School of Business](#) (pdf)

Master of Science in Biomedical Engineering and Biotechnology

Master of Science in Biomedical Engineering and Biotechnology, Professional Science Master's (PSM) Option

[Program Description](#)

[Admissions Requirements](#)

[Curriculum](#)

[Professional Internship](#)

Program Description

The intercampus Biomedical Engineering and Biotechnology (BMEBT) program offers a 34-credit Master of Science Degree in Biomedical Engineering and Biotechnology, Professional Science Master's (PSM) option. This non-thesis program prepares students for a professional career and may be completed on either a full-time or part-time basis. In lieu of a research component, the PSM option requires PLUS courses in business, a communications course, and a professional internship in a specialization area of Biomedical Engineering or Biotechnology.

Individuals interested in the program include graduates of BS programs in biology, chemical engineering, chemistry, clinical laboratory science, computer science, electrical engineering, mathematics, mechanical engineering, physics, plastics engineering and polymer science. Other interested clientele include professionals that are currently employed in the pharmaceutical, biotechnology or medical device industries as well as medical and research labs who are interested in expanding and updating their knowledge in biomedical engineering/biotechnology while concurrently obtaining communication and business skills required for greater job opportunities. The combination of science and business training provided by this program meets the workforce needs of the Massachusetts economy.

where healthcare, as well as biomedical and medical device companies, are leading industries.

Admission Requirements

1. Have earned an appropriate Baccalaureate degree from an accredited university or college with a recommended GPA of 3.0 or better.
2. Have successfully completed prerequisite technical courses: Applicants must have completed the equivalent of two semesters of calculus. Successful applicants will normally have also had undergraduate coursework in statistics/experimental design and in life science/biomedical science.
3. Have earned the following minimums: Graduate Record Examination (GRE) combined verbal and quantitative score of 295 (1000 for tests taken prior to August 1, 2011) and TOEFL score of 79 (internet based) for international applicants.

Curriculum *

The Master of Science in Biomedical Engineering and Biotechnology is a 34 credit hour program. Twenty-four credit hours of STEM courses, 9 credits of PLUS courses and a 1 credit internship and seminar are required.

STEM Required Courses (12 credits):

- IB500 Introduction to Biomedical Engineering & Biotechnology (3 credits)
- IB575 Quantitative Physiology (3 credits)
- 81.666 Special Topics: Molecular and Cellular Biology (3 credits)

And one of the following 3 credit courses

- 24.509 System Dynamics
- 24.539 Math Methods for Engineers*
- 26.548 Numerical Methods in Plastics Processing
- 92.530 Applied Mathematics I
- 92.531 Applied Mathematics II
- 92.555 Applied Math for Life Sciences (Online)+
- 98.582 Numerical Methods in Radiological Sciences and Protection

* Recommended for students with a Biomedical Engineering specialization.

+ Recommended for students with a Biotechnology specialization.

Additional STEM required courses may be chosen with advisor approval.

STEM Electives (minimum 12 credits)

STEM electives are chosen with advisor approval from the available science and engineering courses offered at the participating campuses. Electives are chosen from within a defined specialization option. Available options are listed below:

Biomedical Engineering Specialization Options

- Biomaterials: Tissue Engineering, Polymers/Plastics, Fibers/Textiles, Nanotechnology
- Biomedical Information Systems: Bioinformatics, Cheminformatics, Genomics, Proteomics
- Biomedical Instrumentation: Sensors, Signal Processing, Clinical Sciences
- Biomechanics: Joint/Muscle Mechanics
- Integrative Physiology: Cardiovascular and Pulmonary Modeling
- Medical Imaging: Optics, NMR, MRI, Acoustics, Cell Imaging
- Medical Physics: Radiation Therapy, Nuclear Medicine, Diagnostic Imaging, Nuclear Instrumentation

Biotechnology Specialization Options

- Agricultural and Marine Biotechnology: Therapeutics, Pharmacology, Nutritional Biochemistry, Food Science Technology
- Bioprocessing/Applied Microbiology: Bioremediation, Fermentation, Biocatalysis, Applied Genetic Engineering, Biopharmaceutical Sciences
- Molecular Biotechnology: Clinical Sciences, Biochemical Applications, Diagnostics, Therapeutics

PLUS courses (Business and Communication 9 credits)

PLUS Required Courses (4 credits)

- 81.604 Professional Communication in Science and Technology (3 credits)
OR 66.654 Advanced Professional Communication (3 credits)
- IB 520 Bioethics (1 credit)

PLUS Elective Courses (minimum 5 credits)

- ? 60.501 Financial Accounting (2 credits)
- ? 61.640 Financing Innovation and Technology Ventures (3 credits)
- ? 62.501 Marketing Fundamentals (2 credits)

- ? 62.630 Market Research for Entrepreneurs (3 credits)
- ? 63.501 Operations Fundamentals (2 credits)
- ? 64.650 Innovation and Emerging Technologies (3 credits)
- ? 66.501 Organizational Behavior (2 credits)
- ? 66.601 Managing Organizational Design and Change (3 credits)
- ? 66.630 New Product Development (3 credits)
- ? 66.651 Organizational Behavior (3 credits)
- ? 66.652 Human Resources Management (3 credits)
- ? 66.691 Strategy Formation and Implementation (3 credits)

Additional PLUS electives may be chosen with advisor approval.

Professional Internship in Biomedical Engineering or Biotechnology (1 credit)

A Professional Internship is required for students in the PSM option and is expected to be a minimum of 350 hours and have 3-6 month duration. The internship is designed to provide students with an opportunity to obtain real-world experience in business, government agencies, non-profit organizations or research laboratories. Internships or research project experiences will typically take place in clinical, pharmaceutical, diagnostic, biotechnological or medical device companies or institutions. Research experience can also be obtained at the University or other research centers.

Internships have to be approved in advance by the Advising/Admissions/Curriculum Committee (AACC) on each campus, including approval of a qualified supervisor for off-campus internships. The AACC will provide oversight of all internships. A written report, signed by the internship supervisor, must be submitted by the student upon completion of the internship. An oral presentation by the intern at a BMEBT seminar also is required. For students already employed in a BMEBT industry, the professional internship will be tailored to meet the needs of both employee and employer. A new project experience will be required that adds to the student's current set of skills.

To be eligible for the Professional Internship, students will be required to have 1) completed a minimum of 12 credits of STEM courses, 2) completed a minimum of 6 credits of PLUS courses, 3) attained an overall minimum GPA of 3.0 and 4) and have AACC permission. All students will be required to submit a final written report and give oral presentation on their work at a seminar. All post-internship students will participate in this seminar. All Professional Internships require supervision by program faculty.

Professional Science Master's curriculum includes the following courses as part of the internship requirement:

- PSM 500 Professional Science Master's Internship (0 credit)
Professional Science Master's students who are preparing to participate in an internship enroll in this Professional Development Seminar prior to the semester of their work period. This seminar will provide them with resources and skills to manage an internship search; secure a position; and work successfully in a professional environment.
- PSM 501 Professional Science Master's Reflective Seminar (1 credit)
Reflective seminar concurrent with the internship enables Professional Science Master's (PSM) students to share and learn from the experiences of colleagues in other settings. Students evaluate and compare individual internship experiences, explore career opportunities and gain further knowledge about functioning in a professional environment. The seminar may be conducted online, on campus, or in a blended mode and will include writing and oral presentation of experience.

Total (34 credits)

* Note: Courses listed are available at UML. Other STEM and PLUS courses are available at the other campuses involved in the BMEBT program and may be used towards the degree with the approval of the graduate coordinator.

Biomedical Engineering & Biotechnology Doctoral Program

The Boston, Dartmouth, Lowell and Worcester campuses of the University of Massachusetts offer a joint PhD degree program in Biomedical Engineering and Biotechnology. Students in the PhD program may elect to receive the MS degree along the way to the doctorate.

- [Admission Requirements](#)
- [Academic Advisor](#)
- [Transfer of Credits/Advanced Standing](#)
- [Academic Program](#)
- [General Program Requirements](#)
- [Core Course Requirements](#)
- [Specialization Course Requirements](#)
- [Capstone Requirement](#)
- [Earning the MS Degree](#)
- [Selection of the Doctoral Dissertation Committee](#)
- [Qualifying Examination](#)
- [Doctoral Credit Requirements](#)
- [Dissertation Defense](#)
- [Professional Science Master's Option](#)
- [Combined Bachelors to Master's Degree Program](#)

Admission Requirements

Applicants from many different science/engineering undergraduate programs are invited to apply. Because the degree brings together biomedical engineering with biotechnology, it is designed equally for students with life sciences or engineering/physical science backgrounds. One's specific background will be of less interest in determining qualification for entrance than will be one's personal and career goals, demonstrated academic ability and research potential, and commitment to an interdisciplinary, team-work approach.

Applications will be accepted from individuals holding appropriate bachelor's degrees or master's degrees (or the US baccalaureate equivalents from a foreign institution). Applicants should have a background in life science, physical science, or engineering. All applicants must have taken a full year (two semester or three quarter sequence) of calculus, and the successful applicants will normally have had undergraduate coursework in statistics/experimental design and in life science/biomedical science.

Applicants are encouraged to contact participating faculty to explore how they might fit into a specific specialization option before submitting their application and to report on the results of those contacts in their Statement of Purpose (see below). A personal interview with the applicant by the campus Advising/Admissions/Curriculum Committee (AACC) may be recommended but is not required.

Applicants submit the following and are expected to meet the standards indicated:

- Generally students with an overall undergraduate grade point average of 3.0 or higher will be considered for admission. Applicants must present official undergraduate and graduate transcripts from all schools attended.
- Applicants accepted into the program should present a minimum Graduate Record Exam (GRE) combined verbal and quantitative score of 300 (1100 for tests taken prior to August 1, 2011). The AACC will also pay particular attention to the applicant's score on the GRE analytical writing section of the general examination because of the emphasis placed on strong writing skills in this program. Only official GRE scores from the Educational Testing Service will be considered acceptable.
- Applicants must have a minimum of two semesters of calculus and have strong quantitative skills.
- International applicants should present a minimum Test of English as a Foreign Language (TOEFL) score of 79 (internet version), 213 (computer version) or 550 (paper version). Only official TOEFL scores from the Educational Testing Service will be considered acceptable.
- Three letters of recommendation, from individuals familiar with the applicant's academic ability and potential to conduct original research at the doctoral level, will be required.
- Applicants will also be required to submit a Statement of Purpose (personal essay). This statement is an important element in the application packet. It has two related roles:

(1) Indication of an applicant's qualifications and motivation for the program. Applicants should indicate their qualifications for and motivation to undertake this program as well as their personal and career goals. Specifically, the statement should indicate the applicant's background, research credentials, and career plans as they relate to the multidisciplinary nature of the doctorate, and discuss your research experience (academic, industrial) and include any publications and grants/patents, and

(2) Indication of how an applicant will fit into the program. Applicants should indicate their specific areas of interest within Biomedical Engineering and Biotechnology, so that a fit between their interests and qualifications and the specific specialization options that the program offers can be determined. If the applicant has a specific interest in working with one or more of the program's faculty, they should describe that specific interest and identify those faculty member(s). The Statement of Purpose should also exemplify the applicant's writing skills.

- We invite applicants also to submit a personal résumé.

Individual circumstances can be taken into account, and extraordinary qualifications in some areas can be used to outweigh weaknesses in others. The GRE can be waived by petition to the AACC for applicants with a prior graduate degree from an accredited U.S. institution. For these applicants, the application without the GRE must demonstrate exceptional potential.

Along with an admissions decision comes consideration of the appropriate program of courses for the applicant. The interdisciplinary nature of our program gives special importance to the advising relationship in forming a specific academic program to meet each student's specific goals. Applicants may be offered admission with a number of courses identified as conditional requirements that they will need to take to fill in for gaps in preparation or knowledge. Each admitted student is assigned to a faculty advisor, who is identified in the letter of admission. Acceptance into the program is subject to the availability of appropriate advisors.

Academic Advisor

Campus AACC's are responsible for overseeing the advising components of the program, which are initiated while each student is still an applicant. Students will be assigned a faculty advisor when they are accepted into the program. The initial faculty advisor will either be a member of the AACC or a program faculty determined based on the applicant's Statement of Purpose. After the student's first year in the program, the student may want to change to a new advisor that fits the student's research interest and is likely to become the chair of the student's dissertation committee.

Transfer of Credits/Advanced Standing

For students who have previously completed graduate course work, the admissions committees on each campus may approve the transfer of graduate credits for courses from an accredited US college or university that received a grade of B (not B-) or better if those courses were not already used in the degree requirements of another earned degree. The graduate school at each campus will govern the maximum number of credits that may be transferred into the program. The transfer credit may replace core or specialization course requirements. The project/directed studies, seminar and dissertation research credits will not be accepted for transfer from institutions outside of the UMass system.

Students may also have core courses waived without transfer of course credit. Students would still be responsible for the full credits required of each degree (31 credits for the MS and 63 credits for the PhD), but would not have to take the waived course.

Students who join the program with an earned master's degree may receive ?Advanced Standing? in the doctoral program. The number of credits required to complete the PhD will be determined by the home campus AACC, but at a minimum 9 course (core or specialization) credits, the capstone project course (3 credits), doctoral seminar (taken twice, 1 credit each) and 30 dissertation research credits will be required. The capstone project may be waived for students who have completed a master's thesis or research project at one of the UMass campuses. These students will be required to complete a minimum of 12 course (core or specialization) credits. Students with Advanced Standing will be required to pass the Qualifying Examination before progressing to the dissertation stage. Doctoral students who enter the program with advanced standing will not earn the MS. To earn the MS, a student must complete or transfer in credit to meet the core (16 credits), specialization (12 credits), and capstone project course (3 credits) requirements.

Academic Program

The curriculum is organized around common experiences, including common core courses, a capstone project, and intercampus graduate research presentations. The program makes some use of distance learning/on-line/faculty exchange for delivery of courses and seminars, and the campuses are close enough to permit commuting between them. The program encourages a multidisciplinary team approach during the Instrumentation and Laboratory Experience, the capstone project, and in the selection of the dissertation committee. Industry representation occurs in the introductory core course, in the capstone project, in the doctoral seminar series, and from an outside advisory group. In addition, each student pursues a sequence of courses and then completes a focused research project leading to a doctoral dissertation in a specialization option.

Biomedical Engineering Specialization Options

- Biomaterials: Tissue Engineering, Polymers/Plastics, Fibers/Textiles, Nanotechnology
- Biomedical Information Systems: Bioinformatics, Cheminformatics, Genomics, Proteomics
- Biomedical Instrumentation: Sensors, Signal Processing, Clinical Sciences
- Biomechanics: Joint/Muscle Mechanics
- Integrative Physiology: Cardiovascular and Pulmonary Modeling
- Medical Imaging: Optics, NMR, MRI, Acoustics, Cell Imaging
- Medical Physics: Radiation Therapy, Nuclear Medicine, Diagnostic Imaging, Nuclear Instrumentation

Biotechnology Specialization Options

- Agricultural and Marine Biotechnology: Therapeutics, Pharmacology, Nutritional Biochemistry, Food Science Technology
- Bioprocessing/Applied Microbiology: Bioremediation, Fermentation, Biocatalysis, Applied Genetic Engineering, Biopharmaceutical Sciences
- Molecular Biotechnology: Clinical Sciences, Biochemical Applications, Diagnostics, Therapeutics

General Program Requirements

The program of courses includes a core requirement, specialization requirement, and capstone requirement. As students advance, they will have to meet requirements in addition to satisfactory completion of courses, including participation in seminars and symposiums, passing a qualifying examination, defending a dissertation proposal, completing a dissertation, and a dissertation defense.

The PhD requires completion or transfer of at least 63 total credits (or a minimum of 44 credits for students with advanced standing due to an existing MS degree). Students must meet the specific requirements of their "home campus" for such matters as grade averages, documentation of completion of requirements, registration for program continuation if needed, and submitting the final dissertation to the library. No course receiving a grade below C (2.0) can receive credit. Grades earned below C are still calculated in the student's grade point average.

Students are limited in the number of Directed or Independent Study course credits that they can apply toward their program. No more than 6 credits of coursework below the level of dissertation registrations may be in the form of Directed or Independent Study. All courses must be conducted at the graduate level.

Students must pursue and complete a program of study approved by their assigned advisor. The interdisciplinary nature of this program makes close contact between each student and his or her advisor important.

Core Course Requirements

The core courses provide a common foundation for all students, either from life science or physical science/engineering backgrounds. Proposed core courses must be approved by the IACC.

1) Introduction to Biomedical Engineering & Biotechnology (3 credits)

This course should be taken in a student's first semester in the program if possible. Team-taught introductory course that emphasizes a multidisciplinary approach to current topics in the range of academic disciplines and gives students their first exposure to faculty research areas. The course, as much as possible, will involve faculty from all participating campuses. We will also invite outside industry speakers to present topics of contemporary importance and offer joint lectures from guest speakers.

Approved UML course: IB 500, Introduction to Biomedical Engineering & Biotechnology (3 credits)

2) Instrumentation and Laboratory Experience (3 credits)

This course is designed to be a practical, hands-on lab rotation course and give students exposure to cutting-edge research

methodology in a number of different areas, with a balance between biomedical engineering and biotechnology areas. A team approach will be encouraged as students employ various laboratory techniques to carry out short-term projects. Students will either rotate through a number of different experimental procedures within a single investigator's laboratory or rotate through multiple faculty laboratories, learning a particular type of methodology for which the laboratory may be noted and uses frequently. The course may also provide laboratory experiences/demonstrations at sister campuses and industrial sites where faculty members have affiliations.

Approved UML course: IB 550 BMEBT Instrumentation and Laboratory Experience (3 credits) Students must satisfactorily complete at least one lab-based course. This could be IB 550 or a lab-based course within their specialization.

3) Advanced Mathematics (3 credits)

The core mathematics requirement offers two options: (1) Advanced Numerical Methods, for those from a physical science, engineering or mathematics background or (2) Applied Mathematics for Life Scientists. Advanced Numerical Methods uses differential equations and statistics to examine engineering problems with biomedical examples/applications. Applied Mathematics for Life Scientists provides an intense treatment of the subject matter designed to achieve applied math literacy for students with life science and related backgrounds. An on-line version of this course will be available to all campuses.

Approved UML courses:

24.509 System Dynamics (3 credits)
24.539 Math Methods for Engineers (3 credits)*
26.548 Numerical Methods in Plastics Processing (3 credits)
92.530 Applied Mathematics I (3 credits)
92.531 Applied Mathematics II (3 credits)
92.555 Applied Math for Life Sciences (3 credits, online) +
98.582 Numerical Methods in Radiological Sciences & Protection (3 credits)

* Recommended for students with a Biomedical Engineering specialization.

+ Recommended for students with a Biotechnology specialization.

4) Quantitative Physiology (3 credits)

This course presents physiology at the organ system level with a quantitative approach. It helps integrate the curriculum for individuals with life science and engineering undergraduate backgrounds, permitting engineers and physical scientists an appreciation of how organisms function from the organ/system perspective and gives life scientists a more rigorous quantitative approach to physiology than is usual in undergraduate courses.

Approved UML course: IB 575 Quantitative Physiology (3 credits)

5) Bioethics (1 credit)

Current ethical issues in biomedical research will be included, with a review of legal/regulatory (e.g. FDA) considerations in the development of biological products and bringing them to market. This course is offered in seminar format with multi-campus participation and biotechnology industry guest speakers. Equivalent courses on the campuses may be substituted, although these might have additional credits. An on-line version of this course will be available to all campuses.

Approved UML course: IB 520 Ethical Issues in Biomedical Research (3 credits)

Advanced Cell and Molecular Biology (3 credits)

Rigorous treatment of topics in advanced cell and molecular biology, illustrating applied research through examples and presenting biochemistry concepts at the cell/molecular level.

Approved UML course: 81.666 Special Topics: Molecular and Cellular Biology (1 credit)

6) Advanced Cell and Molecular Biology (3 credits)

Rigorous treatment of topics in advanced cell and molecular biology, illustrating applied research through examples and presenting biochemistry concepts at the cell/molecular level.

Approved UML course: 81.666 Special Topics: Molecular and Cellular Biology (3 credits)

Specialization Course Requirements

Specialization courses will help the student attain depth in focused areas. Each specialization option represents an area in biotechnology or biomedical engineering, within which are found a selection of appropriate graduate courses.

Faculty involved in each specialization will see to an appropriate combination of depth and breadth in the student's selection of specialization courses. They may announce some structure to the course selections allowed within the area. With the approval of their advisor, students will select 12 credits of course work (minimum) from within one of the specializations. Any graduate course approved by the advisor may be used to satisfy this requirement. Many specialization options will require more than 12 credits of additional course work.

Capstone Requirement

As students transition from coursework to dissertation research, they undertake a capstone project course. This is designed to be a culminating experience in which the student synthesizes course knowledge and experimental skills into a brief but detailed experimental study, which also involves cross-field interdisciplinary cooperation. Although in some cases this project may be done individually under the supervision of one faculty member, it is expected that students will join in a team-based, collaborative effort involving students from a number of different disciplines, post-doctoral fellows, and industry representatives; and with intercampus participation.

Approved UML course: IB 600 Capstone Project (3 credits)

Annually in May, a Biomedical Engineering and Biotechnology Research Symposium will be held, rotating each year to a different campus, at which the students from all four campuses will present their projects in a poster session and/or orally. Participation in this non-credit activity is required.

Earning the MS Degree

Following successful presentation of the capstone project and with a minimum of 31 credits completed or transferred in required and approved courses, the student will be awarded the Master of Science degree as a credential along the way toward the doctorate. Students must have at least a cumulative B average to receive the MS degree and advance to the Qualifying Examination. (Students not working up to that level are subject to review for dismissal from the program. Specific standards are set for graduate students on each "home campus" for continuation in graduate programs.)

Selection of the Doctoral Dissertation Committee

As they move through this stage of their program, students will select their Doctoral Dissertation Committee, with one person as the major advisor. A committee must have at least three members (in some cases individual campus requirements may result in a higher minimum). The advisor and at least one other dissertation committee member must be chosen from the approved faculty of the Biomedical Engineering and Biotechnology program. Having one member of a dissertation committee be an outside industry scientist or engineer is encouraged.

Two models are provided for the dissertation committee, the intercampus and the intracampus committee structures:

The intercampus structure, which is strongly recommended, has one faculty member from a campus other than the candidate's home campus. It is expected that all three members will not represent the same academic departmental affiliation.

The intracampus committee structure has faculty just from the home campus. It is expected that all three members will not be from the same academic department.

Each student's committee is approved by the campus AACC, which will also approve any changes to a previously-approved committee.

Qualifying (Written) Examination

Students must pass a written qualifying examination that will cover questions on course work as well as experimental procedures the student has utilized. All material in the student's curriculum is subject to examination. The examination must be taken within one year after completion of the MS Biomedical Engineering and Biotechnology requirements, or within two years after entering the program for a student with advanced standing.

Doctoral students, in consultation with their advisor, will identify two topic areas in which to be examined. At least one of the topics must be primarily engineering/technological in nature (for example, solid mechanics), and another primarily biological/medical in nature (for example, pathophysiology of musculoskeletal disorders). Proposals for the qualifying examination must be submitted to the AACC with approval of the student's advisor.

For Biomedical Engineering students, the second topic must be biological or medical in nature. This requirement can be fulfilled with an exam that is a combination of material from the core Biology courses (Quantitative Physiology and Advanced Cell and Molecular Biology) and specific biology/medical information related to the student's specialization or research area.

For Biotechnology students, the second topic must be engineering or technological in nature. This requirement may be fulfilled with an exam that makes use of the skills learned in the core math requirement and tests for an in depth understanding of topics introduced in the Introduction to Biomedical Engineering or Biotechnology course or specific engineering/technological information related to the student's specialization or research area.

The proposal will outline the material covered by the exam, which may be designated as specific portions of courses, textbooks, and journal articles. Emphasis will be placed on the student's ability to integrate information in the areas examined. The AACC will be responsible for approving topic areas covered by the exam.

The examination will be in written form and given during two one-half days within a one-week period. Examinations for a given topic area will be designed to be completed within a three to four-hour period. The qualifying examination will be administered and evaluated by program faculty selected by the AACC. Examinations for a given topic area will be graded Pass or Fail. Students who are unsuccessful in their first attempt in a given topic area may repeat it once. Failure to pass the examination on any topic area on the second attempt results in overall failure on the Qualifying Examination and dismissal from the PhD program.

Doctoral Credit Requirements

1) Doctoral Seminar (2 credits, minimum)

Doctoral students will present research in progress. The seminar will emphasize not only research but also communication and writing. Every active doctoral candidate will present her or his work in progress in the seminar, and in addition there will be at least two presentations from external speakers. Students will write summaries of each presentation. Course is graded pass-fail or satisfactory-unsatisfactory (depending on grading system in use on the campus). Students must complete this course in at least two different semesters.

Approved UML course: IB 601 Doctoral Seminar (3 credits)

2) Dissertation Research (variable credit each semester, 30 credits minimum)

Doctoral students will register for a minimum of 30 credits of doctoral research with their faculty advisor (dissertation chair). They will use these credits during preparation and defense of the dissertation proposal, carrying out their dissertation research and preparation and defense of the doctoral dissertation.

Approved UML course: IB 759 Dissertation Research (1-9 credits)

3) Dissertation Proposal (Oral Preliminary Examination)

Students must present for approval a written dissertation proposal and then defend it in an oral presentation to his or her dissertation committee. The dissertation proposal will follow the format established for NIH proposals, including the page limits, and will perform an extensive review of the literature on the student's chosen topic, present original hypotheses, design experiments to test the hypotheses, document the appropriate methodology that will be used, project anticipated results, and indicate how such results might be interpreted. The proposal must show application to current biomedical/biotechnological problems. After successfully defending the dissertation proposal, the student attains the designation "doctoral candidate". Failure to pass the defense of the dissertation proposal (oral examination) results in dismissal from the PhD program.

Dissertation Defense

The doctoral candidate will defend his/her written dissertation before the doctoral dissertation committee, the University, and the outside community. The specific format of the defense is usually decided by the committee chair, but a typical format consists of the PhD candidate first presenting an overview of the thesis research, then answering specific questions asked by the committee members. Questions may test anything from knowledge of the existing literature, to scrutinization of the material and methods or experimental design, to the assumptions in the research, to the interpretation of the results, to recommendations for future work. If the candidate has worked closely with his or her advisor, and committee, it is likely that there will be no surprises at this final stage of the process. It is common, however, for the committee to ask that certain minor revisions be made to the written dissertation before final submission. Successful defense of the dissertation and submission of the finished work to the library will result in the awarding of the PhD in Biomedical Engineering and Biotechnology. Dissertations must be filed with Dissertation Abstracts International.

Combined Bachelor's and Master's Degree Program

The program participates in the University's effort to encourage outstanding graduate students to begin study toward an advanced degree while still undergraduates. Arrangements are possible for joint programs that combine a bachelor's degree in one of the other departments in the University with a master's degree in the Biomedical Engineering and Biotechnology program. Such arrangements are made for eligible students after discussions with graduate coordinators in both departments (see [eligibility requirements](#)).

Graduate Certificate Programs in Biomedical Engineering and Biotechnology

There are six graduate certificates offered by UMass Lowell departments that are associated with the intercampus Biomedical Engineering and Biotechnology Program. With the approval of the degree granting department, graduate certificate course credit may be applied to master's and doctoral degree programs.

- [Biomedical Engineering](#)
- [Biotechnology and Bioprocessing](#)
- [Disability Outcomes](#)
- [Environmental Biotechnology](#)
- [Medical Plastics Design and Manufacturing](#)
- [Molecular and Cellular Biotechnology](#)

[Graduate Certificate Application Form](#) (pdf)

Biomedical Engineering & Biotechnology Program

The Boston, Dartmouth, Lowell and Worcester campuses of the University of Massachusetts offer joint Master's of Science and PhD degree programs in Biomedical Engineering and Biotechnology. Students who wish to pursue a Master's degree have two choices 1) a research-based degree awarded en route to the PhD, or 2) the student may apply directly for the Master of Science Professional Science Master's (PSM) option. The PSM option is a master's degree which is not a way-station on the road to the PhD, rather it is a degree which prepares professionals to work in industry.

The program's purpose is to offer nationally recognized Professional Science Master's and PhD programs that are at the intersection of biology and engineering; that will be readily accessible to individuals with a wide range of science/engineering undergraduate degrees; that will address contemporary biomedical/health research problems; and that will contribute significantly to meeting the workforce

needs of allied biomedical industries.

Students who enter the PhD program may elect to receive the MS degree (without the PSM option) along the way to the doctorate.

The [Master of Science, Professional Science Master's option](#) is a non-thesis, two-year program designed to enhance core science curricula with business fundamentals, communications, ethics and project management. Students put their skills and knowledge into practice during a required internship. (Students who are employed full-time may be able to substitute a project for the required internship.) The program provides its graduates with the following knowledge, skills and abilities:

- Competency in cutting-edge technical/laboratory/computer skills related to a wide range of instrumentation/procedures;
- The application of research in solving current biomedical/health problems especially in relationship to new discoveries in nanoscience and technology;
- The ability to function as interdisciplinary collaborators with strong critical thinking, inquiry-based analytical skills;
- The ability to work on integrated problems in multidisciplinary research teams;
- The development of written and oral presentation skills which will allow them to adapt highly scientific material to a variety of audiences;
- The development of advanced problem solving skills using a multidisciplinary approach;
- Appreciation of the challenges of conducting/publishing research associated with contemporary biomedical ethical issues;
- Grantsmanship skills that will allow them to collaborate with researcher to obtain extramural private/federal research funding;
- Knowledge about intellectual property/patents/regulatory issues;
- The understanding of how theory/concepts are related to applied research;
- The understanding of how applied research is conducted in an industrial setting;
- The understanding of how industry applies experimental research to equipment design/ manufacturing/product development.

As well as the skills listed above, the [PhD program](#) aims to provide its doctoral recipients with the following additional knowledge, skills, and abilities:

- The ability to formulate/test multiple, original scientific hypotheses related to their dissertation research based on careful observations and a comprehensive review of past and current literature in their field;
- The ability to design/carry out detailed experiments or develop theoretical models/numerical simulations;
- The application of their research in solving current biomedical/health problems especially in relationship to new discoveries in nanoscience and technology;
- The ability to function as independent researchers with strong critical thinking, inquiry-based analytical skills;
- The ability to critically interpret their research results, synthesizing findings from other investigators/previous studies, that will serve as the basis for developing new hypotheses;
- Written/oral presentation skills resulting in publication of their findings and presentation of results at professional research conferences; and
- Grantsmanship skills that will allow them to obtain pre-doctoral and post-doctoral extramural private/federal research funding.

Master of Science in Marine Sciences & Technology Degree Program

The M.S. program requires a minimum of 30 credit hours with the thesis option and 33 credit hours with the non-thesis option. Students are required to take three core courses (9 credits) and choose additional courses appropriate to a selected area of concentration. Attendance at a weekly seminar series is required (1 credit each for two semesters), and each student must present at least one seminar in their third or fourth semester. Fulltime M.S. students normally complete their degree requirements in four semesters. Part-time M.S. students are encouraged to take two courses per semester.

Core Course Requirements

Each IGS student must complete three core courses (9 credits), which includes 2 out of 3 of the core courses in the biological, chemical, and physical oceanography and a third core course in marine policy and/or management areas (including law and economics). The Core column in the IGS course list identifies the core courses and their respective areas. The core courses are intended to provide a common grounding in the biological, chemical, and physical oceanographic areas of marine sciences and technology, and in related marine policy and management disciplines. Courses covering technology and quantitative skills are generally subject to student choice and guidance committee approval, though there may be requirements specific to each option area. At least two core courses are offered each semester using the University's substantial distance learning facilities and technology. Students normally complete the core courses in the first two semesters.

Within a few years, IGS plans to develop new core courses, one in each of the core areas (biological, chemical, and physical oceanography), which will satisfy the requirements of IGS students. These courses will ensure that all IGS students master key concepts and skills central to an interdisciplinary marine sciences and technology graduate program. All of the new core courses will be taught via distance learning, may be team taught in some cases, and will replace at least some of the currently offered core courses.

Concentrations and Electives

To build on the core courses, each IGS student selects an area of concentration and chooses a marine policy or management core course and electives appropriate to this concentration, as approved by their faculty advisor and/or thesis committee. Concentrations and Courses describes the concentrations and lists the electives associated with each concentration.

Students typically take most of their elective courses on the campus where they and their major faculty advisor are in residence. Some elective courses, however, will also be taught via distance learning. In addition, students may choose to be in residence at different campuses for a period of time during their course of study, in order to take certain courses or to take advantage of research

opportunities.

Weekly Seminars

Weekly seminars presented by students and by visiting speakers are intended to broaden the scope of each student's experience and to provide experience in verbal communication. Each M.S. student must present at least one seminar in the third or fourth semester. Attendance at the weekly seminars is required during all four semesters, for which students receive 1 credit for each of the first two semesters but no credit for the second two semesters.

Thesis and Non-Thesis Options

M.S. students may choose either a thesis or non-thesis option. Each student electing the thesis option will be assigned a Thesis Committee, chaired by the student's major advisor, which will be responsible for insuring that the student fulfills all requirements of the IGS as well as other campus requirements, including presentation of a thesis defense consisting of a public lecture on the thesis, and a subsequent oral examination by the Thesis Committee. Each student electing the non-thesis option, in addition to an additional 3 credits, must complete a substantial research paper that must be read and approved by the major advisor and at least one other faculty member.

Sequence of Courses by Semester

In the first two semesters, fulltime M.S. students normally complete the core courses (9 credits), register for the seminar series (one credit each semester), and take an elective (9 credits). Additional coursework and the thesis or the non-thesis research paper are typically completed in the third and fourth semesters. A minimum total of 30 credits (thesis) or 33 credits (non-thesis) is required for the degree. The following tables summarize the sequence of courses for each of the four semesters.

Course	Semester 1	Semester 2
Core courses	6 credits	3 credits
One elective	3 credits	6 credits
Seminar series	1 credit	1 credit
Total 20 credits	10 credits	10 credits

Course	Semester 3	Semester 4
One elective (minimum)	3 credits	3 credits
Thesis/non-thesis	1-6 credits	1-6 credits
Seminar series (required)	no credit	no credit
Total 10+ credits	3 + 1-6 credits	3 + 1-6 credits

Doctor of Science Degree Program

The Ph.D. program includes four core courses taken by all students (12 credits), courses in a concentration area beyond the core, seminars, and dissertation research. Work in the concentration area usually includes a minimum of 24 credit hours of courses and helps the student prepare for the written and oral candidacy examinations. Ph.D. students are not normally accepted as part-time students. Courses may be taken at any IGS-affiliated program on the four campuses, in other departments, or at other area institutions, and may be included in a student's program of studies as determined by the student's major advisor and/or dissertation committee.

Core Course Requirements

Each IGS student must complete four core courses (12 credits), one in each of four core areas: biological oceanography, chemical oceanography, physical oceanography, and Marine Policy and/or Management areas (including law and economics). The Core column in the IGS course list identifies the core courses and their respective areas. The core courses are intended to provide a common grounding in the biological, chemical, and physical oceanographic areas of marine sciences and technology, and in related marine policy and management disciplines. At least two core courses are offered each semester using the University's substantial distance learning facilities and technology. Students normally complete the core courses in the first two semesters.

physical oceanography), which will satisfy the requirements of IGS students. These courses will ensure that all IGS students master key concepts and skills central to an interdisciplinary marine sciences and technology graduate program. All of the new core courses will be taught via distance learning, may be team taught in some cases, and will replace at least some of the currently offered core courses.

Concentrations and Electives

To build on the core courses, each IGS student selects an area of concentration and chooses a marine policy or management core course and electives appropriate to this concentration, as approved by their faculty advisor and/or thesis committee. Concentrations and Courses describes the concentrations and lists the electives associated with each concentration.

Students typically take most of their elective courses on the campus where they and their major faculty advisor are in residence. Some

elective courses, however, will also be taught via distance learning. In addition, students may choose to be in residence at different campuses for a period of time during their course of study, in order to take certain courses or to take advantage of research opportunities.

Weekly Seminars

Weekly seminars presented by students and by visiting speakers are intended to broaden the scope of each student's experience and to provide experience in verbal communication. Each M.S. student must present at least one seminar in the third or fourth semester. Attendance at the weekly seminars is required during all four semesters, for which students receive 1 credit for each of the first two semesters but no credit for the second two semesters.

Candidacy Examinations and Dissertation

No later than the end of the fourth semester, the student and major faculty advisor select additional faculty who constitute the student's graduate committee, and the student presents a written dissertation proposal to the committee. The student's major advisor and committee may determine a later date for the presentation of the dissertation proposal. A student's committee is chaired by the student's major advisor and guides the student's research. Committee members may be selected from IGS faculty, other departments, and other institutions. All committees must include at least one IGS faculty member from a campus other than the campus where the student resides.

Successful performance in the core courses is required for advancement to degree status. A grade of B or better in each core course and an overall average of 3.0 in the core courses are required. There is a retake option on a course for which the student receives a grade of B- or less.

No later than the sixth semester, the student's committee administers the written and oral candidacy examinations. The candidacy examinations are comprehensive and cover the core areas and the student's area of concentration. They are designed to test the intellectual competence and maturity of the student in the broad area of marine sciences and technology and in the selected area of concentration. Upon successful completion of the Ph.D. candidacy examinations, the student is awarded an M.S. degree.

A scholarly dissertation based on original research is required of all Ph.D. candidates. Dissertation research may be done in the laboratory or the field, or may be carried out in part during residence with an appropriate private business or government agency. Presentation and defense of a satisfactory dissertation, normally to be completed within five years from the date of advancement to candidacy, fulfill the degree requirements. The dissertation defense consists of a public lecture on the dissertation and a subsequent oral examination by the candidate's dissertation committee.

Sequence of Courses by Semester

In the first two semesters, Ph.D. students normally complete the core courses (12 credits), register for the seminar series (one credit each semester), and take an elective (3 credits). Additional coursework (24 credits minimum) is normally completed by the end of the fifth semester, in order to complete the written and oral candidacy examinations no later than the sixth semester. Upon advancement to candidacy, Ph.D. students register each semester for dissertation research and other courses as appropriate until graduation.

Course	Semester 1	Semester 2
Core courses	6 credits	3 credits
One elective	3 credits	6 credits
Seminar series	1 credit	1 credit
Total 20 credits	10 credits	10 credits

Course	Semester 3	Semester 4	Semester 5
Thesis/Electives	9 credits	9 credits	9 credits
Seminar series (required)	no credit	no credit	no credit
Total 24-30 credits	9 credits	9 credits	9 credits

Marine Sciences & Technology Program

Please Note: The information here on course descriptions reflects the UMass Lowell campus. Other faculty and courses that are part of this graduate program are described at the websites of the other UMass system campuses, and the [UMass Marine Sciences](#) website.

The UMass Intercampus Graduate School (IGS) of Marine Sciences and Technology offers both Master's (M.S.) and Doctoral (Ph.D.) programs in marine sciences and technology. Students graduating with a M.S. or Ph.D. degree from IGS receive a joint degree from the University of Massachusetts Amherst, Boston, Dartmouth, and Lowell. The degree programs are fundamentally grounded in a broad, integrated,

interdisciplinary approach to the study of marine sciences and technology. Students located at the four participating campuses are required to complete "core" courses selected from the natural and social sciences to equip them for interdisciplinary studies and

research before focusing upon an area of concentration.

The programs prepare students for employment opportunities in the private and governmental sectors and academia. Emphasis is placed on the education of researchers and scholars who will contribute not only to basic research but also to the application of that research in a coherent approach to resource management and economic development issues.

Combining facilities and resources on four campuses into a single, coherent graduate program greatly expands the opportunities for IGS students. Students have access to a much greater range of education and research opportunities, expertise, and facilities than exists on one campus alone. Each campus has a number of departments and interdepartmental programs with areas of strength in marine-sciences related teaching, research, and outreach that either complement or constitute critical units of IGS.

IGS is also closely affiliated with a number of on-campus research centers and institutes and off-campus marine research facilities, expanding its realm of research opportunities and resources.

[Admissions Standards](#)

[Application Criteria](#)

[Admissions Procedures](#)

[Core Courses](#)

Admissions Standards

Successful applicants will generally have completed an undergraduate or graduate degree with a GPA of 3.00 or better and will have an undergraduate major in one of the basic scientific disciplines or engineering, or will have strong multidisciplinary training with completion of at least six semesters of coursework in the natural sciences, generally to include biology, chemistry, and/or physics. Preparation in mathematics at least through integral calculus is strongly encouraged. Students who do not meet these criteria need identify a faculty advocate who must bring a request for exception before the Admissions Committee. At the discretion of the Admissions Committee applicants may make up deficiencies in prior coursework either before or after admission is granted to the IGS. Consideration will be on a case-by-case basis, and the recommendation of the committee will be forwarded to the Dean for approval.

Candidates may apply for admission at either the Masters or Doctoral level. Students admitted directly into the Doctoral Program are expected to have exceptional academic credentials and/or work experience. Students entering with a Bachelor's degree may be required to complete the requirements of a Masters degree before admission to the Doctoral Program. Students entering with a Masters can be admitted at the Doctoral level provided the degree, coursework and research experience warrant such a decision by the Admissions Committee.

Application Criteria

The Admissions Committee will evaluate a number of additional criteria in its consideration of applications. They include performance on the Graduate Record Examinations (GREs), TOEFL (if appropriate), Letters of Recommendation, Transcripts, and a Statement of Interest and Intent. Successful applicants will generally have combined verbal and quantitative GRE scores greater or equal to 1200, and a strong analytical score. International students must take the Test of English as a Foreign Language (TOEFL). A minimum of 600 (or 213 on the computer-based exam) is strongly recommended. GRE Subject tests may also be used in evaluation but are not required.

Three letters of recommendation from referees familiar with the applicant's academic and/or work experience are required.

Official transcripts of all undergraduate and graduate coursework must be submitted.

Statements of Interest and Intent are also requested.

-The Statement of Interest should provide reviewers an indication of the motivation of the student for pursuing graduate work.

-The Statement of Intent should describe how graduate training would address the student's career goals.

The applicant is strongly encouraged to identify one or more faculty members who could serve as the applicant's advisor, at least initially, upon admission. To this end, discussions with individual faculty before completing the application are strongly encouraged.

Admissions Procedures

The Office of Graduate Studies at the University of Massachusetts Dartmouth processes all applications for admission to the graduate programs of the Intercampus Graduate School for Marine Science and Technology. You will send your application and its associated materials and should address any inquiries about your application to that campus.

A single application form has been prepared for the use of applicants for admission to the Intercampus Graduate School of Marine Sciences and Technology. It will be made available in the graduate admissions offices of each participating campus.

The Application for Admission to the Intercampus Graduate School for Marine Science and Technology is available in PDF format (78Kb). Viewing a PDF requires the free Adobe Acrobat Reader.

Admission decisions will be made as expeditiously as possible once the application file is complete. Applications should be completed and submitted prior to June 1 for Fall admission.

For assistance with an application:

Voice: 508-999-8604

Fax: 508-999-8183

e-mail: graduate@umassd.edu

Mail your application materials to:

Office of Graduate Studies
University of Massachusetts Dartmouth
285 Old Westport Road
North Dartmouth, Massachusetts
02747-2300

Core Courses

To achieve interdisciplinary breadth and depth, each IGS student will be required to take courses in five areas:

Biological Oceanography (BO)

Chemical Oceanography (CO)

Physical Oceanography (PO)

Socio-Economics of Coastal/Marine Systems (S/E)

Marine-Related Technologies (MT)

Courses in BO, CO, and PO are generally taken in the first 4 to 6 semesters (preferably in the first 2). For each area, course content is fairly uniform, though there may be multiple offerings between campuses.

Courses in S/E and MT are taken after selection of an area of concentration. Course content is not uniform and selection of course should be consistent with a student's concentration area. Depending on the student's concentration, the socio-economic requirement might be met best by courses in policy, economics, law or international/intergovernmental relations. Courses satisfying the technology requirement could be drawn from such areas as marine measurement technology, wastewater and environmental mitigation technology, Geographic Information Systems (GIS), Data/Information Management Systems, graphic display technologies or marine modeling approaches.

To build on the core courses, each IGS student selects an area of concentration and chooses electives appropriate to this concentration, as approved by their faculty advisor and/or thesis committee. Reflecting the interdisciplinary character of IGS, both natural and social science courses support certain concentrations, and many courses support more than one concentration.

Students typically take most of their courses on the campus where they and their major faculty advisor are in residence. Some courses, however, including at least two core courses each semester, will also be taught using the University's substantial distance learning facilities. Students may also choose to be in residence at different campuses for a period of time during their course of study, in order to take certain courses or to take advantage of research opportunities.

The Concentrations of Study section describes each area of concentration and lists the courses associated with the respective concentration. The Courses section lists all IGS courses, identifies the core courses and their respective core areas, and provides other pertinent course information.

UMass System Graduate Programs

UMass Lowell offers two intercampus programs drawing on the strengths of the whole UMass System.

[Marine Science](#)

- [Biomedical Engineering & Biotechnology Program](#)

Master's Programs in Biology

The Department of Biological Sciences offers two major tracks to a Master's degree.

The Master of Science in Biological Sciences, and the [Master of Science in Biological Sciences - Biotechnology Option](#) provide the advanced study and training necessary to conduct independent research at a professional level and to be successful in today's competitive academic and industrial research markets. Students in the program will be encouraged to explore quantitative approaches to the solution of problems in the basic and applied biological sciences. Depending on their career goals, students may choose either research or course work options within the Department, or from the interdisciplinary Biotechnology option. All candidates for the master's degree are expected to demonstrate sufficient knowledge and skills to pursue independent and creative research activities.

The [Professional Science Master's Program](#) (PSM) combines traditional training in biological sciences with additional preparation in areas outside of biology, such as project management and discipline-specific courses, to provide students with a broader expertise useful for attaining positions in private-sector companies. A thesis is not required, but each student must participate in a professional

internship.

Four Professional Science Master's options are available:

- [Applied Biotechnology](#),
- [Biosafety](#),
- [Environmental Biotechnology](#), and
- [Project Management for Life Sciences](#).

Entrance Requirements and Procedures

Applications for the Master of Science, including the Biotechnology Option, are considered twice per year, with deadlines for receipt of applications of October 15 and January 10 for the following Spring and Fall semesters, respectively.

Entering graduate students are expected to have a sound preparation in the biological sciences, chemistry, physics, calculus, and statistics. A student found deficient in any of these areas may be required, during the first year, to take appropriate courses to eliminate the deficiencies. If the student has not had a biochemistry course, 81.519 should be taken for graduate credit. The departmental Graduate Coordinator helps plan the entering students programs of study, acquaints them with research opportunities in the department, and assists in selecting research advisors.

Applications for the Professional Science Master's program (PSM) are accepted year round, but it is recommended that complete applications be submitted several months before expected matriculation. Similarly to the MS degree described above, applicants are expected to have a strong background in biological science.

Applications and information for admission to the MS and PSM programs can be found at the Graduate Admissions website.

Degree Requirements

A minimum of 30 semester hours of graduate level work is required for the Master of Science degree in Biological Sciences (Note: the PSM options in Biological Sciences require 37 credits. See the [Professional Science Master's](#) section for details). The student has a choice of three options: thesis, project, or non-thesis. Minimal core requirements for all options include 1 semester (3 credits) of Professional Communication in Science and Technology 81.604, completion of Biochemistry 81.519 or an approved equivalent and 12 credits of formal course work selected from departmental electives (exclusive of thesis, project, problems, or other directed studies). The remaining 16 credits may be satisfied by additional electives within the department (thesis, project, problems, or more course work), by transfer credit for approved graduate level biological sciences courses taken at other accredited institutions (9 credit maximum), or by graduate courses taken in related disciplines within the University (e.g., bioinformatics, chemistry, environmental sciences, chemical engineering, radiological sciences; 8 credit maximum). There is no formal language requirement. Students whose professional goals are to continue on for the Ph.D. degree, or who plan to seek employment in academic or industrial research laboratories as technicians or junior scientists are strongly advised to choose the thesis or project option in order to successfully compete for such positions. Students in the non-thesis option should endeavor to select courses with accompanying laboratories whenever possible.

Thesis Option

In choosing this option, the student concentrates on an in-depth, independent, scholarly investigation of a contemporary biological problem. Credit is allowed for 6-12 semester hours of M.S. Thesis Research. After consulting with the research advisor, the student selects two additional faculty members (one of whom must be from within the Department) to serve as members of the Thesis Committee. The student presents to the Committee a proposal of intended research and obtains the Committee's approval of the research topic. After completing the written thesis, the student gives an oral presentation of his results to the Thesis Committee.

Project Option

The project option is designed for independent laboratory investigations of a more limited nature than the thesis option. Generally, a project is completed in one or two semesters and credit is given for 3 or 6 semester hours of M.S. Project (no more than 6 credits will be allowed).

Non-Thesis Option

This option offers course work in breadth and depth, and may be of special interest to secondary school science teachers and individuals already employed in academic, hospital, or industrial laboratories. The non-thesis option may be completed during the day on a full-time basis or in late-afternoon or evening sessions on a part-time basis. However, since not all day courses are available in the evening sessions, a part-time student's progress toward the M.S. degree will depend not only on his/her available time and abilities, but also on the scheduling of electives. In some instances, with the consent of a faculty member, an evening student may elect the thesis or project option.

Professional Experience

Credit (81-500; 3cr) may be requested by individuals who present satisfactory evidence (in the form of a written statement from their current supervisor) of engaging in at least one year of full-time experience in secondary school science teaching, or in an academic, hospital, or industrial laboratory setting.

Professional Communication in Science and Technology

Each student is required to complete one semester of Professional Communication in Science and Technology (81.604; 3 credits) in Biology.

Master of Science in Biological Sciences - Biotechnology Option

This option is more structured than the M.S. in Biological Sciences program described above. The core curriculum offers extensive hands-on experience in current techniques and instrumentation. Field trips and seminars afford students an opportunity for interaction with the biotechnology industry. Students are encouraged to conduct research in one of the recognized areas of biotechnology or to present an innovative application of technology or engineering principles to a biological problem of economic interest. The nature and extent of the investigation will determine its degree credit value. Those who enter the program having already completed some of the core courses, or who already have extensive laboratory experience, may consult with an advisor to design a course of study appropriate to their needs. A variety of biotechnology-related electives are available.

Core Requirements Biotechnology Option

- 81.519 Biochemistry I
- 81.520 Biochemistry II
- 81.521 Techniques in Biochemistry
- 81.542 Cell Biology OR 81.560 Stem Cell Biology
- 81.567/569 Molecular Biology (lecture and lab)
- 81.576 Cell Culture
- 81.593/595 Immunology (lecture and lab)
- 81.604 Professional Communication in Science and Technology

Recommended Electives Biotechnology Option

- 10.535 Cell and Microbe Cultivation
- 10.545 Isolation and Purification
- 10.555 Biopharmaceutical GMP and Licensing
- 10.586 Biotechnology Processing Projects Laboratory
- 81.572 Virology
- 81.733 Projects Laboratory
- 81.733 M.S. Project in Biology

Up to 9 credits of coursework may be taken in other departments. The sum of core and elective courses must total at least 30 credits.

Professional Science Master's

The curriculum requires students to complete: 2 core courses (Biochemistry I and Professional Communication in Science and Technology) common to all options; 1-2 core courses specific to the option that allow for specialization; additional electives within and outside the Biology Department that permit flexibility in meeting the students' employment needs and interests; 2 advanced courses specific to the option; and a 1 credit Professional Internship that can be completed during a summer session or either academic semesters. The total minimum credit requirement for each option is 37.

Applied Biotechnology Professional Science Master's (PSM) Option

Core Biology Requirements - Applied Biotechnology PSM Option

- 66.635 Project Management (offered by the College of Management)
- 81.519 Biochemistry
- 81.521 Biochemical Techniques
- 81.542 Cell Biology or
- 81.560 Stem Cell Biology
- 81.576 Cell Culture
- 81.567/569 Molecular Biology/Laboratory
- 81.593/595 Immunology/Laboratory
- 81.604 Professional Communication in Science and Technology

Additional Biology Courses - Applied Biotechnology PSM Option (3 credits minimum)

- 81.541 Topics in Cell Biology
- 81.540 Advances in Plant Biology
- 81.582 Cancer Biology
- 81.542 Cell Biology
- 81.580 Developmental Biology
- 81.504 Environmental Microbiology
- 81.590 Human Neurobiology
- 81.560 Stem Cell Biology
- 81.572 Virology

Advanced Biotechnology/Interdisciplinary Courses - Applied Biotechnology PSM Option (6 credits minimum)

92.586 Applied Statistics or
19.575 Introduction to Biostatistics and Epidemiology
10.586 Biotechnology Processing Project Laboratory
10.555 Biopharmaceutical GMP and Licensing
10.535 Cell and Microbe Cultivation
10.545 Isolation and Purification of Biotechnology Products

Professional Internship Applied Biotechnology PSM Option (1 credit)

Biosafety Professional Science Master's (PSM) Option

Core Requirements - Biosafety PSM Option

19.525 Recognition of Work Environment Hazards: Introduction to Occupational and Hygiene Ergonomics
19.573 Bioaerosols in Health and Biodefense
81.519 Biochemistry
81.604 Professional Communication in Science and Technology

Additional Biology Courses - Biosafety PSM Option (18 credits)

(Graduate, 81.XXX)

Advanced Biosafety/Interdisciplinary Courses - Work Environment/Rad Science (choose 6 credits)

19.509 Hazardous Waste Site Worker and Emergency Training Response
19.503 Toxicology and Health
95.504 Introduction to Radiological Sciences
19.515 Principles and Practices of Biological Safety
19.516 Laboratory Environmental Health and Safety

Professional Internship Biosafety PSM Option (1 credit)

Environmental Biotechnology Professional Science Master's (PSM) Option

Core Requirements Environmental Biotechnology PSM Option

92.586 Applied Statistics or
19.575 Introduction to Biostatistics and Epidemiology
81.504 Environmental Microbiology
81.519 Biochemistry
81.521 Biochemistry Techniques
81.567/569 Molecular Biology/Lab
81.604 Professional Communication in Science and Technology
66.635 Project Management (offered by the College of Management)

Advanced Environmental Biotechnology/Interdisciplinary Courses (choose 14 credits)

14.567 Environmental Aquatic Chemistry
14.568 Environmental Fate and Transport
14.578 Biological Wastewater Treatment
14.595 Hazardous Waste Site Remediation
81.505/507 Bioinformatics Lecture/Lab
81.523 Biology of Global Change
81.540 Advances in Plant Biology
81.542 Cell Biology
81.557/559 Advanced Invertebrate Zoology Lecture/Lab
81.560 Stem Cell Biology
19.573 Bioaerosols in Health and Biodefense
81.576 Cell Culture

Professional Internship Environmental Biotechnology PSM Option (1 credit)

Project Management for Life Sciences Professional Science Master's (PSM) Option

Core Requirements Project Management for Life Sciences PSM Option

66.635 Project Management (College of Management)
81.519 Biochemistry
81.604 Professional Communication in Science and Technology

Additional Biology Courses Project Management for Life Sciences PSM Option (choose 21 credits)

(Graduate, 81.XXX)

Advanced Management Courses Project Management for Life Sciences PSM Option (choose 6 credits)

- 26.590 Survey of Intellectual Property
- 61.640 Financing Innovation and Technology Ventures
- 62.630 Market Research for Entrepreneurs
- 64.650 Innovation and Emerging Technologies
- 64.655 Corporate Entrepreneurship
- 64.681 New Venture Implementation
- 66.630 New Product Development
- 66.640 Building and Managing Entrepreneurial Teams
- 64.680 New Venture Planning

Professional Internship Project Management for Life Sciences PSM Option (1 credit)

Bachelor's-Master's Program

Outstanding undergraduates may pursue an accelerated course of study leading to the BS and MS degrees in Biological Sciences.

[How to apply and program information information](#)

Doctoral Degree Programs in Biology

I. Doctor of Philosophy Degree Program (Ph.D. in Chemistry-Biochemistry Option)

The Department of Biological Sciences and the Department of Chemistry have developed a program in Biochemistry which results in the award of a Ph.D. in Chemistry. For a full discussion of program requirements, see the section on [biochemistry](#) in the Chemistry Department.

II. Doctor of Philosophy Degree Program in Biomedical Engineering & Biotechnology

The department of Biological Sciences offers a Doctorate in Biomedical Engineering and Biotechnology. For a full description of the program, see the [five-campus program](#).

III. Doctor of Philosophy in Marine Science and Technology (Interdisciplinary)

An interdisciplinary program is offered through the UMass Intercampus Graduate School (IGS). Students graduating with a M.S. or Ph.D. degree from IGS receive a joint degree from the University of Massachusetts Amherst, Boston, Dartmouth, and Lowell. The degree programs are fundamentally grounded in a broad, integrated, interdisciplinary approach to the study of marine sciences and technology. Students located at the four participating campuses are required to complete "core" courses selected from the natural and social sciences to equip them for interdisciplinary studies and research before focusing upon an area of concentration. For a full description of the program, see Marine Science and Technology.

Graduate Certificates in Biological Sciences

- [Biotechnology and Bioprocessing](#)
- [Environmental Biotechnology](#)
- [Molecular and Cellular Biotechnology](#)

Admission Criteria:

Prospective students will be required to complete a simplified application and provide their undergraduate transcript indicating that they hold a baccalaureate degree in a relevant natural science or engineering field. Applicants with degrees from institutions outside the USA are encouraged to have their credentials evaluated by one of the local evaluation companies. A minimum undergraduate GPA of 3.0 (4 point scale) is preferred. Close attention will be paid to grades in relevant science and engineering courses. There is no application fee and GREs are not required.

Please note that a Graduate Certificate, while below a full Masters degree, is not a remedial graduate program. Students must demonstrate the ability to complete graduate level work to be accepted into a graduate certificate program. As such, if an applicant was denied acceptance into a graduate degree program due to academic deficiencies, then acceptance into the certificate program is unlikely.

Requirements for Completion of Certificate:

- Students must complete all certificate requirements (core and electives).
- The program must be completed within five years.
- Students must have a minimum grade point average of 3.0 with not more than one course with a grade below 'B' (note a B- is considered below a B).
- All other University requirements apply, including deadlines and fees.

Transferability:

Courses may not be applied to a certificate if already applied to another certificate and vice versa. However, credits earned towards a certificate may be applied to a Masters or Doctoral degree program in an appropriate discipline. Note that acceptance into a Graduate Degree Program is separate from acceptance into a Graduate Certificate Program.

Biotechnology and Bioprocessing

Biological Sciences and Chemical & Nuclear Engineering departments (Interdisciplinary)

Dr. Carl Lawton 978-934-3158

carl_lawton@uml.edu

The certificate is intended for students who hold a baccalaureate degree in science, engineering, health, or related disciplines. The courses emphasize biological and engineering principles, process concepts and the application of these to process design and improvement. Courses deliberately cross disciplinary boundaries and emphasize teamwork in a multidisciplinary environment as well as a result-oriented, document-driven approach to efficient project completion.

Required Courses:

- 10.535 or 81.535 Principles of Cell and Microbe Cultivation (3 credits)
- 10.545 or 81.545 Isolation and Purification of Biotech Products (3 credits)

Plus Two Electives from the following:

- 10.555 or 81.555 Biopharmaceutical Regulatory Compliance (3 credits)
- 10.538 Advanced Separations in Biotechnology (3 credits)
- 10.586 Bioprocessing projects laboratory (3 credits)
- A technical elective with the approval of the Coordinator (3 credits)

Environmental Biotechnology

Biological Sciences, Chemistry, Civil & Environmental Engineering departments (Interdisciplinary)

Dr. Juliette Rooney-Varga 978-934-4715

juliette_rooneyvarga@uml.edu

Environmental biotechnology refers to the application of biological technologies to monitor, understand, and remediate environmental problems. This certificate combines courses that explore the ecological impact of anthropogenic environmental change with courses that provide training in current biological technologies that can be brought to bear on environmental problems. Recent advances in biotechnology are providing new avenues for investigating biologically mediated environmental processes, many of which were inaccessible using traditional approaches. New biological technologies are being developed to mitigate environmental problems. These include the biological remediation of pollutants, biological treatment of wastewater and drinking water, source tracking of microbial pathogens, and mitigation of toxic algal blooms. As environmental resources are increasingly strained and new biological technologies with the potential to improve our environment become available, the demand for professionals with training in environmental biotechnology will continue to increase.

Required Courses (choose two):

- 81.504 Environmental Microbiology
- 81.523 Biology of Global Change
- 14.578 Biological Wastewater Treatment

Elective courses (choose six to eight credits):

- 84.580 Advanced Analytical Biochemistry
- 84.514 Advanced Analytical Chemistry
- 81.505/507 Bioinformatics (4 credits)
- 84.526 Chromatography
- 14.567 Environmental Aquatic Chemistry
- 14.568 Environmental Fate and Transport
- 14.595 Hazardous Waste Site Remediation
- 81.567 Recombinant DNA Techniques
- 81.569 Recombinant DNA Techniques Laboratory (2 credits)

Total: 12-14 credits

Molecular & Cellular Biotechnology

Contact:

Dr. Michael Graves
978-934-2887

michael_graves@uml.edu

The Graduate Certificate in Molecular and Cellular Biotechnology provides students with training in this growing field. Over the years, an ever-increasing demand for manipulation of DNA and analysis in cultured cells in most aspects of funded research has created a growing need in the job market.

Certificate Program:

The Certificate consists of five courses, with four core courses and one related elective (14 credits total).

All students must hold a baccalaureate degree in a relevant natural science or engineering field; **at least one year of college-level biology, genetics and biochemistry also is required.**

Required Courses: (4 courses, 11 credits)

- 81.567 Molecular Biology Lecture (3 credits)
- 81.569 Molecular Biology Lab (2 credits)
- 81.542 Cell Biology (3 credits) OR 81.460 Stem Cell Biology (3 credits)*
- Cell Culture (81.576; 3 credits) +

* Students may take both Cell Biology and Stem cell Biology, in which case one will count towards the core and the other as the elective.

+ Either Cell Biology or Stem Cell Biology can be used to satisfy the pre-requisite for Cell Culture.

Elective courses (students choose one 3 credit course from the following list):

- 81.519 Biochemistry I*
- 81.541 Topics in Cell Biology
- 81.542 Cell Biology (if not taken as core)
- 81.560 Stem Cell Biology (if not taken as core)
- 10.535 Cell & Microbe Cultivation
- 10.545 Isolation & Purification

*Biochemistry I is a pre-requisite for Molecular Biology and Cell Biology, but still may be used to satisfy the certificate requirements.

Department of Biological Sciences

The following degree programs are available:

- [Doctor of Philosophy in Biomedical Engineering and Biotechnology](#) (Interdisciplinary)
- Doctor of Philosophy in Chemistry
 - Biochemistry Option (see full description in [Chemistry](#) section) (Interdisciplinary)
- Doctor of Philosophy in Marine Science and Technology (Interdisciplinary)
- Master of Science in Marine Science and Technology (Interdisciplinary)
- [Master of Science in Biological Sciences - Professional Science Master's Options](#)
 - Applied Biotechnology
 - Biosafety
 - Environmental Biotechnology
 - Project Management for Life Sciences
- [Master of Science in Biological Sciences](#)
- [Master of Science in Biological Sciences](#)
 - Biotechnology Option
- [Graduate Certificates](#)
 - Biotechnology and Bioprocessing
 - Environmental Biotechnology
 - Molecular and Cellular Biotechnology

Facilities

The Departmental research and teaching instrumentation includes an array of centrifuges (ultraspeed, superspeed, microfuges), electrophoresis equipment (prep and analytical for proteins and nucleic acids, sequencing, isoelectric focusing, pulsed-field), PCR thermal cyclers, HPLC perfusion and other chromatography equipment; UV-visible and fluorescence spectrophotometers, scintillation spectrometers, various microscopes (transmission EM, fluorescence, confocal, inverted phase), microinjection apparatus, flow cytometer, Coulter counter, speed vac, electroporator, microtiter plate reader, fermenters, laminar-flow hoods, and numerous incubators, baths, and ovens for cell growth and temperature-controlled reactions. The facilities include dark rooms, X-ray facility, temperature-controlled plant and animal cell culture incubation chambers and walk-in rooms, and animal quarters. Labs and offices have Internet access and extensive computer facilities such as computerized image processing and microdensitometry. A new bioinformatic computational lab containing 20 new Dell and PC computers and several iMac stations has recently been opened within the department.

Highly specialized equipment in the Center for Advanced Materials in the Chemistry Department, such as transmission and scanning electron microscopes, scanning tunneling-atomic force microscope, secondary ion mass spectrophotometers, and X-ray diffractometers, are available for faculty and student research.

Faculty Research Interests

The graduate faculty in the Department of Biological Sciences are actively engaged in research in the following areas: bioinformatics, biochemistry, molecular biology, cell biology, immunology, neurobiology, developmental biology, tumor cell biology, biogeochemistry, and applied environmental microbiology.

Master's Programs in Chemistry

Specializations are offered in [analytical](#), [biochemistry](#), [inorganic](#), [organic](#), [physical chemistry](#), and [polymer science](#). This program provides opportunity for advanced study and research training in chemistry, both general and specialized. Provision also is made for the student to elect certain advanced subjects in related fields of mathematics, physics, and engineering.

The Department of Chemistry also offers two [Professional Science Master's Options in Chemistry](#) (one in chemistry and polymer science and the other in pharmaceutical biochemistry) which have different requirements than those outlined below.

Credit Requirements

A minimum of 30 credits is required for the Master of Science degree in Chemistry, with 18 credits being earned in courses; and 12 credits earned in graduate research. Of the 18 course credit minimum, exclusive of research, a minimum of 15 credits must be taken in chemistry. The remaining course credits (3 or more) may be taken in chemistry or in related fields such as physics, mathematics, biology or engineering. Credit normally is not allowed for 400 level subjects in chemistry except for those designated in the catalog or approved by a student's advisor. Each graduate program in chemistry must include at least three advanced subjects from three of the following areas: analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, physical chemistry, or polymer chemistry, unless such requirements have been met previously and approved by the department.

Requirements

Specialization in Analytical Chemistry

84.514 Advanced Analytical Chemistry

and two courses of the following:

[84.523 Organic Reaction Mechanism

or 84.568 Structural Analysis]

84.532 Advanced Physical Chemistry

84.550 Biochemistry I

84.543 Modern Inorganic Chemistry

84.580 Advanced Analytical Biochemistry

Specialization in Biochemistry

84.550 Biochemistry

84.551 Biochemistry II

and any three courses of the following:

84.568 Structural Analysis

84.514 Advanced Analytical Chemistry

84.526 Chromatography

84.523 Organic Reaction Mechanisms

84.532 Advanced Physical Chemistry

84.538 Biochemical Mechanisms

84.560 Advanced Physical Biochemistry

84.567 Advanced Computational Chemistry

84.569 Advanced Biocheminformatics

84.580 Advanced Analytical Biochemistry

Specialization in Inorganic Chemistry

84.543 Modern Inorganic Chemistry

84.532 Advanced Physical Chemistry

84.523 Organic Reaction Mechanisms

and one course from the following

84.514 Advanced Analytical Chemistry

84.550 Biochemistry I

84.551 Biochemistry II

Specialization in Organic Chemistry

84.523 Organic Reactions, Mechanisms

84.524 Organic Synthesis

84.568 Structural Analysis

and at least two courses from the following:

84.532 Advanced Physical Chemistry

84.550 Biochemistry I

84.543 Modern Inorganic Chemistry

Specialization in Physical Chemistry

84.531 Statistical Thermodynamics

84.532 Advanced Physical Chemistry

84.513 Spectroscopy

84.523 Organic Reaction Mechanisms

84.543 Modern Inorganic Chemistry

84.540 Chemical Kinetics

Specialization in Polymer Science

Required: select from the following courses:

97.503 Advanced Polymer Science I

97.504 Advanced Polymer Science II

97.505 Polymer Preparation and Characterization

84.568 Structural Analysis

97.553 Organic Chemistry of Macromolecules

84.532 Advanced Physical Chemistry

84.523 Organic Reaction Mechanisms

Although the design of the academic program is the responsibility of the student's advisory committee, the following listing provides recommended courses for program development.

First Semester Subjects

97.503 - Advanced Polymer Science

97.505 - Polymer Preparation and Characterization

84.568 - Structural Analysis
97.553 - Organic Chemistry of Macromolecules
97.607 - Polymer Science Seminar
97.701 - Graduate Research in Polymer Science
97.549 - Physical Chemistry of Macromolecules
84.523 - Organic Reaction Mechanisms and Structure

Second Semester Subjects

97.504 - Advanced Polymer Science II
97.512 - Properties of Bulk Polymers
97.602 - Polymer Science Seminar
97.702 - Graduate Research in Polymer Science
84.434 - Colloid and Surface Chemistry
84.524 - Organic Synthesis
26.523 - Plastics Processing Techniques

Seminar Requirement

Each semester the student is required to attend and participate in the chemistry seminar/colloquium program 84.601,602, 603 and 604. In addition, a master's candidate is required to present one seminar.

Thesis Advisory Committee

An advisory committee should be selected jointly by the student and advisor at the earliest possible opportunity. A minimum of three (3) faculty members are required for the master's thesis committee. The student's advisor will serve as the chairperson of this advisory committee. The purpose of this committee is twofold. First, it will be responsible for ascertaining that the student's research was conducted and presented in final form, in a professional and acceptable manner. Perhaps of more importance, the committee will serve in an advisory capacity during the course of the research project. In this spirit it is recommended that the student convene a meeting of the selected committee prior to starting his/her research. The purpose of this meeting is to informally present an outline of the proposed research project.

Non-Thesis Masters in Chemistry (NTMC)

This program provides opportunity for advanced study in chemistry that must include at least three of the following areas: analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, physical chemistry, or polymer chemistry.

Credit Requirements

The NTMC degree requires 30 credits (10 courses). The following NTMC requirements must be met: 1) A total of 18 course credits (84- or 97-prefix) must be taken within the Chemistry Department at University of Massachusetts Lowell. 2) The remaining credits may be satisfied by either additional 84- or 97- courses or by transfer of up to 12 credits from a closely related program at a domestic university, including University of Massachusetts Lowell.

Note: Students who wish to pursue the NTMC degree who currently hold a B.S. or B.A. degree in chemistry or a related science, but do not have previous laboratory experience, may be required to take up to three undergraduate chemistry laboratory courses to ensure that they have sufficient laboratory skills upon completion of their NTMC degree.

Master of Science in Chemistry - Professional Science Master's Options

The Chemistry Department offers two Professional Science Master's Options within the Master's of Science in Chemistry. Please read the admissions requirements and programs requirements carefully as they are not identical.

[Professional Science Master's in Chemistry and Polymer Science Option \(PSMCPS\)](#)

[Admissions Requirements for the PSMCPS](#)
[Course of Study for the PSMCPS](#)

[Professional Science Master's in Pharmaceutical Biochemistry Option](#)

[Admissions Requirements for the PSMPB](#)
[Course of Study for the PSMPB](#)

Master's of Science - Professional Science Master's in Chemistry and Polymer Science Option (PSMCPS)

The goal of this program is to further educate ACS accredited chemists for a professional career in an industrial, government, or non-profit research setting.

This is a 32 credit program which requires the successful completion of 18 credits of chemistry/polymer science courses, 9 credits of management courses, 3 credits of management or chemistry electives, a one-credit ethics seminar; and a one-credit professional internship.

Applicants who have recently graduated, as well as, those who have worked in the chemistry/polymer field for multiple years, and foresee the potential of a managerial role in their future are urged to apply.

Chemistry Department Admissions Requirements for the PSMCPS:

Incoming students must possess an ACS undergraduate degree in chemistry (or its full equivalent) and have a minimum cumulative undergraduate GPA of 3.0 from an accredited college or university. Candidates with a closely related major may be admitted with the approval of the Graduate Program Coordinator.

Since advanced study is required in at least three disciplines of chemistry, a number of courses in Analytical/Environmental, Biochemistry, Inorganic, Organic, Physical and Polymer will be available every semester. All students must make up any deficiencies during the first year of their program.

Applications for the Professional Science Masters in Chemistry and Polymer Science are accepted year round, but it is recommended that completed applications be submitted one semester prior to expected matriculation.

Graduate Admissions Requirements:

General requirements for all applicants are a completed application packet supplied by the [Graduate Admissions Office](#) which includes:

- Graduate Admissions Application form
- A Statement of Purpose
- Three letters of recommendation pertaining to academic ability and/or professional performance
- Official score report for the Graduate Record Exam, with a satisfactory level score
- Official transcript(s)
- Application fee

Applications may be downloaded or submitted electronically from the [Graduate Admissions website](#).

PSMCPS Course of Study

Chemistry and Polymer Science Course Requirements (18-21 credits total)

Required Core Courses for Chemistry and Polymer Science (Choose 4 courses from the following list. Each course is 3 credits):

84.514 Adv. Analytical Chem.
84.524 Modern Organic Synthesis
84.532 Adv. Physical Chem.
84.543 Modern Inorganic Chemistry
97.503 Adv. Polymer Science I

Elective Courses for Chemistry and Polymer Science (Choose 2-3 courses from the following list. Students may also use the fifth course from the list above. Each course is 3 credits.):

84.523 Organic Reaction Mechanisms
84.526 Chromatography
84.550 Biochemistry I
84.568 Structural Analysis
84.580 Bioanalytical Chemistry
84.672 Surface and Colloid Chemistry
97.504 Adv. Polymer Science II
97.553 Organic Chemistry of Macromolecules

Provision is made for a student to elect certain advanced subjects in related fields of chemistry, mathematics, physics, and engineering with permission of PSM Coordinator & Faculty advisor.

Management Course Requirements (9-12 credits total): Students are required to take a minimum of six credits of advanced (600 level) courses. Up to two 2-credit basic courses may count towards the degree if they are advanced course prerequisites.

Required Advanced Management Courses (2 courses; 3 credits each):

66.635 Project Management
66.688 Professional Communication

Advanced Elective Management Courses (1-2 Courses; 3 credits each)

61.640 Financing Innovation & Technology Ventures
62.630 Market Research for Entrepreneurs
64.650 Innovation & Emerging Technology
66.630 New Product Development

Basic Courses (2 credits each) maybe prerequisites of advanced courses. If necessary, up to two of the following 2 credit courses can be counted towards the program requirements

60.501 Financial Accounting
61.501 Business Financial Analysis

Other courses may be substituted with permission of the PSM Coordinator and the Faculty Advisor.

Required Science and Ethics Seminar (1 credit total)

Required Professional Internship: (1 credit total)

The duration of the internship component of the PSM degree is expected to be a minimum of 340 hours and be 3 to 6 months in duration. The student will work within a business, government agency or research institute directly related to their area of chemistry. The student is encouraged to participate in real world work situations involving not only technical problems, but also teamwork, communication skills and decision-making.

Before commencing the internship a student must be formally enrolled in the PSM program, have completed a minimum of 18 credit hours (including one management and one ethics course) towards the degree, and have permission of their faculty advisor.

Upon completion the intern will be required to submit a paper in thesis format and defend an oral presentation of their work.

Students who possess a full-time position in business, industry or government will be permitted to use work related to their current position as an internship.

Professional Science Masters in Pharmaceutical Biochemistry (PSMPB)

The goal of this program is to further educate scientists with strong backgrounds in chemistry/biochemistry for a professional career in an industrial, government, or non-profit research pharmaceutical setting. This is a 32 credit program which requires the successful completion of 18 credits of chemistry/biochemistry coursework, 9 credits of management course work, an additional three credits of chemistry or management electives, a one-credit ethics seminar, and a one-credit professional internship.

Applicants who have recently graduated, as well as, those who have worked in the biochemistry/pharmaceutical field for multiple years, and foresee the potential of a managerial role in their future are urged to apply.

Chemistry Department Admissions Requirements for the PSMPB:

- The PSMPB program will consider applicants with BA/BS undergraduate degrees in chemistry, biochemistry, biology, health professions or related disciplines who possess a significant chemistry background and have a minimum cumulative undergraduate GPA of 3.0 from an accredited college or university.
- Since advanced study is required in at least three disciplines of chemistry, a number of courses in Analytical/Environmental, Biochemistry, Inorganic, Organic, and Physical Chemistry will be available every semester. All students must make up any deficiencies during the first year of their program.
- Applications for the Professional Science Masters in Chemistry and Polymer Science are accepted year round, but it is recommended that completed applications be submitted one semester prior to expected matriculation.

Graduate Admissions Requirements:

General requirements for all applicants are a completed application packet supplied by the [Graduate Admissions Office](#) which includes:

- Graduate Admissions Application form
- A Statement of Purpose
- Three letters of recommendation pertaining to academic ability and/or professional performance
- Official score report for the Graduate Record Exam, with a satisfactory level score
- Official transcript(s)
- Application fee
- Applications may be downloaded or submitted electronically from the [Graduate Admissions website](#).

PSMPB Course of Study

Pharmaceutical Biochemistry Course Requirements (18-21 credits total)

Required Core Courses for Pharmaceutical Biochemistry (All students must take 84.550 and 84.562 PLUS two courses from the following list. Each course is 3 credits):

84.550 Biochemistry I

84.562 Pharmaceutical Biochemistry

And two courses from the following list:

84.560 Adv. Physical Biochemistry

84.563 Chemistry of Natural Products

84.570 Protein Chemistry

84.580 Bioanalytical Chemistry

Elective Courses for Pharmaceutical Biochemistry (Choose 2-3 courses from the following list or an additional course from the above list. Each course is 3 credits.):

84.514 Advanced Analytical Chemistry

84.526 Chromatography

84.538 Biochemical Mechanisms
84.543 Modern Inorganic Chemistry
84.551 Biochemistry II
84.567 Computational Biochemistry

Provision also is made for the student to elect certain advanced subjects in related fields of chemistry, health sciences, biology, and other related disciplines with permission of PSM Coordinator & Faculty advisor.

Management Course Requirements (9-12 credits total):

Required Courses (2 courses; 3 credits each):

66.635 Project Management
66.688 Professional Communication

Elective Courses (Students choose 1-2 courses from the following list. Each course is 3 credits.)

61.640 Financing Innovation & Technology Ventures
62.630 Market Research for Entrepreneurs
64.650 Innovation & Emerging Technology
66.630 New Product Development

Other courses may be substituted with permission of the PSM Coordinator and the Faculty Advisor.

Science and Ethics Course (1 credit total)

Professional Internship: (1 credit total)

The duration of the internship component of the PSM degree is expected to be a minimum of 340 hours and be 3 to 6 months in duration. The student will work within a business, government agency or research institute directly related to their area of chemistry. The student is encouraged to participate in real world work situations involving not only technical problems, but also teamwork, communication skills and decision-making. Before commencing the internship a student must be formally enrolled in the PSM program, have completed a minimum of 18 credit hours (including one management and one ethics course) towards the degree, and have permission of the PSM coordinator and their faculty advisor. Upon completion the intern will be required to submit a paper in thesis format and defend an oral presentation of their work. Students who possess a full-time position in business, industry or government will be permitted to use work related to their current position as an internship.

Please address any inquiries to Chemistry PSM Coordinator: [Dr. Melisenda J. McDonald](#).

Doctoral Programs in Chemistry

Doctor of Philosophy (Ph.D.) in Chemistry

Specializations:

- Analytical
- Inorganic
- Organic
- Physical

Options:

- [Ph.D. Option in Biochemistry](#)
- [Ph.D. Option in Environmental Studies](#)
- [Ph.D. Option in Green Chemistry](#)
- [Ph.D. Option in Polymer Science and Polymer Science/Plastics Engineering](#)

Specializations

Analytical, Inorganic, Organic and Physical Chemistry

The doctoral program in chemistry is designed to provide the students with a background in advanced course work and chemical laboratory techniques that will prepare them to carry out, under the guidance of experienced scientists, an original, independent investigation that will lead to an acceptable contribution to the body of contemporary knowledge.

Plan of Program

The doctoral degree normally requires four years of study beyond the bachelor's degree or a minimum of two to three years beyond the master's degree. The plan of study pursued by each student is dependent on individual requirements and is developed through a conference with the Advisory Committee (or with his or her temporary advisor). The initial part of the student's program, normally completed at the end of two years of study, is devoted to formal course work. The first year is usually given to subjects in the major branches of chemistry in preparation for area (candidacy) examinations. The second year is devoted primarily to advanced subjects in a special field of concentration. The second and final part of the program is devoted principally to research leading to the doctoral thesis. However, the student is encouraged to begin research as early as possible in the program of study.

Research Tools Requirements

These research tools may be a second foreign language, a computer language, a statistics course or another skill acceptable to both the Graduate Coordinator and the research advisor of the student. The language(s) selected may not include the native language of a student's country of origin. Students in all Ph.D. programs may fulfill this requirement by 1) two foreign language courses; 2) one foreign language and a research skill course or 3) two research skill courses. Language Requirement may be met by completion of a two-semester undergraduate course sequence in French, German, Japanese or Russian with an average grade of B or better satisfies this requirement. Research skill requirement may be met by taking courses in programming and/or Statistics.

Credit Requirements

Of the 45 minimum credit requirements, a minimum of 27 credits in course work, exclusive of thesis and seminar, is required with at least 18 to be taken in chemistry. The remaining course credits (9 or more, with a student's Advisory Committee having the authority to add 6 additional credits to the minimum in special situations) may be taken in chemistry or in a related field such as biology, physics, mathematics or engineering. Credit is not normally allowed for undergraduate subjects in chemistry except for those so designated in the catalog. Research credits and seminars would then make up the remainder of the 45 credit requirements. Planning the program of courses with the student is the responsibility of a student's Advisory Committee.

Course Requirements

Each student in any of the Ph.D. programs in Chemistry shall take both an advanced course in Physical Chemistry and Organic Chemistry and two courses from Advanced Inorganic, Advanced Analytical, Biochemistry, or Polymer Chemistry unless such requirements have been met previously. Since each division (Analytical, Biochemistry, Organic and Physical/Inorganic) has its own specific course requirements, a student intending to specialize in one of these areas is encouraged to meet with the coordinator of that program.

A. Course Requirements (Ph.D.): Analytical Chemistry Specialization

27 Credits in course work are required. They are:

- 84.514 Advanced Analytical Chemistry
- [84.523 Organic Reaction Mechanisms or
84.568 Structural Analysis]
- 84.532 Advanced Physical Chemistry
- 84.538 Biochemical Mechanisms
- 84.543 Modern Inorganic Chemistry
- 84.550 Biochemistry I
- 84.580 Advanced Analytical Biochemistry

Note: With the exception of 84.514, Advanced Analytical Chemistry, one of the following courses may be substituted but only with the permission of the student's faculty advisor and the analytical coordinator. Of the remaining 15 credits at least 6 must be in chemistry. The approval of the advisor and analytical coordinator are required for non-chemistry courses. Such courses must be justified as being relevant to the student's course of study.

B. Course Requirements (Ph.D.): Inorganic Chemistry Specialization

Required Courses:

- 84.532 Advanced Physical Chemistry
- 84.543 Modern Inorganic Chemistry
- 84.534 Quantum Chemistry
- 84.540 Chemical Kinetics
- 84.523 Organic Reaction Mechanisms
- One course to be selected from:
 - 84.514 Advanced Analytical Chemistry
 - 84.550 Biochemistry I
 - 84.551 Biochemistry II
 - 84.580 Advanced Analytical Biochemistry

The remaining 9 credits may be taken in chemistry, mathematics or engineering.

C. Course Requirement (Ph.D.): Organic Chemistry Specialization

Required Courses:

84.523 Organic Reaction Mechanisms

84.524 Organic Synthesis

84.532 Advanced Physical Chemistry

84.568 Structural Analysis

And two courses selected from the following:

84.514 Advanced Analytical Chemistry

84.534 Quantum Chemistry

84.538 Biochemical Mechanisms

84.543 Modern Inorganic Chemistry

84.550 Biochemistry I

The remaining course requirements may be fulfilled by selecting courses from the following list or from graduate courses offered by other departments.

84.527 Stereochemistry

84.563 Chemistry of Natural Products

84.565 Heterocyclic Chemistry

D. Course Requirements (Ph.D.): Physical Chemistry Specialization

Required courses:

84.532 Advanced Physical Chemistry

84.523 Organic Reaction Mechanisms

84.543 Modern Inorganic Chemistry

and a choice from the following:

84.513 Spectroscopy

84.514 Advanced Analytical Chemistry

97.503 Advanced Polymer Science I

Written Area Examinations

Upon admission to the Ph.D. program the student must pass exams in his/her major area of specialization. The method of conducting these area exams is designated by the staff in each field of specialization, as follows:

Analytical Chemistry

The area examinations for analytical chemistry will consist of a series of six (6) examinations. The first will be a qualifying examination used to test the student's general knowledge of Analytical Chemistry. The student will have two opportunities to pass the qualifying examination with a score of 5.0 out of 10.0 points. This qualifying exam will be administered at the beginning and end of the area exams. The area examinations will be offered annually, commencing in October and administered at monthly intervals. A minimum of 6.0 out of a possible 10.0 points is required for each individual examination and a total of at least 30.0 out of a possible 50.0 points is required for the successful completion of the Written Area Examination. Failure to perform adequately may result in the student being required to complete a master's degree. Continuation towards the Ph.D. degree will be considered on a Case-by-case basis.

Inorganic Chemistry

The area examinations in Inorganic Chemistry will be a series of cumulative examinations. The student is expected to begin the series of exams in the second year of study. The area examinations will consist of a series of five (5) examinations. The examinations are each graded from 0.0 to a maximum of 3.0 points. A student must receive a total of 8.0 points to successfully complete the area examinations. Students who do not receive the necessary points may complete a master's degree and with special permission apply for readmission to the Ph.D. program in Inorganic Chemistry.

Organic Chemistry

Organic students take a series of eight cumulative examinations, given once a month (except December), beginning in September of each year. The examinations are graded pass or fail and a student must pass four of the examinations. The examinations must be taken in consecutive months. Typically, a student will start the examinations in the second year of graduate study and must complete these examinations by the end of the third year of graduate study.

Physical Chemistry

By the third year of graduate study, a Ph.D. student in physical chemistry must take a comprehensive examination. This is an all day written examination with questions designed to test the student's physical chemistry background, and ability to set up models and solve them mathematically. The student has two chances to pass the comprehensive examination.

Research Proposal

As part of the area examination(s) a Ph.D. candidate must present an oral defense of an original research proposal within 3 months of completing the written area examinations although a specific program may require the proposal to be presented at an earlier date. With the aid and advice of the Advisory Committee the student selects a suitable subject for investigation, completes a literature survey, outlines the method of approach, and suggests possible results and conclusions. The oral defense of this proposal is conducted by the student's Advisory Committee with other faculty members in attendance. The proposal is defended by the end of the semester following completion of area exams. The topic of the proposal cannot be closely related to or contained within the thesis project.

Chemistry Seminar

During each year of residence the student is required to attend and participate in 84-601,602, Chemistry Seminar, and 84-603,604, Chemistry Colloquium. Each doctoral student is required to present two seminars.

Candidacy for the Doctorate in Chemistry

To be admitted to candidacy for the doctorate, a student must:

1. Satisfy the 27 course credit requirement, with a minimum Grade Point Average of 3.0.
2. Pass the area examinations, which includes completion of a research proposal.
3. Fulfill the research tools requirements.
4. Inform the graduate coordinator in writing that the above requirements have been completed.

Ph.D. Option in Biochemistry

The Departments of Chemistry, Biological Sciences, Computer Science, and Health and Clinical Sciences have developed a program in biochemistry that results in the awarding of a Ph.D. in Chemistry. This program draws upon the special and diverse talents of these faculties, and provides chemistry graduate students with both in-breadth class work and in-depth thesis research. Emphasis is on the application of modern techniques and concepts of physical and chemical science to the solution of problems of current interest in biology and medicine.

Students may choose one of four concentrations in the Biochemistry Option:

1. Biochemistry
2. Cellular and Molecular Biology
3. Clinical/Nutritional Biochemistry
4. Biocheminformatics

Dissertation research can be conducted in any of the aforementioned departments or in an interdisciplinary setting.

Admission Requirements and Removal of Undergraduate Deficiencies

Admission to the program requires demonstration of an acceptable B.S., B.A., or M.S. degree in chemistry, biology, biochemistry or other related science. Students will be expected to have completed two semesters each of general, organic and physical chemistry as well as introductory biology. Deficiencies must be removed by enrolling in the corresponding undergraduate course during the first year in the program.

Academic Standards for Retention in the Biochemistry Program

The graduate student is expected to maintain an average of 3.0 or better in all his/her graduate-level courses. All other department requirements must also be met.

Research Tools Requirement

These requirements have been described above.

Degree Requirements

There are 45 credits required for the Ph.D. in Chemistry, Biochemistry Option. A total of 27 of these must be in formal courses while the remaining 18 will be accrued in Doctoral Dissertation. Of the 27 required hours of graduate course work, the Biochemistry Program requires that 15 hours are in the specific courses delineated below:

84.550 Biochemistry I

- 84.551 Biochemistry II
- 84.538 Biochemical Mechanisms
- 84.560 Advanced Physical Biochemistry
- 84.580 Advanced Analytical Biochemistry

The remaining elective courses (a minimum of 12 hours) may be selected from approved graduate courses in the Biology Sciences, Chemistry, Health & Clinical Sciences, or Chemical Engineering Departments. Course selection should be made in consultation with the student's research advisor. Below is a list of possible elective courses.

- 84.514 Advanced Analytical Chemistry
- 84.526 Chromatography
- 84.543 Modern Inorganic Chemistry
- 84.563 Chemistry of Natural Products
- 84.567 Advanced Computational Chemistry
- 84.569 Advanced Biocheminformatics
- 84.570 Advanced Protein Chemistry
- 10/81.535 Principles of Cell and Microbe Cultivation
- 10/81.545 Isolation and Purification of Biotech Products
- 81.567/569 Recombinant DNA Techniques
- 81.576/578 Cell Culture
- 81.593 Immunology
- 36.506 Biochemistry of Lipids
- 36.552 Advanced Clinical Biochemistry Seminars

During each semester in residence all full-time students must register for a seminar course and attend one seminar each week, as required by the Chemistry Department. The student is required to present two one-hour presentations during his/her residence.

Research

A. Initiation of Research ? Preceptor Selection Procedure

The dissertation research of each graduate student may be initiated at any time but not later than the end of the second semester in the program. The student is advised to make serious efforts, prior to the summer following his/her first entrance to the program, to initiate faculty research interviews and attempt to identify the area of his/her research interest and particular research group which may be suitable for pursuing his/her research goals.

B. Examination Committee

The examination committee will be composed of four faculty members chosen after consultation by the student with his/her preceptor. Two of these members must be from the Department of Chemistry faculty.

Examinations

A. Comprehensive Exam

Please contact the biochemistry program coordinator concerning details about the area examination.

B. Oral Research Proposal must be presented within 3 months of completion of comprehensive exam. Failure to do so will result in the student being required to complete a master's degree before reentering the Doctoral Program. The student will be required to present and defend, orally, a research proposal in an area of biochemistry related to but not identical to that of his/her thesis. A written copy of the proposed research must be distributed to the Examination Committee at least one week prior to the examination. All members of the university community are welcome to attend these examinations. Failure to perform adequately in either the written proposal or the oral defense may result in the student being required to complete an M.S. degree. Continuation toward a Ph.D. degree will be judged on a case by case basis.

Admission to Candidacy for the Doctorate

To be admitted to candidacy for the doctorate, a student must:

1. Complete all required courses with necessary grade point average. There is an absolute minimum cumulative grade point average (GPA) requirement of 3.0 for all graduate work. At the end of the first semester, if a student is found to be below the minimum GPA, a written warning will be issued. If the cumulative GPA is not raised to 3.0 or higher by the end of the second semester in residence, the student will automatically be dropped from the Ph.D. program but allowed to continue toward a master's degree in Biochemistry with the approval of the graduate committee. While completing the M.S., a candidate must have a minimum GPA of 3.0 and maintain that GPA throughout the remainder of his or her career. Upon successful completion of the Master of Science degree, the student may reapply for admission to the doctoral program. Each case will be reviewed on an individual basis. Students reentering the Ph.D. program will then satisfy all the requirements for the degree including passing the comprehensive examination, presentation of their research proposal, and completion of their research and dissertation defense. Seminar presentations and course work accomplished to complete the master's degree will, of course, be cumulative.
2. Pass the area exams.
3. Fulfill the research tools requirement.
4. Successfully present and defend the Oral Research Proposal by the end of the fourth semester of full time study.
5. Present two seminars.
6. Secure written approval of his/her research preceptor and the chemistry graduate coordinator. When these requirements have been fulfilled, the Biochemistry Graduate Committee will recommend that the graduate coordinator of the Department of Chemistry notify the Registrar's Office to place the student on the list of candidates for the Ph.D. degree. Admission to candidacy in no way guarantees the granting of the degree.

Ph.D. Option in Environmental Studies

This graduate program is designed as an optional course of study to the traditional Ph.D. in Chemistry for students with backgrounds in engineering (civil, environmental and chemical engineering) and other sciences (physics, biology, etc.) as well as chemistry. Candidates will be exposed to advanced course work in chemistry and environmental engineering and will be able to choose an area of specialization that best suits their interests and previous experience. A combination of faculty from Chemistry, Work Environment and Civil Engineering with a variety of research expertise gives this program unique characteristics and affords the student the opportunity to perform practical interdisciplinary research. It is expected that most students will require at least four years beyond the Bachelor's degree and two years past the Master's degree.

Entrance Requirements

In addition to the requirements for admission listed in this catalog, applicant will have an earned bachelor's degree in one of the following fields: chemistry, chemical or civil engineering, biology, environmental sciences, geology or physics. Students will be expected to have satisfactorily completed undergraduate courses in analytical, organic, and physical chemistry, physics and calculus. However, applicants who have not completed courses in these areas of chemistry may remedy their deficiencies while in the program and, therefore, are encouraged to apply. Admissions will be determined by a committee consisting of faculty active in the program.

Program Outline

A total of 48 credits are required for the Ph.D. program. Of these, at least 30 credits must be in course work exclusive of seminar and the rest is usually in thesis research. Courses shown below are divided into three categories:

- core course requirements (9 credits),
- areas of specialization (12 credits), and
- elective courses (9 credits).

Additional elective courses from other departments may be substituted with the approval of the student's Advisory Committee.

In addition, full-time students must register for 84.601/84.602 or 18.502 Environmental/Analytical seminar every semester.

Each student will be required to give two seminars on current research topics during their graduate career. Students in the Environmental program must select a thesis advisor by the end of the second semester. At this time, an Advisory Committee is appointed and a plan of study is established. The Advisory Committee must consist of at least four members, including the thesis advisor. A minimum of two Chemistry Department faculty is required to be on the committee with two other members from any participating department. An additional member from another department may also be added if agreed upon by the student and thesis advisor. Students must maintain a 3.0 cumulative average in order to continue in the program.

Required Courses (21 credits):

I. Core Courses (9 credits)

84.514 Advanced Analytical Chemistry
 84.532 Advanced Physical Chemistry
 [84.523 Organic Reaction Mechanism or
 84.568 Structural Analysis]

II. Areas of Specialization (12 credits)

a. Analytical /Environment

14.567 Environmental Chemistry I (Aquatic Chemistry)
 14.568 Environmental Chemistry II (Fate and Transport)
 84.519 Environmental Chemistry III (Marine Chemistry)

84.526 Chromatography

b. Water Environment

14.567 Environmental Chemistry I (Aquatic Chemistry)
14.568 Environmental Chemistry II (Fate and Transport)
84.519 Environmental Chemistry III (Marine Chemistry)
14.562 Groundwater Hydrology

c. Air Environment

18.571 Air Pollution Phenomenology
18.523 Air Resources Management & Control
18.573 Air Pollution Laboratory (Monitoring and analysis)
14.568 Environmental Chemistry II (Fate and Transport)

III. Elective Courses (9 credits)

84.532 Advanced Physical Chemistry
84.523 Organic Reaction Mechanisms
84.568 Structural Analysis
14.567 Environmental Chemistry I (Aquatic Chemistry)
14.568 Environmental Chemistry II (Fate and Transport)
84.519 Environmental Chemistry III (Marine Chemistry)
84.526 Chromatography
84.586 Spectrochemical Analysis
14.562 Groundwater Hydrology
14.561 Physical Chemical Treatment Processes
18.568 Environmental Laboratory
18.571 Air Pollution Phenomenology
18.523 Air Resources Management
18.573 Air Pollution Laboratory (Monitoring and Analysis)
93.415 Advanced Atmospheric Dynamics I
93.416 Advanced Atmospheric Dynamics II
93.430 Atmospheric Diffusion
18.572 Energy and the Environment
92.591 Statistical Modeling and Data Analysis
14.565 Industrial Waste Water Treatment Processes
18.510 Water Resources Management
18.522 Solid Waste Management (Municipal, Industrial and Hazardous)
18.525 Epidemiology for Environmental Studies
18.527 Environmental Law
19.501 Industrial Hygiene
98.501 Radiation Safety and Control
98.503 Radiation Biology
98.508 Environmental Toxicology

Written Area Examinations (Cumulative Examinations)

Beginning in the second year of study, the student must pass examinations in their major area of specialization. The faculty administrators

examinations associated with the program and are based on course work either completed or in progress as well as seminars, scientific literature and accepted theory in the field of study. Environmental studies students take six cumulative examinations each of which focuses on a different area of environmental science and analytical chemistry. Students must take the examinations consecutively in a given academic year. The topic, date, time and faculty member in charge of a particular exam in the cumulative examination series will be given to the student prior to the first cumulative exam. Students taking cumulative exams are urged to meet with the individual faculty member preparing an exam for more specific information. If a student misses a cumulative exam a grade of zero will be assigned. There are no makeup cumulative exams.

Research Proposal

A Ph.D. candidate must submit an original research proposal and successfully pass an oral defense of that proposal in their second or third year of study. After consulting with their Advisory Committee, the student selects a suitable subject for investigation, completes a literature survey, outlines the method of approach, and suggests possible results and conclusions. The oral defense of this proposal is conducted by the student's Advisory Committee with other faculty in attendance. The proposal must be defended within three months following completion of the cumulative examinations.

Ph.D. Option in Green Chemistry

The doctoral program in chemistry is designed to provide the students with a background in advanced course work and chemical laboratory techniques that will prepare them to carry out, under the guidance of experienced scientists, an original, independent investigation that will lead to an acceptable contribution to the body of contemporary knowledge. The requirements of this Program exactly parallel the requirements of the Ph.D. Organic Chemistry Specialization with the exception that an additional 9 credits of course work are required above the 27 credit minimum required for the Organic Ph.D. Furthermore, the requirements of this program closely parallel those of the other highly successful doctoral programs in chemistry at UMass Lowell.

Plan of Program

The doctoral degree normally requires four years of study beyond the bachelor's degree or a minimum of two to three years beyond the master's degree. The plan of study pursued by each student is dependent on individual requirements and is developed through a conference with the Advisory Committee (or with his or her temporary advisor). The initial part of the student's program, normally completed by the end of two years of study, is devoted to formal course work. The first year is usually given to subjects in the major branches of chemistry in preparation for area (candidacy) examinations. The second year is devoted primarily to advanced subjects in a special field of concentration. The second and final part of the program is devoted principally to research leading to the doctoral thesis. However, the student is encouraged to begin research as early as possible in the program of study.

Credit Requirements

Of the 54 minimum credit requirements, a minimum of 36 credits in course work, exclusive of thesis and seminar, is required with at least 21 graduate credits to be taken in chemistry listed in the two sections that follow. Credit is not normally allowed for undergraduate subjects in chemistry except for those so designated in the catalog. Research credits and seminars would then make up the remainder of the 54 credit requirement. Planning the program of courses with the student is the responsibility of a student's Research Advisor and/or Advisory Committee.

Course Requirements:

84.523	Organic Reaction Mechanisms
84.524	Organic Synthesis
84.532	Advanced Physical Chemistry
84.568	Organic Structural Analysis

2. Required are three elective courses selected from the following courses having an 84- or 97- prefix:

84.514	Advanced Analytical Chemistry
84.538	Biochemical Mechanisms
84.543	Modern Inorganic Chemistry
84.550	Biochemistry I
97.503,504	Advanced Polymer Science I, II
84.563	Chemistry of Natural Products
84.526	Chromatography
84.672	Surface and Colloid Chemistry

3. Required are two additional courses:

At least one additional course having an 84- or 97- prefix OR a course from a closely related discipline.

4. In order to pursue the Green Chemistry Option, three additional courses taken above the 27 credit minimum defined above are needed to satisfy this Concentration. These courses require the approval of the Organic Chemistry/Green Chemistry Committee (Drs. Sandman, Chiang, Manohar). Pre-approved courses include:

19.503	Toxicology and Health
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19.550	Environmental Law and Policy
10.529	Experimental Conceptualization

Cumulative Examinations

Students in the Green Chemistry Option must pass four cumulative examinations to be taken at the beginning of the second full year of study. The exams will be given eight times in the Fall semester at two week intervals, and four must be passed to satisfy this requirement. The exams will be based on the required courses, seminars, and knowledge of the current literature from state-of-the-art journals such as Journal of the American Chemical Society, Journal of Organic Chemistry, Chemical Communications, Angewandte Chemie International Edition, Organic Letters, Accounts of Chemical Research, and Chemical Reviews.

Each cumulative examination will consist of announced and unannounced topics at the discretion of the examiner. The exam will be three hours in duration. The examining faculty will include the Organic Chemistry/Green Chemistry Committee. Topics to be covered on the examinations will be determined by the Committee. A faculty member from the Department of Chemistry at the University of Massachusetts Dartmouth may also be included, as appropriate in a given year when student(s) in the joint doctoral program with UMass Dartmouth are taking cumulative exams. The grading of each exam will be ?pass? or ?fail?.

Original Research Proposal

Upon completion of the cumulative examination requirement, a student must defend an original research proposal within 3 months. The topic of the proposal should be different from the research topic of the student. The defense will be public and the examining committee must have a minimum of two voting chemistry faculty members. There should be a thesis advising committee consisting of at least 4 UMass Lowell faculty members with a minimum of two voting chemistry faculty members. The rest of the committee members may include a co-advisor and non-chemistry faculty as voting members. The subject of the proposal requires approval of the Committee prior to presentation; unanimous decision of the Committee is required for the student to successfully satisfy this requirement.

Seminars

A student must present at least two seminars in the course of a Ph.D. program.

Selection of Advisor

By the end of the first academic year of graduate study, the student must select a research advisor in the Chemistry Department. A non-chemistry faculty member may be a co-advisor, but in such a case, the co-advisor is responsible for the support of the student.

Ph.D. Option in Polymer Science and Polymer/Plastics Engineering

Students in the Ph.D. Program in the Department of Chemistry may elect the Polymer Science or the Polymer Science/Plastics Engineering Option. The Polymer Science/Plastics Engineering Option doctoral program is organized jointly with the Department of Plastics Engineering. The program is designed to provide students with a background in advanced course work and laboratory techniques that will prepare them to carry out an original investigation leading to an acceptable contribution to the body of contemporary knowledge in the fields of macromolecules or plastics.

Plan of Program

The doctoral degree normally requires four years of full-time study beyond the bachelor's degree or a minimum of two to three years of full-time study beyond the master's degree. The plan of study pursued by each student is dependent on individual requirements and is developed through conference with his/her Advisory Committee (or temporary advisor).

All students entering the program must take the American Chemical Society Graduate Level placement examinations in organic, physical and analytical chemistry. An evaluation examination in polymer science is given to those who wish to be exempted from 97-503-504.

Requirements for Admission

Requirements for admission into the program are the same as those for students entering other Ph.D. programs in Chemistry. It is the student's responsibility to satisfy any admission requirements stipulated for the Ph.D. in Chemistry.

Undergraduate deficiencies in the student's background must be remedied promptly, usually by the end of the student's second semester. During this period, the student must also successfully complete graduate courses appropriate to his/her background. Students will not be formally admitted to the Ph.D. program if their grade point average is below B.

Advisory Committee

Upon admission the student will be assigned a temporary adviser by the Coordinator of the Graduate Polymer Program. The student's major thesis adviser will become the chairperson of the permanent Advisory Committee.

The Advisory Committee will meet at least once each semester to monitor the progress of the student's research.

Program Outline

The initial part of the program is devoted to formal course work. The first year usually is devoted to subjects in major branches of chemistry, polymers, and plastics in preparation for the student's area (cumulative) examinations. The student must choose a research

adviser before the end of the second semester and is normally expected to start research during the first summer.

Language Requirements

Pathways for satisfying the language requirements have been described previously under the Chemistry section of this catalog.

Written Area Examinations

Upon formal admission to the Ph.D. program the student is required to pass a series of consecutive cumulative area examinations. This requirement must be completed by the end of the third semester for students entering in the fall semester, and by the end of the fourth semester for students entering in the spring semester. Policy and grading underlying each examination will be announced at the beginning of each academic year.

Each student must also present an oral defense of an original research proposal within six months after the completion of the last area exam.

Course Requirements

Of the 45 minimum credit requirements a minimum of 27 credits in course work, exclusive of thesis and seminar, is required with at least 18 to be taken in chemistry and polymer science (84 and 97 prefixes). The remaining course credits (nine or more, with a student's Advisory Committee having the authority to add six additional credits to the minimum in special situations) may be taken in chemistry or in a related field such as biology, physics, mathematics or engineering. Credit normally is not allowed for undergraduate subjects in chemistry except for those so designated in the catalog. Research credits would then make up the remainder of the 45 credit requirement. The program of courses is the responsibility of a student's Advisory Committee and must include advanced subjects in the appropriate areas of chemistry, polymers, and plastics. When it is necessary to carry less than the normal credit load of 9 per semester, the student must apply to the chairman of the department through the chairman of his/her Advisory Committee for approval.

Required Courses: The student must take the following core courses:

a. Polymer Science:

84.523 Organic Reaction Mechanisms

84.568 Structural Analysis

84.532 Advanced Physical Chemistry

97.503 Advanced Polymer Science I

97.504 Advanced Polymer Science II

97.553 Organic Chemistry of Macromolecules

97.505 Polymer Preparation & Characterization

The following course schedule is suggested to prepare the students for the cumulative examinations:

First Semester

97.503	Advanced Polymer Science 1 3 cr
84.568	Structural Analysis 3 cr
26.503	Mechanical Behavior of Polymers 3 cr

Second Semester

97.504	Advanced Polymer Science II 3 cr
97.553	Organic Chemistry of Macromolecules 3 cr
84.532	Advanced Physical Chemistry 3 cr

Third Semester

97.505 Polymer Preparation and Characterization 2 cr

Cumulative Examinations

The remaining required courses may be taken in the following semesters.

In addition, the student must register for Polymer Seminar 97.601/602 and 97.603/604 Polymer Science Colloquium each semester.

b. Polymer Science/Plastics Engineering Option:

84.523 Organic Reaction Mechanisms

84.568 Structural Analysis
 84.532 Advanced Physical Chemistry
 97.503 Advanced Polymer Science I
 97.504 Advanced Polymer Science II
 97.553 Organic Chemistry of Macromolecules
 97.505 Polymer Preparation & Characterization
 26.503 Mechanical Behavior of Polymers
 26.506 Polymer Structure
 26.509 Plastics Processing I
 26.510 Plastics Processing II

The following course schedule is suggested to prepare the students electing the Polymer Science/Plastics Engineering option for the cumulative examinations:

First Semester

97.503	Advanced Polymer Science I 3 cr
26.509	Plastics Processing I 3 cr
26.503	Mechanical Behavior of Polymers 3 cr

Second Semester

97.504	Advanced Polymer Science II 3 cr
97.553	Organic Chemistry of Macromolecules 3 cr
26.510	Plastics Processing II 3 cr

Third Semester

97.505 Polymer Preparation and Characterization 2 cr

Cumulative Examinations

The remaining required courses may be taken in the following semesters.

In addition, the student must register for Polymer Seminar 97.601/602 and 97.603/604 Polymer Science Colloquium each semester.

Candidacy for Ph.D. Polymer Science, and Polymer Science/Plastics Engineering Option

To be admitted for candidacy for the doctorate, a student must:

1. Satisfy the course credit requirement with a minimum grade point average of 3.0.
2. Pass the area examinations which includes completion of the research proposal.
3. Fulfill the language requirements.
4. Secure the approval of his/her Advisory Committee and the Graduate Coordinator of the Department of Chemistry.

When these requirements have been fulfilled, the Graduate Coordinator of the Department of Chemistry notifies the Registrar's Office in writing and recommends that the student be placed on the list of candidates for Ph.D. degree. Admission to candidacy in no way guarantees the granting of the degree.

Graduate Certificates in Chemistry

[Chemistry](#)

[Environmental Biotechnology](#)

Chemistry

Department of Chemistry

Dr. Eugene Barry 978-934-3669
eugene_barry@uml.edu

This certificate is aimed at the baccalaureate scientist who would like to expand his/her expertise in a pertinent area of modern chemistry. The certificate consists of two required courses from the concentration core, plus two approved electives. Course credits earned through the Certificate Program are directly applicable to the course credit requirements of the M.S. and Ph.D. degrees.

Core Concentrations (2 courses required for each concentration):

Analytical Chemistry Sequence:

84.514 Advanced Analytical Chemistry
84.526 Chromatography

Biochemistry Sequence:

84.550 Biochemistry I
84.551 Biochemistry II

Physical Chemistry Sequence:

84.513 Spectroscopy
84.532 Advanced Physical Chemistry

Organic Chemistry Sequence:

84.523 Organic Reaction Mechanisms
84.568 Structural Analysis
... or
84.563 Chemistry of Natural Products

Polymer Sequence:

97.503 Polymer Science I
97.504 Polymer Science II

Advanced Materials Sequence:

84.510 Microscopy of Advanced Materials
84.568 Structural Analysis

After concentration courses are completed, students take any two additional courses listed above or from the list of electives.

Electives:

84.519 Environmental Chemistry
84.538 Biochemical Mechanisms
84.543 Modern Inorganic Chemistry
84.560 Advanced Physical Biochemistry
84.570 Advanced Protein Chemistry
84.580 Advanced Analytical Biochemistry
97.512 Properties of Bulk Polymers
97.553 Organic Chemistry of Macromolecules

Environmental Biotechnology

Biological Sciences, Chemistry, Civil & Environmental Engineering departments

Dr. Juliette Rooney-Varga 978-934-4715
juliette_rooneyvarga@uml.edu

Environmental biotechnology refers to the application of biological technologies to monitor, understand, and remediate environmental problems. This certificate combines courses that explore the ecological impact of anthropogenic environmental change with courses that provide training in current biological technologies that can be brought to bear on environmental problems. Recent advances in biotechnology are providing new avenues for investigating biologically mediated environmental processes, many of which were inaccessible using traditional approaches. New biological technologies are being developed to mitigate environmental problems. These include the biological remediation of pollutants, biological treatment of wastewater and drinking water, source tracking of microbial pathogens, and mitigation of toxic algal blooms. As environmental resources are increasingly strained and new biological technologies with the potential to improve our environment become available, the demand for professionals with training in environmental biotechnology will continue to increase.

Required Courses (choose two):

81.504 Environmental Microbiology
81.523 Biology of Global Change
14.578 Biological Wastewater Treatment

Elective Courses (choose six to eight credits):

84.580 Advanced Analytical Biochemistry

84.514 Advanced Analytical Chemistry
81.505/507 Bioinformatics (4 credits)
84.526 Chromatography
14.567 Environmental Aquatic Chemistry
14.568 Environmental Fate and Transport
14.595 Hazardous Waste Site Remediation
81.567 Recombinant DNA Techniques
81.569 Recombinant DNA Techniques Laboratory (2 credits)

Total: 12-14 credits

Department of Chemistry

The following graduate programs are offered:

- [Doctor of Philosophy in Chemistry](#)
 - Specializations include:
 - Analytical
 - Inorganic
 - Organic
 - Physical
 - Option in Biochemistry
 - Option in Environmental Studies
 - Option in Green Chemistry
 - Option in Polymer Science or Polymer Science/Plastics Engineering
- [Master of Science in Chemistry](#)
 - Specializations include:
 - Analytical
 - Biochemical
 - Inorganic
 - Organic
 - Physical
 - Polymer Science
- [Master of Science in Chemistry - Professional Science Master's \(PSM\) Options](#)
 - Chemistry and Polymer Science
 - Pharmaceutical Biochemistry
- [Graduate Certificates](#)
 - Chemistry
 - Environmental Biotechnology

The Department of Chemistry at University of Massachusetts Lowell offers both the Master's Degree in Chemistry and the Doctor of Philosophy Degree in Chemistry. The options and specializations allow interdisciplinary study and involve interaction between chemistry and other departments at the University of Massachusetts Lowell.

Overall Departmental Entrance Requirements:

1. A Bachelor's Degree in Chemistry or a related discipline (which requires a solid base in Chemistry).
2. An Undergraduate GPA of 3.0 (or its equivalent).
3. A minimum combined score of 1500 on the GRE. (A score of 1600 for polymer science applicants).
4. A minimum combined GRE Verbal and TOEFL of 1000 (for international students whose native language is not English).
5. Students not meeting these requirements are invited to enroll in the [Graduate Certificate Program](#) and reapply.

Ph.D. in Computer Science Bio/Cheminformatics Option

Students who are interested in pursuing the Bioinformatics option within the Doctor of Philosophy Degree in the Department of Computer Science are admitted through the Computer Science Department and must adhere to the department's Graduate Academic Policies and Procedures along with Graduate School requirements.

Ph.D. Candidacy Requirements

In addition to acceptance into the program, in order to be admitted to candidacy, a student must:

- Complete the degree requirements for the [MS in CS](#) (Bio/cheminformatics option)
- Pass the departmental [qualifying exams](#) which may include the addition of a fourth qualifying exam in an area covering Bio/Cheminformatics.

Ph.D. Course Requirements

Major and Minor Area Courses: (12 credits, 4 courses)

The major and minor area course requirements for the Ph.D. degree are in addition to the Master's degree. The primary purpose of

these major and minor courses is to provide breadth of knowledge. Therefore, students are encouraged to select courses from a variety of areas which for Bioinformatics students will help build a high level of biomedical computing expertise. Database I is required for all Doctorate students in the Bio/Cheminformatics option. This course may be taken as one of a course pair (or prior to a student's matriculation in the program).

Electives (Bio/Cheminformatics Courses, 6 credits, 2 courses)

Bio/cheminformatics students are required to take 2 courses (6 credits) in the approved Bio/Cheminformatics elective list. These courses will be in addition to the three courses (9 credits) taken at the Master's Degree level. These electives will be chosen under the direction of an advisor, from the approved list of courses.

Total Course Credits: 18

Dissertation

The dissertation will be supervised by faculty from the Computer Science Department along with appropriate multidisciplinary faculty (which may include Biological Sciences, Mathematical Sciences, and Chemistry).

Ph.D. Thesis: 24

Program total: 42 credits

Sample Program

91.541 Data Visualization (or Algorithm 1)

91.580 Computational Methods in Molecular Biology or (Data Mining or AI)

91.504 Algorithms 2

91.553 Parallel Processing

84.551 Biochemistry 2

84.570 Advanced Protein Chemistry

(This sample program presumes that student has taken Database I)

Students should be aware that the above courses may only be used toward the Bio/Cheminformatics option. If the entire requirements of the option are not completed then these courses cannot be applied in isolation toward the degree in Computer Science.

MS and Ph.D. Course Pairs

The following is the list of approved course pairs for both the MS and the Ph.D.

NOTE: Among all course pairs for the MS and Ph.D. combined, at most one pair may contain a course "piggybacked" onto a core course.

91.563 Data Communications I
91.564 Data Communications II

91.563 Data Communications I
91.555 Computer Networks

91.515 Operating Systems I
91.516 Operating Systems II

91.546 Graphics I
91.547 Graphics II

91.546 Graphics I
91.541 Scientific Data Visualization

91.527 Human-Computer Interaction
91.568 Human-Computer Interaction Seminar

91.527 Human-Computer Interaction
57.521 SWD in Context (formerly 65.790)

91.527 Human-Computer Interaction
91.565 Evaluation of Human-Computer Interaction

91.522 Object-Oriented Analysis and Design
91.523 Software Engineering I

91.523 Software Engineering I
91.524 Software Engineering II

91.523 Software Engineering I
91.521 A Discipline for Software Engineering

91.523 Software Engineering I
91.526 Project Management

91.573 Database I
91.574 Database II

91.551 Computer Architecture
91.553 Parallel Processing

91.551 Computer Architecture
91.515 Operating Systems I

91.515 Operating Systems I
91.520 Storage Architecture

91.515 Operating Systems I
91.553 Parallel Processing

91.504 Algorithms II
91.553 Parallel Processing

91.503 Algorithms I
91.504 Algorithms II

91.531 Programming Language Design
91.538 Semantics of Programming Languages

91.531 Programming Language Design
91.539 Computational Logic

91.538 Semantics of Programming Languages
91.539 Computational Logic

91.543 Artificial Intelligence
91.538 Semantics of Programming Languages

91.543 Artificial Intelligence
91.539 Computational Logic

91.513 Internet and Web Systems I
91.514 Internet and Web Systems II

91.534 Compiler Writing I
91.535 Compiler Writing II

91.531 Design of Programming Languages
91.534 Compiler Construction I

91.548 Robot Design
91.549 Mobile Robots

91.561 Computer Security I
91.562 Computer Security II

91.543 Artificial Intelligence
91.544 Machine Learning and Data Mining

See [course descriptions](#).

MS in Computer Science - Entrepreneurship Option

Entrepreneurship Option

This is a Master's Degree Option within the Computer Science Graduate Program. It is directed to people with a strong undergraduate background in Computer Science who are interested in both deepening their technical knowledge and in understanding the tools required for developing a company directed towards software services and products.

Admission Requirements: as specified in the Catalog for admission to the MS program in Computer Science.

MS Requirements

Non-thesis option:

- 7 courses from Computer Science, satisfying the MS core and distribution requirements. (total of 21 credits)
- 3 College of Management courses (total of 9 credits) chosen from:
 - 64.650: Innovation and Emerging Technologies (3 credit)
 - 62.630: Market Research for Entrepreneurs (3 credit)
 - 61.640: Financing Innovation and Technology Ventures (3 credit)
 - 66.630: New Product Development (3 credit)

and taken within the first two semesters of full-time study (first six graduate courses).

1 course from either Computer Science or Management, as deemed appropriate in consultation with the faculty advisor(s). (3 credits)

Total Credits: 33

Thesis option:

- 6 courses (18 credits) from Computer Science, satisfying the MS core and distribution requirements.
- 3 College of Management courses (9 credits) chosen from:
 - 64.650: Innovation and Emerging Technologies (3 credit)
 - 62.630: Market Research for Entrepreneurs (3 credit)
 - 61.640: Financing Innovation and Technology Ventures (3 credit)
 - 66.630: New Product Development (3 credit)

and taken within the first two semesters of full-time study (first six graduate courses).

- 6 credits of Master's Thesis. The primary advisor shall be from CS, with a member of the thesis committee from the College of Management. The thesis will articulate the results of appropriate market research, a detailed business plan, and will deliver a prototype of a product. A course taken from either CS or Management could substitute for 3 thesis credits, if approved by both advisors as being critical for the thesis.

Total Credits: 33

Master of Science Degree in Computer Science

- [Admissions requirements](#)
- [Matriculated Spring 2010 and later](#)
- [Matriculated Sept. 2008 or later](#)
- [Matriculated between Sept. 1997 and August 2008](#)
- [Master's thesis](#)
- [Bioinformatics Option](#)
- [Entrepreneurship Option](#)

Admissions requirements

Admissions requirements for the MS in CS are designed to ensure that MS candidates enter the program on roughly the same level as our own BS in CS graduates. See [CS Graduate Admissions Requirements](#) for details.

[MS degree requirements for students matriculated Spring 2010 and later](#) (pdf)

[MS degree requirements for students matriculated September 2008 and later](#) (pdf)

MS degree requirements for students matriculated between September 1997 and August 2008

Each degree candidate will be required to pass, with an average of B or better, and not more than two grades below B, the following minimum number of credits, distributed to include one project and one general area:

Core courses

91.502 Foundations of CS

91.503 Algorithms

91.531 Design of Programming Languages

Project Area

6 credits (2 courses with programming assignments from the [course pairs list](#))

General Area

6 credits (2 courses, not necessarily project-related, from the [course pairs list](#))

Electives

3 elective courses

Total: 30 credits

At most one core course can be used to form either a project pair or a general pair of related courses.

See the graduate catalog for course descriptions.

Master's Thesis

An optional master's thesis can be substituted for at most six credits, and can be used to substitute for one pair of Project- or General-area courses. Students who wish to do a thesis must file a Proposed Thesis Committee form with the Graduate Coordinator prior to beginning work on the thesis.

Doctor of Philosophy Degree Coursework Requirements

- [Admission Requirements](#)
- [Candidacy Requirements](#)
- [Course Requirements for Students Matriculated Jan. 2009 or later](#)
- [Course Requirements for Students Matriculated Prior to Jan. 2009](#)
- [Additional Requirements](#)
- [Computational Mathematics Option](#)
- [Bioinformatics Option](#)

Admission Requirements

The Ph.D. admission requirements include demonstration of knowledge of computer science at the Master's degree level, as evidenced by the successful completion of appropriate coursework. Applicants to the Computer Science Ph.D. program are encouraged to submit GRE Computer Science subject test scores. In some cases, this might help compensate for gaps in Computer Science academic background.

Candidacy Requirements

Despite acceptance into the program, in order to be admitted to candidacy, student must:

- complete the degree requirements for the MS in CS (unless he or she possesses an MS in CS or a closely related engineering, scientific, or mathematical discipline)
- pass the departmental qualifying examinations.

Course Requirements for Students Matriculated Jan. 2009 or Later

6 courses (18 credits) from the [Masters course group list](#), with at most 4 courses from a single [Masters course group](#). No course applied towards an MS degree can be used to satisfy course distribution requirements for the Doctoral degree.

Thesis Credits

24 Credits

Total: 42 credits

Course Requirements for Students Matriculated Prior to Jan. 2009

Major Area

6 credits ([course pairs list](#))

Minor Area I

6 credits (two courses from the [course pairs list](#))

Minor Area II

6 credits (two courses from the [course pairs list](#))

Ph.D. Thesis

24 credits

Total: 42 credits

The major and minor area course requirements for the Ph.D. degree are above and beyond the corresponding requirements for the MS degree, but may continue and deepen specializations begun at that level. The primary purpose of the major and minor courses is to provide breadth of knowledge. Therefore, students are encouraged to select courses from a variety of areas. Among all course pairs for the MS and Ph.D. combined, at most one pair may contain a course "piggybacked" onto a core course.

Additional Requirements

- passing qualifying exams ([rules](#))
- submission and defense at an oral examination of a thesis proposal
- completion of the thesis
- final defense of the thesis during another oral examination
- acceptance of two papers for publication in a peer-reviewed (refereed) journal or conference approved by the thesis advisor. At least one of these publications must be in the thesis area. This rule applies to students whose thesis proposals were defended on or after July, 2007.

Students are required to report completion of each of these milestones according to the [Procedures for Student Progress Through the Ph.D. Program](#).

Computational Mathematics Option

Requirements: (beyond a master's degree)

A. 18 Course Credits (6 courses)

91.515 Operating Systems

91.551 Computer Architecture

Four courses in advanced major/minor area electives chosen, under the direction of an advisor, from an approved list of courses

B. 24 Dissertation Credits

Supervised by faculty from the Mathematics and Computer Science Departments

C. Four Qualifying Exams

- Computer Science: Two out of the following three:

1. Programming Languages - based on 91.531.
2. Algorithms - based on 91.503
3. Foundations - based on 91.502.

- Mathematical Sciences

Two exams appropriate to the mathematical emphasis chosen.

Examples are:

1. Real Analysis - based on 92.501 and 92.502
2. One of
 - Probability and Mathematical Statistics based on 92.587, 92.588 and 92.591.
 - Optimization and Applied Probability based on 92.587, 92.572 and 92.585.
 - Differential Equations and Approximation.
 - Combinatorics and Number Theory.

Any student interested in this program should contact the Chair of the CS Department and/or the Chair of the Mathematics Department.

M.S. in Computer Science Bio/Cheminformatics Option

[Admissions Criteria and Requirements](#)

[Core Courses](#)

[Course Pairs](#)

[Electives](#)

Admissions Criteria and Requirements

Applicants for admission to the Master of Science Program with a Bio/Cheminformatics option typically have an undergraduate degree in computer science or a related discipline such as mathematics, physics, biochemistry or engineering. Students wishing to enroll in the Master's program in Computer Science with Bio/Cheminformatics option must demonstrate competency in the knowledge areas listed below. Competency in these areas is usually demonstrated by producing a transcript of previous academic experience which contains related courses passed with a B or better, or by earning a B or better in the courses listed below. Competency in the biology and chemistry area may be demonstrated by successfully passing a CLEP exam. Additional information regarding these exams may be obtained at the CollegeBoard website. The following are the knowledge areas in which competency must be demonstrated:

Biology 81.111 Principles of Biology I

Chemistry 84.121 Chemistry I and 84.122 Chemistry II

Discrete Mathematics 92.321 Discrete Structures I and 92.322 Discrete Structures II

C or C++ through Data Structures 91.250 Accelerated C with Data Structures or 91.101 Computing I and 91.102 Computing II

Programming Languages 91.301 Organization of Programming Languages

Computer Architecture 91.305 Computer Architecture

Operating Systems 91.308 Introduction to Operating Systems

Analysis of Algorithms 91.404 Analysis of Algorithms

Calculus 92.125 Calculus A and 92.126 Calculus B or 92.131 Calculus I and 92.132 Calculus II

Core courses: Total 9 credits

91.502 Foundations of CS

91.503 Algorithms

91.531 Design of Programming Languages

Course Pairs:

The following course pairs are selected from the approved list of Computer Science pairs, these courses have been chosen because they complement the goals of the bio/cheminformatics option.

Total 12 Credits (Two pairs of courses from the approved list of CS pairs.)

91.503 Algorithms I

91.546 Graphics I

91.504 Algorithms II

91.547 Graphics II

91.573 Database I

91.573 or 91.574 Database I or II

91.574 Database II

91.550 Data Mining

91.573 or 91.574 Database I or II

91.546 or 91.547 Graphics I or II

91.522 Analysis and Design

91.541 Scientific Data Visualization

91.523 or 91.525 Software Engineering I or II 91.550 Data Mining

91.523 or 91.525 Software Engineering I or II

91.521 SWD in Context

91.526 Project Management

91.503 or 91.504 Algorithms I or II

91.543 Artificial Intelligence

91.553 Parallel Processing

91.550 Advanced Data Mining

91.503 or 91.504 Algorithms I or II

91.513 Internet and Web Systems I

Topics Course Data Mining

91.514 Internet and Web Systems II

91.503 or 91.504 Algorithms I or II

91.503 or 91.504 Algorithms I or II

91.510 Computational Methods in Molecular Biology

91.543 Artificial Intelligence

Electives - Total 9 credits

Three additional courses will be taken from the list of approved bio/cheminformatics approved courses. The list below is for example only and it includes the current approved courses. This list will be updated as new courses are added to the program.

81.505* (3 credits) Bioinformatics

81.507* (1 credit) Bioinformatics Laboratory (coreq. 81.405)

81.519 (3 credits) Biochemistry I
81.520 (3 credits) Biochemistry II
81.501 (3 credits) Selected Topics I
81.502 (3 credits) Selected Topics II
81.567 Recombinant DNA Techniques
84.651 Selected Topics in Chemistry: Protein and Chemical Informatics
84.550 (3 credits) Biochemistry I
84.551 (3 credits) Biochemistry II
84.567 (3 credits) Biocheminformatics
84.568 (3 credits) Computational Chemistry
84.570 (3 credits) Advanced Protein Chemistry
84.580 Advanced Analytical Biochemistry
92.593 (3 credits) Experimental Design (Mathematics Department)

Although Organic Chemistry is not required as a prerequisite, some of the courses offered as part of this degree rely on knowledge of this subject.

Students should be aware that the above courses may only be used toward the Bio/Cheminformatics option. If the entire requirements of the option are not completed then these courses cannot be applied in isolation toward the M.S. in Computer Science.

Program Total: 30 credits (assuming prerequisites have been filled)

An optional master's thesis can be substituted for at most 6 credits, and may be used to substitute for one pair of related courses.

Graduate Certificate Programs

The department of Computer Science offers the following graduate level certificate Programs:

[Human-Computer Interactions](#)
[Network Security](#)
[System Models and Management](#)
[Telecommunications](#)

To fulfill requirements and earn a certificate, the required courses for the certificate must be completed within a five year period with a minimum 3.0 grade point average, and with no more than 3 credits below B. Courses completed for one certificate may not be used for another certificate.

Human-Computer Interaction Certificate

Coordinator:
Dr. Jill Drury
jldrury@mitre.org

Admission Requirements: Prerequisites as specified in the Catalog for admission to the MS program in Computer Science. Candidates with a Bachelor's degree in some other suitable area and extensive programming experience should contact the CS Graduate Program Coordinator.

All courses for the Human-Computer Interaction certificate may be used toward a graduate degree in Computer Science, subject to the approval of the Graduate Coordinator and meeting the requirements for admission to the MS program.

Core Courses:

- 91.527 Introduction to HCI (3 credits)
- 91.528 Evaluation of HCI (3 credits)
- 91.568 Seminar in HCI (3 credits)

Elective:

One three-credit course taken from the following list:

- 91.513 Internet and Web Systems I
- 91.514 Internet and Web Systems II

- 91.523, Software Engineering I
- 91.541 Data Visualization
- 91.546 Computer Graphics I
- 91.547 Computer Graphics II
- 91.548 Robot Design
- 91.549 Mobile Robots
- 91.550 selected Topics courses, such as Human-Robot Interaction or Multi-Touch Interaction, with permission of the Certificate Coordinator.
- 57.521 Software Design in Context
- or another three credit course with the permission of the Certificate Coordinator

Network Security

Coordinator:

Prof. William Moloney
978-934-3640
bill@cs.uml.edu

This certificate program is available to students who have an undergraduate degree in Information Technology, Computer Science, Information Systems and related majors. Students should be familiar with the 'C' programming language and have a math background that includes at least pre-calculus math, statistics and a first course in discrete structures. The certificate courses do not have pre-requisite requirements among themselves, and may be taken in any order.

NOTE: Courses taken for this certificate may not be used towards the MS in Computer Science degree.

Admission Requirements:

- Transcript showing proof of completion of an undergraduate BS or BA degree from an accredited institution
- Mathematical experience to include a minimum of one semester of pre-calculus, one semester of discrete mathematics and one semester of statistics, or the equivalent experience
- C programming proficiency, to include a minimum of one class of C programming and one class of data structures, or the equivalent experience
- Approval of the Graduate Coordinator

The following four three-credit courses are required (12 credits total):

- 94.561 Computer Network Security
- 94.562 Digital Forensics
- 94.563 Network Infrastructures
- 94.564 Secure Mobile Networks

Systems Models and Management

Coordinator:

Prof. William Moloney
978-934-3640
bill@cs.uml.edu

This certificate program is immediately available to students who have completed an undergraduate degree in Information Technology, Computer Science, Information Systems and related majors. Students should be familiar with the 'C' programming language and have a math background that includes at least pre-calculus math, statistics and a first course in discrete structures. The certificate courses do not have pre-requisite requirements among themselves, and may be taken in any order.

NOTE: Courses taken for this certificate may not be used towards the MS in Computer Science degree.

Admission Requirements:

- Transcript showing proof of completion of an undergraduate BS or BA degree from an accredited institution
- Mathematical experience to include a minimum of one semester of pre-calculus, one semester of discrete mathematics and one semester of statistics, or the equivalent experience
- C programming proficiency, to include a minimum of one class of C programming and one class of data structures, or the equivalent experience
- Approval of the Graduate Coordinator

Required Courses: The certificate is comprised of the following courses: (four 3-credit courses, Total 12 credits)

- 94.517 Operating Systems Foundations
- 94.518 Large Scale Application Deployment
- 94.511 Network and Systems Administration
- 94.519 Managing Virtual Systems

Telecommunications

Coordinator:
Dr. Byung Kim
978-934-3617

Byung_Kim@uml.edu or kim@cs.uml.edu

This graduate certificate consists of courses from both the Computer Science and Electrical Engineering Departments. It is intended for students who hold a baccalaureate degree in science or engineering and who wish to concentrate on hardware/software issues pertaining to telecommunications.

Admissions requirement:

- BS in Computer Science/Engineering/Mathematics

Course requirements:

- 91.563 Data Communications 1
- 91.555 Computer Networks
- 16.543 Introduction to Communication Theory
- or another three credit course with the permission of the Certificate Coordinator

All courses for the Telecommunications certificate may be used toward a graduate degree in either the Electrical Engineering or the Computer Science Department subject to the approval of the appropriate graduate coordinator and meeting the requirements for admission to the MS program.

Department of Computer Science

The UMass Lowell computer science graduate program provides computer scientists with an education of sufficient breadth and depth to prepare them for leadership positions in both industrial and academic environments. It is distinguished by a balanced mixing of the practical, engineering aspects of computer science, with substantial exposure to the theoretical foundations of the field. This mission is supported by departmental and university research labs and Centers. Our graduate program is intended primarily for students with undergraduate degrees in computer science, or for those who have completed a degree in a related area (Electrical Engineering, Mechanical Engineering, Mathematics, Physics, Management, etc.) and who possess a substantial background in computer science. Recognizing the interdisciplinary nature of computer science applications, the program features cooperation with allied departments in the Colleges of Arts and Sciences, Engineering, and Management. Students with strong interdisciplinary interests and abilities will be encouraged and advised on an individual basis.

[Resources](#)

[Master of Science](#)

[Master of Science, Entrepreneurship Option](#)

[Doctor of Philosophy](#)

[Admission Requirements](#)

Resources

The Computer Science Department has strong industrial ties through its faculty members, its participation in the research activity in various University Centers, its internal laboratories and institutes, its continuing relationships with many local computer and software manufacturers, and its industrial advisory committee. These relationships provide sources of short and long range research projects, hardware donations and student funding, while also providing insight to and understanding of the short and long term directions of local industry. To support instructional and research activities, the Department of Computer Science maintains a large heterogeneous network, including PCs, workstations, and a collection of more specialized equipment. All systems and servers are connected to /accessible via the University's network.

Department Research Groups / Laboratories:

- [Center for Biomolecular and Medical Informatics](#)
- [Compilers and Parallel Systems Research Group](#)
- [Computational Mathematics Research Group](#)
- [Computer Science Systems Lab](#)
- [Computing Theory and Algorithms Group](#)
- [Database and Software Systems Research Group](#)
- Human-Computer Interaction Research Group
- Laboratory for Artificial Intelligence and Robotics
- [Robotics Lab](#)
- [Institute for Visualization and Perception Research](#)
- [Network and Systems Security Laboratory](#)
- [Discovery and Knowledge Representation Research Group](#)
- [Information Sciences, Engineering and Technology \(ISET\) Research Scholars Program](#)

The Master of Science Degree Program

The Master of Science degree program in Computer Science serves several audiences, from the professional with extensive industrial

experience to the recent graduate aiming ultimately for an advanced research degree. In all cases, a major objective is to prepare the student for a professional work environment in which continued growth is the norm.

The Computer Science Department offers to outstanding undergraduates a Bachelor's-Master's (BS/MS) program. The major advantage of this program is that it allows students to integrate their undergraduate and graduate education, possibly reducing the amount of time required for completion and reducing the administrative overhead for the student.

To be accepted into the BS/MS program, students are expected to have at least a B (3.0) grade point average, both overall and in Computer Science, and to apply during their junior year. The rules governing eligibility for the program appear in the current [Graduate Catalog](#).

The Doctor of Philosophy Degree Program

The Doctor of Philosophy degree program aims to provide a student, whether planning on an industrial or academic career, with a challenging research environment and the opportunity to tackle theoretical or applied projects of major scope, depth, and originality.

Admission Standards and Criteria

General Requirements

In addition to the general requirements for admission listed in this catalogue, applicants for admission to the graduate program at both the Master of Science and Doctor of Philosophy level are expected to have an undergraduate degree in Computer Science or a related discipline such as Mathematics, Physics, or Engineering. They should submit the official application obtainable from the Graduate Admissions Office. Besides undergraduate transcripts and letters of recommendation, applicants are expected to submit an official score from the Graduate Record Examination, with the general part required and the advanced computer science part recommended. Any student may be required, at the discretion of the department, to complete transitional or remedial courses without graduate credit.

MS Requirements

In order to be fully matriculated into the MS program, students must demonstrate competency in the following eight knowledge areas:

- C or C++ programming and Data Structures
- Discrete Mathematics
- Calculus
- Analysis of Algorithms
- Programming Languages
- Computer Architecture
- Operating Systems
- Automata Theory

Competency is typically demonstrated by producing a transcript of previous academic experience which contains passing grades in courses related to these seven areas, or by earning a B or better in the courses below. Knowledge in areas that have not been satisfied at the time of entrance into the M.S. program become conditions on full matriculation. It is the student's responsibility to fulfill his /her conditions at the earliest possible time.

The following table lists courses which satisfy each of the eight knowledge areas.

Programming:

- 91.250 Accelerated C with Data Structures, or
- 91.101 Computing I and 91.102 Computing II, or
- 92.267 C Programming and 92.360 Data Structures

Discrete Math:

- 91.500 Fundamental Models, or
- 92.321 Discrete Math I and 92.322 Discrete Math II

Calculus:

- 92.131 Calculus I and 92.132 Calculus II

Algorithms:

- 91.404/94.404 Analysis of Algorithms

Languages:

- 91.301/94.301 Organization of Programming Languages

Architecture:

- 91.305/94.305 Computer Architecture

Operating Systems:

- 91.308/94.308 Introduction to Operating Systems

Automata Theory:

- 91.304/94.304 Foundations of Computer Science

These last five courses generally are generally offered each semester; registration is restricted to graduate students who are satisfying conditions on admission.

Ph.D. Requirements

Admission to the Doctor of Philosophy degree program requires the demonstration of knowledge of computer science at the Master's degree level, as evidenced by the successful completion of appropriate course work. To be admitted to doctoral candidacy, the student must pass a written departmental qualifying examination. At a subsequent oral examination, the student, under the direction of a faculty advisor, will propose a thesis topic and demonstrate his/her qualifications to pursue the research. Preparation of the thesis will be directed by a faculty advisor, and the completed thesis will be defended before a committee approved by the department. Representatives of industry and other universities may participate in thesis direction and support.

Financial Support

The Department has a limited number of teaching assistantships available to qualified graduate students. These assistantships can be renewed for up to four semesters. Other support is available through funded research programs in the departmental laboratories and, possibly, through support from other university departments.

Atmospheric Sciences Concentration - Master of Science in Environmental Studies

The M.S. program requires the completion of 30 credits, 9 in core courses, and 15 in elective courses listed below. Six credits may be achieved by completing a Masters Thesis. The thesis involves original laboratory or theoretical work, usually publishable in accredited and peer reviewed technical journals. With the Graduate Coordinator's approval, the thesis work may be performed at home or at the student's employment facilities. The thesis advisory committee will consist of a Principal Advisor who is the member of the EEAS faculty, and two members chosen from EEAS or associated UMass Lowell faculty. One member may be from outside the University, with the approval of the Graduate Coordinator. Students may elect to take additional courses instead of writing a thesis.

Most of the courses will be offered in the evening, usually from 6 to 9 PM, once per week. This enables working students to complete the course requirements while the student is employed. A maximum of 5 years is allowed for completion of the master's degree, including the thesis.

Core Courses

- 85.501 Boundary Layer Meteorology
- 87.575 or 84.575 Physical Chemistry for Environmental Studies
- 18.527 or 19.550 Environmental Law and Policy
- 49.615 Environmental and Natural Resources Economics

Elective Courses

- 85.502 Advanced Synoptic Meteorology
- 85.503 Remote Sensing of the Atmosphere
- 85.511 Solar Terrestrial Relations
- 85.515 Atmospheric Structure and Dynamics
- 85.523 Air Pollution Control
- 85.571 Air Pollution Phenomenology
- 85.673/19.617 Air Pollution Laboratory/Measurement of Airborne Contaminants
- 85.674 Air Quality Modeling
- 87.572 Energy and the Environment
- 92.550 Mathematical Modeling
- 98.613 Environmental Monitoring and Surveillance (Radionuclides)

For information on the Master's Program in Environmental Studies/Environmental Engineering, visit the [Civil and Environmental Engineering Department](#).

Department of Environmental, Earth & Atmospheric Sciences

- [Master of Science in Environmental Studies - Atmospheric Sciences Concentration](#)
- [Complete Course Listings](#)

The Department of Environmental, Earth and Atmospheric Sciences offers an atmospheric sciences concentration in the Environmental Studies Master's Program. Developed in close cooperation with the Department of Civil and Environmental Engineering, this program is focused on problems relating to air pollution, mesoscale meteorology, remote sensing and climate dynamics. The Department maintains specialized teaching /research laboratories, and cooperates closely with the Center for Atmospheric Research. Students will find that classes are integrated with laboratory work, field studies, and "hands-on" experiences.

Enrollment in this program is open to individuals with a baccalaureate degree in sciences, mathematics and engineering. Others may be admitted with the approval of the Graduate Program Coordinator. Such students may make up course prerequisite deficiencies while in the program, although these credits will not count toward the total required for the master's degree. Frequently, students entering the program are required to take a number of undergraduate courses to develop the analytical skills, and to prepare for the advanced level courses.

Marine Sciences and Technology Master's Program

The Marine Sciences and Technology Master's Program, offered by the School of Marine Sciences (SMS), requires a minimum of 30 credit hours with the thesis option and 33 credit hours with the non-thesis option. Students are required to take three core courses (9 credits) and choose additional courses (15 credit minimum for thesis option, 22 credit minimum for non-thesis option) appropriate to a selected area of concentration. Attendance at a weekly seminar series is required (1 credit each for two semesters), and each student must present at least one seminar in their third or fourth semester. Fulltime MS students normally complete their degree requirements in four semesters. Part-time MS students are encouraged to take two courses per semester.

Core Course Requirements

Each SMS student must complete three core courses (9 credits), which includes 2 out of 3 of the core courses in the biological, chemical, and physical oceanography and a third core course in marine policy and/or management areas (including law and economics). The Core column in the SMS course list identifies the core courses and their respective areas. The core courses are intended to provide a common grounding in the biological, chemical, and physical oceanographic areas of marine sciences and technology, and in related marine policy and management disciplines. Courses covering technology and quantitative skills are generally subject to student choice and guidance committee approval, though there may be requirements specific to each option area. At least two core courses are offered each semester using the University's substantial distance learning facilities and technology. Students normally complete the core courses in the first two semesters.

SMS has developed core courses, that are taught via distance learning, one in each of the core areas (biological, chemical, and physical oceanography), which will satisfy the requirements of SMS students. These courses will ensure that all SMS students master key concepts and skills central to an interdisciplinary marine sciences and technology graduate program. The core courses may be team taught in some cases.

Concentrations and Electives

To build on the core courses, each SMS student selects an area of concentration and chooses a marine policy or management core course and electives appropriate to this concentration, as approved by their faculty advisor and/or thesis committee. Concentrations and Courses describes the concentrations and lists the electives associated with each concentration.

Students typically take most of their elective courses on the campus where they and their major faculty advisor are in residence. Some elective courses, however, will also be taught via distance learning. In addition, students may choose to be in residence at different campuses for a period of time during their course of study, in order to take certain courses or to take advantage of research opportunities.

Weekly Seminars

Weekly seminars presented by students and by visiting speakers are intended to broaden the scope of each student's experience and to provide experience in verbal communication. Each MS student must present at least one seminar in the third or fourth semester. Attendance at the weekly seminars is required during all four semesters, for which students receive 1 credit for each of the first two semesters but no credit for the second two semesters.

Thesis and Non-Thesis Options

MS students may choose either a thesis or non-thesis option. Each student electing the thesis option will be assigned a Thesis Committee, chaired by the student's major advisor, which will be responsible for insuring that the student fulfills all requirements of the SMS as well as other campus requirements, including presentation of a thesis defense consisting of a public lecture on the thesis, and a subsequent oral examination by the Thesis Committee. Each student electing the non-thesis option, in addition to an additional 3 credits, must complete a substantial research paper that must be read and approved by the major advisor and at least one other faculty

member.

Sequence of Courses by Semester

In the first two semesters, fulltime MS students normally complete the core courses (9 credits), register for the seminar series (one credit each semester), and take electives (9 credits). Additional coursework and the thesis or the non-thesis research paper are typically completed in the third and fourth semesters. A minimum total of 30 credits (thesis) or 33 credits (non-thesis) is required for the degree. The following tables summarize the sequence of courses for each of the four semesters.

Course	Semester 1	Semester 2
Core courses	6 credits	3 credits
One elective	3 credits	6 credits
Seminar series	1 credit	1 credit
Total 20 credits	10 credits	10 credits

Course	Semester 3	Semester 4
One elective (minimum)	3 credits	3 credits
Thesis/non-thesis	1-6 credits	1-6 credits
Seminar series(required)	no credit	no credit
Total 10+ credits	3 + 1-6 credits	3 + 1-6 credits

Marine Sciences & Technology Doctoral Program

The Marine Sciences and Technology Ph.D. program, offered by School of Marine Sciences (SMS), includes four core courses taken by all students (12 credits), courses in a concentration area beyond the core, seminars, and dissertation research. Work in the concentration area usually includes a minimum of 24 credit hours of courses and helps the student prepare for the written and oral candidacy examinations. Ph.D. students are not normally accepted as part-time students. Courses may be taken at any SMS-affiliated program on the four campuses, in other departments, or at other area institutions, and may be included in a student's program of studies as determined by the student's major advisor and/or dissertation committee.

Core Course Requirements

Each SMS student must complete four core courses (12 credits), one in each of four core areas: biological oceanography, chemical oceanography, physical oceanography, and Marine Policy and/or Management areas (including law and economics). The Core column in the SMS course list identifies the core courses and their respective areas. The core courses are intended to provide a common grounding in the biological, chemical, and physical oceanographic areas of marine sciences and technology, and in related marine policy and management disciplines. At least two core courses are offered each semester using the University's substantial distance learning facilities and technology. Students normally complete the core courses in the first two semesters.

SMS has developed core courses that are taught via distance learning, one in each of the core areas (biological, chemical and physical oceanography), which will satisfy the requirements of SMS students. These courses will ensure that all SMS students master key concepts and skills central to an interdisciplinary marine sciences and technology graduate program. The core courses may be team taught in some cases.

Concentrations and Electives

To build on the core courses, each SMS student selects an area of concentration and chooses a marine policy or management core course and electives appropriate to this concentration, as approved by their faculty advisor and/or thesis committee. Concentrations and Courses describes the concentrations and lists the electives associated with each concentration.

Students typically take most of their elective courses on the campus where they and their major faculty advisor are in residence. Some elective courses, however, will also be taught via distance learning. In addition, students may choose to be in residence at different campuses for a period of time during their course of study, in order to take certain courses or to take advantage of research opportunities.

Weekly Seminars

Weekly seminars presented by students and by visiting speakers are intended to broaden the scope of each student's experience and to provide experience in verbal communication. Each M.S. student must present at least one seminar in the third or fourth semester. Attendance at the weekly seminars is required during all four semesters, for which students receive 1 credit for each of the first two semesters but no credit for the second two semesters.

Candidacy Examinations and Dissertation

Generally, at the end of the fourth semester but no later than the end of the sixth semester, after passing the comprehensive written and oral examinations, the student and major faculty advisor select additional faculty who constitute the student's graduate committee, and the student presents a written dissertation proposal to the committee. The student's major advisor and committee may determine a later date for the presentation of the dissertation proposal. A student's committee is chaired by the student's major advisor and guides the

student's research. Committee members may be selected from SMS faculty, other departments, and other institutions. All committees must include at least one SMS faculty member from a campus other than the campus where the student resides.

Successful performance in the core courses is required for advancement to degree status. A grade of B or better in each core course and an overall average of 3.0 in the core courses are required. There is a retake option on a course for which the student receives a grade of B- or less.

No later than the sixth semester, the student's committee administers the written and oral candidacy examinations. The candidacy examinations are comprehensive and cover the core areas and the student's area of concentration. They are designed to test the intellectual competence and maturity of the student in the broad area of marine sciences and technology and in the selected area of concentration. Upon successful completion of the Ph.D. candidacy examinations, the student is awarded an M.S. degree.

A scholarly dissertation based on original research is required of all Ph.D. candidates. Dissertation research may be done in the laboratory or the field, or may be carried out in part during residence with an appropriate private business or government agency. Presentation and defense of a satisfactory dissertation, normally to be completed within five years from the date of advancement to candidacy, fulfill the degree requirements. The dissertation defense consists of a public lecture on the dissertation and a subsequent oral examination by the candidate's dissertation committee.

Sequence of Courses by Semester

In the first two semesters, Ph.D. students normally complete the core courses (12 credits), register for the seminar series (one credit each semester), and take two electives (6 credits). Additional coursework (24 credits minimum) is normally completed by the end of the fifth semester, in order to complete the written and oral candidacy examinations no later than the sixth semester. Upon advancement to candidacy, Ph.D. students register each semester for dissertation research and other courses as appropriate until graduation.

Marine Science

The University of Massachusetts School of Marine Sciences (SMS) offers both Master's (M.S.) and Doctoral (Ph.D.) programs in marine science. Students graduating with a MS or Ph.D. degree from SMS receive a joint degree from the University of Massachusetts Amherst, Boston, Dartmouth and Lowell. The degree programs are fundamentally grounded in a broad, integrated, interdisciplinary approach to the study of marine science. Students located at the four participating campuses are required to complete core courses in the areas of biological, physical, and chemical oceanography, as well as a course in policy/management to equip them for interdisciplinary studies and research before focusing upon an area of concentration.

The programs prepare students for employment opportunities in the private and governmental sectors and academia. Emphasis is placed on the education of researchers and scholars who will contribute not only to basic research but also to the application of that research in a coherent approach to resource management and economic development issues.

Combining facilities and resources on four campuses into a single, coherent graduate program greatly expands the opportunities for SMS students. Students have access to a much greater range of education and research opportunities, expertise, and facilities than exists on one campus alone. Each campus has a number of departments and interdepartmental programs with areas of strength in marine-sciences related teaching, research, and outreach that either complement or constitute critical units of SMS.

SMS is also closely affiliated with a number of on-campus research centers and institutes and off-campus marine research facilities, expanding its realm of research opportunities and resources.

Core Courses

To achieve interdisciplinary breadth and depth, each SMS student will be required to take courses in four areas:

Biological Oceanography (BO)

Chemical Oceanography (CO)

Physical Oceanography (PO)

Socio-Economics of Coastal/Marine Systems (S/E)

Marine-related Technologies (MT)

Courses in BO, CO, and PO are generally taken in the first 4 to 6 semesters (preferably in the first 2). For each area, course content is fairly uniform, though there may be multiple offerings between campuses.

Courses in S/E and MT are taken after selection of an area of concentration. Course content is not uniform and selection of course should be consistent with a student's concentration area. Depending on the student's concentration, the socio-economic requirement might be met best by courses in policy, economics, law or international/intergovernmental relations. Courses satisfying the technology requirement could be drawn from such areas as marine measurement technology, wastewater and environmental mitigation technology, Geographic Information Systems (GIS), Data/Information Management Systems, graphic display technologies or marine modeling approaches.

To build on the core courses, each SMS student selects an area of concentration and chooses electives appropriate to this concentration, as approved by their faculty advisor and/or thesis committee. Reflecting the interdisciplinary character of SMS, both natural and social science courses support certain concentrations, and many courses support more than one concentration.

Students typically take most of their courses on the campus where they and their major faculty advisor are in residence. Some courses, however, including at least two core courses each semester, will also be taught using the University's substantial distance learning facilities. Students may also choose to be in residence at different campuses for a period of time during their course of study, in order to take certain courses or to take advantage of research opportunities.

Admissions Standards

Successful applicants will generally have completed an undergraduate or graduate degree with a GPA of 3.00 or better and will have an undergraduate major in one of the basic scientific disciplines or engineering, or will have strong multidisciplinary training with completion of at least six semesters of coursework in the natural sciences, generally to include biology, chemistry, and/or physics. Preparation in mathematics at least through integral calculus is strongly encouraged. Students who do not meet these criteria need to identify a faculty advocate who must bring a request for exception before the Admissions Committee. At the discretion of the Admissions Committee applicants may make up deficiencies in prior coursework either before or after admission is granted to the SMS. Consideration will be on a case-by-case basis, and the recommendation of the committee will be forwarded to the Dean for approval.

Candidates may apply for admission at either the Masters or Doctoral level. Students admitted directly into the Doctoral Program are expected to have exceptional academic credentials and/or work experience. Students entering with a Bachelor's degree may be required to complete the requirements of a Masters degree before admission to the Doctoral Program. Students entering with a Masters can be admitted at the Doctoral level provided the degree, coursework and research experience warrant such a decision by the Admissions Committee.

Application Criteria

The Admissions Committee will evaluate a number of additional criteria in its consideration of applications. The following five items must be submitted for consideration by the UMass School of Marine Sciences(SMS):

A single application form has been prepared for the use of applicants for admission to the UMass School of Marine Sciences. It is available in the graduate admissions offices of each participating campus.

Three letters of recommendation from those familiar with the applicant's academic and/or work experience are required.

Official transcripts of all undergraduate and graduate coursework.

Graduate Record Examination (GREs) scores and The Test of English as a Foreign Language (TOEFL, if the applicant is not a native English speaker). Typically, for the GREs students should have a combined score 1200 or greater. For TOEFL, a minimum of 550 (or 213 on the computer based exam) is highly recommended.

Statements of interest and intent are also requested. The statement of interest should provide reviewers an indication of the motivation of the student for pursuing graduate work. The statement of intent should describe how graduate training would address the student's career goals.

**It is imperative that prospective students take an active role in contacting faculty member(s) who could potentially advise them, as well as making an effort to seek funding before applying to SMS. Students must also understand that we have a limited number of TA positions, so to be considered they must get their applications in before the deadline.

Admissions Procedures

Applications for admission to the graduate programs of the UMass School of Marine Sciences are currently being processed by the Office of Graduate Studies at the University of Massachusetts Dartmouth. You will send your application and its associated materials and should address any inquiries about your application to that campus.

Students considering entry into the fall semester must be aware of the following dates:

December 15th:

Students who are interested in obtaining a TA must have a completed application and all other appropriate forms sent to the Graduate Office. Prospective students who are not interested in receiving a teaching assistantship are highly encouraged to apply at this time as well.

January 15th:

Admissions Committee will have evaluated all applicants and will send a revised list of all prospective students to the SMS faculty. Any revisions and reconsiderations to the list will be made within a week

February 1st:

The Dean will send final acceptance letters to students who are being awarded a TA, as well as those students who have sufficient funding and an SMS advisor.

The Dean will send conditional letters of acceptance to students who have found an advisor, but have a lack of funding.

The Dean will send letters of deferral to qualified students who have been waitlisted, due to having no apparent advisor and inadequate funding.

The Dean will send letters of rejection to students who do not meet the standards of the school.

March 1st:

Students should be receiving their acceptance, deferral, and rejection letters between February 1st and March 1st. Students who have

been accepted with funding and an advisor are expected to reply within one month of receiving the letter.

April 15th:

All students accepted with funding and an advisor must reply by this date, in order to be able to enter into the SMS program.

May 1st:

The admissions committee will evaluate all acceptances and deferrals from students who had to send in their applications by April 15th. Depending on the number of students admitted, the Admissions Committee will consider the following, in order:

1. Students who have an advisor, but no funding.
2. Students who have no advisor or funding.

May 15th:

The Dean will send final letters of acceptance and rejection to the two groups of students listed above.

June 15th:

Students who are accepted by or after May 15th have until this date to reply, in order to enter into the SMS program. All admission decisions are closed by this date.

Students considering entering in the spring semester must be aware of the following dates:

September 1st:

Students must have a completed application and all other appropriate forms sent to the Graduate Office.

September 30th:

Admissions Committee will have evaluated all applicants and will send a revised list of all prospective students to the SMS faculty. Any revisions and reconsiderations to the list will be made within a week.

October 15th:

The Dean will send out acceptance and rejections letters by October 15th.

Accepted students are encouraged to reply promptly.

November 15th:

All students who are accepted must reply no later than this date, in order to enter into the SMS program. All admission decisions are closed by this date.

Admission decisions will be made as expeditiously as possible once the application file is complete. The SMS application deadlines will go into effect once the semester begins. Prospective candidates must observe these deadlines throughout the entire application process. Those who apply out of sequence will automatically be placed in the next cycle of admissions.

Master of Science in Mathematics

There are four options available in this program:

[Applied and Computational Mathematics](#)

[Probability and Statistics](#)

[Mathematics for Teachers](#)

[Industrial Mathematics Professional Science Master's](#)

All options require a four-year undergraduate degree from an accredited college or university with a satisfactory grade point average, and the official score report of the Aptitude Test of the Graduate Record Examination. For the Applied and Computational Mathematics and the Probability and Statistics options, the undergraduate degree must be in mathematics or a related discipline. For the Mathematics for Teachers option, three semesters of calculus (12 credits) are required. Applicants lacking some prerequisites may be accepted as matriculated with conditions. The Applied and Computational Mathematics, Probability and Statistics, and Mathematics for Teachers programs consist of thirty credit hours approved by the Graduate Curriculum Committee. The Industrial Mathematics Professional Science master's option requires 37 credit hours, including a paid internship. These credit requirements include both required courses and electives (which may be offered in other departments). Up to six credits at the 400 level may be considered for inclusion in the program of study. In addition, in all options except the Industrial Mathematics Professional Science Master's Option, three or six credits may, with the permission of the student advisor and Graduate Committee, be obtained by thesis. Most courses are offered on a regular basis in the late afternoon and early evening so that all programs can be completed on a part-time basis.

Applied and Computational Mathematics

The M.S. Option in Applied and Computational Mathematics focuses on techniques of mathematical modeling and the basic tools needed to investigate problems from both a theoretical and computational viewpoint. Courses range from classical applied mathematics and state of the art courses in signal processing to modern applications of software in problem solution.

Required courses:

92.501 Real Analysis I

92.530 Applied Mathematics I

92.563 Computational Mathematics I.

Probability and Statistics

This option is a professionally oriented program that provides the necessary mathematical skills to solve many of the data analysis problems of government, industry, science, engineering, and management. Courses range from theory based courses in probability through to applied hands-on course in statistical programming, including a course in the use of SAS statistical software.

Required courses:

92.501 Real Analysis I
92.509 Introduction to Probability & Statistics
together with one of
92.584 Stochastic Processes
92.587 Probability Theory
92.588 Mathematical Statistics
and one of
92.519 Introduction to Probability & Statistics II
92.591 Linear Statistical Modeling & Regression
92.593 Experimental Design

Mathematics for Teachers

The Master of Science in Mathematics for Teachers Program aims to give students a balanced combination of theory and practice, to enhance their appreciation and understanding of Mathematics as a science, and to provide them with the tools necessary to instill in their own students an interest in the subject. Courses in Mathematical Analysis, Discrete Mathematics, Linear Algebra, Number Theory, Geometry, and Probability and Statistics are designed to introduce the student to several important areas of Mathematics. Courses in Problem Solving, History of Mathematical Science, Mathematical Modeling, and Computers in the Classroom are intended to provide a deeper awareness of the contexts in which mathematical activity takes place and of the mental processes and technological aids employed by people in solving practical problems. Note that this is not a teaching certification program - contact the Graduate School of Education for information about certification.

Required courses:

92.500 Discrete Structures
92.520 Problem Solving

Industrial Mathematics Professional Science Master's

Admission Requirements

Incoming students will be expected to have completed the equivalent of an undergraduate degree in mathematics. Applicants with degrees in other sciences or engineering may be admitted if they demonstrate significant background in mathematics.

Degree Requirements - Total Number of Credits: 37

Mathematics Courses (15 credits)

Required:

- 92.501 Real Analysis I
- 92.509 Introduction to Probability & Statistics
- 92.530 Applied Mathematics I
- 92.563 Computational Mathematics

Elective - One course from the following list:

- 92.511 Complex Variables I
- 92.513 Number Theory
- 92.515 Intro Chaos & Dynamic System
- 92.521 Abstract Algebra I
- 92.526 Topology
- 92.531 Applied Mathematics II
- 92.545 Partial Differential Equations I
- 92.548 Mathematics Of Signal Processing
- 92.549 Math of Tomography
- 92.551 Calculus of Variations
- 92.552 Wavelet Analysis
- 92.564 Numerical Linear Algebra
- 92.572 Optimization
- 92.579 Reliability and Life Data
- 92.580 Discrete Mathematics for Eng and OR
- 92.581 Graph Theory
- 92.582 Time Series Analysis
- 92.589 Sampling Theory and Methods
- 92.590 Statistical Quality Control
- 92.592 Multivariate Statistics
- 92.595 Information Theory

Science Cluster - One cluster of 12 credits from the following.

(Variations on these clusters or different ones can be proposed with the guidance of the student's advisor.)

Algorithms Cluster

- 92.580 Discrete Math for Science and Engineering
- 91.503 Algorithms
- 91.504 Advanced Algorithms: Computational Geometry
- 91.544 Machine Learning and Data Mining

Random Processes Cluster

- 92.584 Stochastic Processes
- 16.509 Linear Systems Analysis
- 16.548 Coding and Information Theory
- 16.584 Probability and Random Processes

Physics Cluster

- 92.533 Mathematical Methods of Quantum Mechanics
- 95.535 Introductory Quantum Mechanics I
- 95.553 Electromagnetism I
- 95.554 Electromagnetism II

Statistics Cluster

- 92.576 Statistical Programming using SAS
- 92.588 Mathematical Statistics
- 92.591 Linear Statistics Modeling and Regression
- 92.593 Experimental Design

Epidemiology/Biostatistics Cluster

- 92.576 Statistical Programming in SAS
- 92.591 Linear Statistics Modeling and Regression
- 19.575 Introduction to Biostatistics and Epidemiology
- 19.689 Advanced Regression Modeling

Internship (1 credit)

The university will arrange for paid internships lasting a minimum of 340 hours for students in the program. The internship will be scheduled for a period some time after the student completes 18 credit hours in the program. At the end of the internship, the students will submit a paper and give an oral presentation on their work. Allowances will be made for students who already have a position in business, industry or government to allow them to use work in their current position as an internship.

Professional Courses (9 credits - one required plus two elective courses)

Required Professional Course:

- 66.688 Advanced Professional Communication,

plus **two** additional courses (6 credits) from a list approved by the PSM Coordinating Committee, including:

- 64.650 Innovation and Emerging Technologies
- 62.630 Market Research for Entrepreneurs
- 61.640 Financing Innovation and Technology Ventures
- 66.630 New Product Development
- 66.635 Project Management
- 64.655 Corporate Entrepreneurship

Doctoral Program

The Mathematical Sciences Department, through the [Computer Science Department](#), offers a doctoral program in Computational Mathematics.

Comprehensive examination include areas of both mathematical sciences and computer science in order to assure that the student has a well-rounded background. Students can pursue a research program with faculty from Mathematical Sciences.

For further details, contact the Computer Science Department Chair at 978-934-3620, Olsen 313, or Professor Lee Jones, Coordinator of the Doctoral Program in Computational Mathematics

Graduate Certificates in Mathematics

The Mathematical Sciences Department offers two Graduate Certificates:

- [Applied Statistics](#)
- [Mathematics for Teachers](#)

Graduate Certificate Application Form (pdf)

Applied Statistics

Department of Mathematical Sciences

Coordinator:

Dr. Charles Byrne

978-934-2447

charles_byrne@uml.edu

This certificate provides professionals in biology, business, computer science, engineering, insurance, medicine, pharmaceutical and other sciences with statistical tools for survival in a highly competitive world marketplace. Experimental design provides methodology for gaining information in an efficient manner. Use of designed experiments in product development is known as off-line quality control. Clinical trials are examples of designed experiments in the medical field. Statistical modeling (linear regression analysis) includes systematic procedures for collecting and analyzing data in order to ?predict? a response variable based on one or more ?predictor? variables. The techniques covered in design of experiments are special cases of the general approach to statistical modeling. Certificate holders will be equipped with quantitative tools that form the heart of a quality approach to development and improvement of products and services. Most courses are offered in the evening.

This is a 12-credit certificate.

Required of Students without Probability/Statistics Background: (3 credits)

92.509 Introduction to Probability and Mathematical Statistics

Required of All Students: (6 credits)

92.591 Statistical Modeling and Linear Regression Analysis

92.593 Experimental Design

Electives: (6 credits)

Electives may be selected from among the courses listed in the graduate school catalog subject to approval by the graduate coordinator.

Mathematics for Teachers

Department of Mathematical Science and Graduate School of Education (Interdisciplinary)

Coordinators:

Dr. Kenneth Levasseur (Mathematics)

978-934-2414

kenneth_levasseur@uml.edu

Dr. Regina Panasuk (Education)

978-934-4616

regina_panasuk@uml.edu

The Certificate is targeted to both professionals who are interested in teaching, giving them the opportunity to learn what is required to become a math teacher, and to current teachers who wish to deepen their content knowledge. With existing teacher testing and professional development requirements, the certificate provides for further study without long-term commitment.

Note: This program will not provide teacher licensure in mathematics. The program's focus is on the content knowledge that is a prerequisite for mathematics teaching.

Required Courses: (6 credits)

04.535 Mathematics for Teachers II

92.520 Mathematical Problem Solving

Electives: (Choose two 3 credit courses for a total of 6 credits)

92.500 Discrete Structures

92.503 Mathematical Analysis

92.510 Computers and Calculators in the Classroom

92.513 Number Theory

92.521 Algebraic Structures

92.523 Linear Algebra

92.527 Geometry

92.535 History of Mathematics

Department of Mathematical Sciences

Graduate Programs offered:

[Master's of Science in Mathematics](#)

- Applied Mathematics Option
- Mathematics for Teachers Option
- Probability and Statistics Option
- [Industrial Mathematics Professional Science Master's \(PSM\) Option](#)

[Doctor of Science Program in Computational Mathematics](#)

(offered through the Computer Science Department)

[Graduate Certificates](#)

- Applied Statistics
- Mathematics for Teachers

Applicants to the master's and doctoral programs must have an undergraduate degree from an accredited four-year college or university with a major in mathematics or a related discipline and a satisfactory grade point average. Minimal course prerequisites for each of the options are listed in the descriptions below, and additional information can be obtained from the coordinator for that option, whose name is listed at the end of this brochure. Each option coordinator provides individualized advising during the course of graduate study. Applicants must submit the Graduate School application form, an official score for the aptitude portion of the Graduate Record Examination, three letters of reference, and an official undergraduate transcript indicating receipt of the bachelor's degree.

Students holding the bachelor's degree may take courses as a non-degree student while applying for matriculation and may transfer up to four courses (12 credits) taken before matriculation with grades of B or better. Up to 12 credits taken at another accredited U.S. or Canadian university may be transferred into a program, but no more than a total of 12 credits taken either at another institution or at the University of Massachusetts Lowell before matriculation, or any combination of the two, may be transferred.

Most courses are offered in the late afternoon or evening, and part-time study is possible. A limited number of teaching assistants are available each year. Students should be fully accepted into the graduate program by March to be eligible for a TA position for the following September.

Formal admissions procedures must be initiated through [Graduate Admissions](#). Students may take a limited number of graduate courses before formal acceptance into a program. Check with the graduate coordinator for details.

[Combined Bachelor's-Master's Program](#)

Masters of Science Degree Program

The Department of Physics and Applied Physics offers Master of Science degrees in Physics and in Radiological Sciences and Protection. The master's program in Physics provides an opportunity for advanced study and research in most of the areas mentioned above, including a M.S. option in Optical Sciences. The master's program in Radiological Sciences and Protection is described elsewhere in this catalog.

Graduate Credits and Course Requirements

At least 30 graduate credit hours are required. For the Thesis Option, at least 6 and at most 12 credits are to be M.S. research. For the Project Option, a maximum of 3 credits of M.S. Project will be allowed. Alternatively, the student may substitute satisfactory performance on the Ph.D. Comprehensive Examination for completion of an M.S. Thesis or Project. For this option, a maximum of 6 research credits, and no more than 12 transfer credits, can be applied toward the M.S. degree. At most, 3 credits of Physics Colloquium and Seminar courses may be applied to the 30 credit requirements. Candidates for the Master of Science degree in Physics, except those in the Optical Sciences Concentration, are required to complete the following courses:

95.605 Mathematical Methods of Physics I (3-0)3

95.711/712 Graduate Seminar in Physics (1-0)1

95.701/702 Physics Colloquium (1-0)1

Thesis 6-12 Credits or, Project 3 Credits, 4 Electives

Electives may be chosen in consultation with the academic advisor and research supervisor from the list of Physics courses acceptable for graduate credit. Some graduate courses offered by other departments may also be acceptable for graduate credit in Physics, with the approval of the Physics Department. All students are expected to have completed as part of their undergraduate studies a two-semester course in electromagnetic theory (95.553/554 or equivalent) and a two-semester course in introductory quantum mechanics (95.535/536 or equivalent). These courses cannot be counted as one of the 4 Physics electives needed for the M.S. requirement.

Optical Sciences Option

This program is designed to provide the necessary preparation for students wishing to specialize in such rapidly expanding fields as electro-optical phenomena, lasers, applications of optics to telecommunications and information processing, fiber optics and other new optical materials and devices. This option is intended for students who have completed a bachelor's degree program in Physics, Engineering, or other sciences. It is offered in cooperation with the Department of Electrical Engineering which offers an allied option in Opto-electronics. The Optical Sciences option emphasizes laboratory research providing the student valuable "hands-on" experience with optical systems and devices. Two course sequences are available (1) for students with a B.S. in Physics and (2) for students with a B.S. in Engineering or another scientific discipline.

Course requirements for the Optical Sciences Concentration:

For Students with a Physics B.S.

95.605 Math. Meth. Phys. I (3-0)3

95.539 Electro-Optics (3-0)3

95.577 SS Electronic & Optoelectronic Devices (3-0)3

Seminars and Colloquium 3 Credits

Thesis 6-12 Credits or,

Project 3 Credits

2 Electives

For Students with B.S. in other Sciences or Engineering*

95.605 Math. Meth. Phys. I (3-0)3

95.547 Laser Physics and App. (3-0)3

95.539 Electro-Optics with Lab (3,3)4

95.510 Quantum Physics (3-0)3

Seminars and Colloquium 3 Credits

Thesis 6-12 Credits or, Project 3 Credits

2 Electives

Electives must be chosen from the following list of courses:

95.540 Image Processing & Lab (2-3)4

95.547 Laser Physics and Applications (3-0)3

95.551 Fiber Optics & Lab (2-3)4

95.572 Solid State Physics (3-0)3

95.578 Integrated Optics: Wave Guides and Lasers (3-0)3

95.615 Quant. Mech I (3-0)3

95.631 Non-Linear Optics (3-0)3

96.547 Experimental Laser Optics (12)2

16.568 Electro-Optics System Design (3-0)3

16.610 Optics for Information Processing (3-0)3

*Assuming adequate preparation in mathematics and electromagnetism.

Colloquia

All full-time master's candidates are required to attend Physics Colloquium, 95.701/702, each semester.

Seminars

All full-time master's candidates are required to take 95.711/712 Graduate Seminar in Physics, in addition to the Colloquium each semester. After a student has presented a seminar in 95.711/712 (s)he may substitute one of the other seminars offered by the

Department.

Thesis or Project

The thesis or project is to be based on research performed under the supervision of a member or adjunct member of the Physics Faculty. A student may do a thesis or project under the supervision of a faculty member in another department provided he has a member of the Physics Faculty as a co-supervisor. The student must submit to the Department, for its approval, nine copies of a typewritten proposal briefly describing the project or the problem to be solved for the thesis. This proposal must bear the written approval of the research supervisor. A thesis student must submit the proposal prior to or during the first semester of registration in M.S. Thesis Research in Physics. Students registered for Thesis must submit a brief progress report on the research to the Graduate Coordinator each semester unless a thesis is submitted. Students registered for M.S. Project Research in Physics must submit a final report and complete an oral defense of the Project before the end of the semester. An M.S. Project may not be carried over into a second semester. After completing the work, thesis students must submit three copies of a typewritten thesis to the Department. The student must then pass an oral examination, administered by a Thesis Committee of the Department appointed by the Graduate Coordinator. The examination will be based upon, but not necessarily restricted to, the subject of the thesis. A student who completes a project rather than a thesis must submit three copies of the final project report to the department and pass an oral examination based upon, but not necessarily restricted to, the subject of the project.

[Bachelor's-Master's Program](#)

Doctor of Philosophy Degree Program

- [Doctorate in Physics](#)
- [Applied Physics Options](#)
- [Physics/Energy Engineering Option](#)
- [Applied Mechanics Option](#)
- [Atmospheric Sciences Option](#)
- [Radiological Sciences Option](#)

The Doctor of Philosophy program in Physics and Applied Physics is designed to develop advanced competence in Physics. The Physics course of study prepares the student to carry out original and independent research in physics, while the Applied Physics Options provide training for professional work in several areas of applied physics and allied engineering disciplines.

Graduate Credits

At least 60 graduate credit hours are required, of which at least 15 and at most 24 are to be Ph.D. Dissertation Research. At most 3 credits of Physics Colloquium and seminar courses may be applied to the 60 credit requirement.

Colloquia

All full-time doctoral candidates are required to attend Physics Colloquium, 95.701/702, each semester.

Seminars

All full-time doctoral candidates are required to take at least one physics seminar, in addition to Colloquium, each semester. After a student has presented a seminar in 95.711/712 (s)he may substitute one of the other seminars offered by the Department.

Computer Skills

All candidates are required to demonstrate proficiency in computer programming, which may be accomplished by passing the Departmental computer language exam or by achieving a grade of at least B in courses such as FORTRAN Programming or Introduction to Pascal, or by demonstrating equivalent competence to the Physics Department.

Comprehensive Examination

All candidates must pass a written and oral Physics Comprehensive Examination. Students in pure Physics are expected to take this examination in their first year; those in the Applied Physics options, in their second year. The examination covers I. Classical mechanics, II. Electricity and magnetism, and III. Quantum mechanics, modern physics and statistical mechanics at the advanced undergraduate level. In addition Part I includes some elementary thermo-dynamics and Part II elementary optics. Part III is replaced by a section on radiological sciences and protection for students in that option and is based on the advanced undergraduate course requirements in Radiological Health Physics. For students in the Atmospheric Sciences Option, Part III is replaced by a section in atmospheric sciences, demonstrating a basic understanding of atmospheric structure and dynamics.

Graduate Research Admission Examination

Before commencing Ph.D. dissertation research each doctoral candidate must pass two semesters of Advanced Projects in Physics 96.731/732 and defend this project in an oral examination before a committee of the Physics graduate faculty. Students who have already completed a master's thesis in Physics or a related discipline may apply for a waiver of the Advanced Projects requirement. However, if the M.S. degree is from another institution the student must make an oral presentation of the M.S. work before a committee of the Physics Faculty in order to satisfy the Graduate Research Admission Examination requirement. Alternatively, a one-semester M.S. project may be substituted for one semester of Advanced Project on the recommendation of the student's research supervisor. The

Graduate Research Admission Examination must be passed before a student may submit a Ph.D. dissertation proposal.

Dissertation

The dissertation is to be based upon original research performed under the supervision of a member or adjunct member of the Physics Faculty (or the Faculty of a Department participating in a joint program with the Physics Department) holding an earned doctoral degree. If a student wishes to do a dissertation under the supervision of a faculty member in another department, the student must also have a co-supervisor who is a member of the Physics Faculty. Ph.D. candidates must submit to the Department, for its approval, eleven copies of a typewritten proposal briefly describing the research to be carried out. The proposal must bear the written approval of the research supervisor. A student may not register for Ph.D. Dissertation Research, until the Comprehensive Examination and the Graduate Research Admission Examination have been passed. Furthermore, the dissertation proposal must be submitted prior to or during the first semester in which the student is registered for Ph.D. dissertation research. Students registered for Ph.D. Thesis must submit a brief progress report on the research to the Graduate Coordinator each semester unless a thesis is submitted. After completing the work, the student must submit four copies of a typewritten dissertation to the Department. The student must then pass an oral examination, administered by a Dissertation Committee appointed by the Physics Graduate Coordinator, based on, but not necessarily limited to, the dissertation work.

Physics

The Physics program includes the following areas of study:

- Nuclear Physics
- Solid State Physics
- Laser Physics
- Photonics
- Optics
- Submillimeter Wave Science Technology
- Advanced Materials
- Nonlinear Optics
- Nanomaterials and Technology
- Theory of Elementary Particles
- Atomic Physics
- Quantum Field Theory

The following courses are required:

95.605/606 Mathematical Methods of Physics I,II (3-0)(3-0)6

95.611 Classical Mechanics (3-0)3

95.615/616 Quantum Mechanics I,II (3-0)(3-0)6

95.657/658 Electromagnetic Theory I,II (3-0)(3-0)6

95.617 Advanced Quantum Mechanics I (3-0)3

96.731/*Advanced Projects in Physics I,II (3-0)(3-0)6

*This requirement may be waived for students who have written a Master's thesis in Physics or a related discipline. Electives may be chosen from the list of courses acceptable for graduate credit in Physics. Some graduate courses offered by other departments may also be acceptable for graduate credit in physics, but only with the approval of the Physics Department.

Applied Physics Options

Students in Applied Physics Options may select a program of study and research in one of the following areas:

1. Physics/Energy Engineering Option

(a) Nuclear Energy

(b) Solar Energy

2. Physics/Applied Mechanics Option

3. Atmospheric Sciences Option

4. Physics/Radiological Sciences Option

The above options are official degree program options and will be so noted on the transcript. Areas 1, 2 and 3 are interdisciplinary programs with the Department of Chemical and Nuclear Engineering, the Department of Mechanical Engineering, and the Department of Environmental, Earth, and Atmospheric Sciences, respectively. Area 4 is an extension of the Master of Science degree program in Radiological Sciences and Protection.

General Required Courses

Every student in an Applied Physics Ph.D. Option must satisfy the following course requirements:

(a) 95.513 Classical Mechanics (3-0)3

95.553/554 Electromagnetism I,II (3-0)(3-0)6

95.535 Intro Quantum Mechanics I (3-0)3

95.605 Mathematical Methods of Physics I (3-0)3

(b) Six or eight credits from among the following courses, or their equivalents, as appropriate for each option:

95.611 Classical Mechanics (3-0)3

95.521 Statistical Thermodynamics (3-0)3

95.561/662 Nuclear Physics I,II (3-0)(3-0)6

95.615/616 Quantum Mechanics I,II (3-0)(3-0)6

95.617/618 Advanced Quantum Mechanics I,II (3-0)(3-0)6

95.657/658 Electromagnetic Theory I,II (3-0)(3-0)6

95.660 Quantum Mechanics of Many Particle Systems (3-0)3

(c) 96.731/732 Advanced Projects in Physics I,II (3-0)(3-0)6 or the equivalent in the department appropriate to the student's chosen field of concentration. This may be waived for students who have completed a master's thesis.

Physics/Energy Engineering Option

In addition to the general requirements, students in this option must take

95.536 Intro Quantum Mechanics II (3-0)3

95.606 Mathematical Methods of Physics II (3-0)3 and at least seven additional courses from among the Physics, Energy Engineering, and Mechanical Engineering offerings at the graduate level. These seven courses should include required courses appropriate to either the Solar or Nuclear energy specialization.

Applied Mechanics Option

In addition to the general requirements, students in this option must take

95.536 Intro Quantum Mechanics II (3-0)3

95.606 Mathematical Methods of Physics II (4-0)4 and at least two graduate courses from the Mechanical Engineering Department, the courses to be determined by the student's academic and research advisors.

Atmospheric Sciences Option

In addition to the general requirements, 12 credits of core courses and 15 credits of elective courses. One credit is for atmospheric/environmental seminar. For core and elective course descriptions, see Environmental Studies (Atmospheric Sciences Concentration).

Radiological Sciences Option

In addition to the general requirements, students in this option must take the following courses:

95.536 Intro Quantum Mechanics II (3-0)3

95.606 Mathematical Methods of Physics II (4-0)4

95.561/662 Nuclear Physics I,II (3-0)(3-0)6 and at least twelve credits from among the following graduate level Radiological Sciences and Protection courses, assuming the core courses for the Master of Science Degree in Radiological Sciences and Protection have already been completed.

98.522 Envir. Radiation & Nuc. Site Criteria (3-0)3

98.561/562 Special Topics in Radiological Sciences(3-0)3

98.663 Intro. to Radiation Chemistry (3-0)3

98.608 Environmental Toxicology & Epidemiology (3-0)3

- 98.613 Environmental Monitoring & Surveillance (3-0)3
- 98.614 External Radiation Dosimetry (3-0)3
- 98.615 Internal Radiation Dosimetry (3-0)3
- 98.616 Data Reduction for Rad. Sci. & Protection (3-0)3
- 98.620 Environmental Impact Statements (3-0)3
- 98.625 Medical Health Physics (3-0)3
- 98.646 Accelerator Health Physics (3-0)3
- 98.651 Intro to Electronic Product Radiation (3-0)3
- 98.666 Reactor Health Physics (3-0)3
- 98.681 Medical Physics (3-0)3
- 98.682 Medical Physics Laboratory (0-9)3

Note: It is expected that the requirements for the Master of Science degree in Radiological Sciences and Protection will be met during the first four semesters if the student has not already earned an M.S. degree.

Graduate Certificates in Physics

The Department of Physics offers two Graduate Certificates:

- [Medical Physics](#)
- [Photonics & Opto-Electronic Devices](#)
- [Radiological Health Physics & General Work Environment Protection](#)

Medical Physics

Department of Physics

Contact:

Dr. Clayton French
 978-934-3286
clayton_french@uml.edu

This 12-credit certificate is open to matriculated students who have completed the required core courses for the M.S. in Radiological Sciences. Students who have a graduate degree in Radiological Health Physics or Physics may apply to the certificate program if they meet the core requirements.

Required Courses:

- 98.596 Medical Physics
- 98.676 Graduate Medical Physics Internship
- 98.533 External Radiation Dosimetry and Shielding
- 98.534 Internal Radiation Dosimetry and Bioassay Assessment

Photonics & Opto-Electronic Devices

Physics and Department and Electrical Engineering & Computer Engineering Department (Interdisciplinary)

Contact:

Dr. James Egan
 978-934-3774 / 978-934-3300
james_egan@uml.edu

This certificate is offered jointly by the Electrical & Computer Engineering & Physics Departments and reflects the strong interests in the physics and technologies of electro-optics. Extensive research facilities include: new materials growth (molecular beam epitaxy) and device fabrication and testing laboratories.

Required Courses:

- 95.577 Solid State Electronic & Opto-electronic Devices and 95.539 Electro-optics
- OR 16.595 Solid State Electronics and 16.568 Electro-optics

Elective Courses (choose 2):

- 16.508 Quantum Electronics
- 16.518 EMAG of Materials for Optical Engineers.
- 16.607 Waves in Complex Media
- 16.610 Optical Information Processing
- 95.547 Laser Physics & Applications
- 95.551 Fiber Optics (4 credits)
- 95.631 Nonlinear Optics
- 95.578 Integrated Optics: Wave Guides & Lasers

Radiological Health Physics and General Work Environment Protection

Contact: Dr. Clayton French
978-934-3286
clayton_french@uml.edu

This certificate is open to matriculated students who have completed the required core courses for the MS in Radiological Sciences. Students who already hold a graduate degree in Radiological Health Physics or Physics may also apply to this certificate program if they meet the core requirements.

The program is a collaborative endeavor between the University's Physics and Radiological Sciences Program and the Work Environment Program. No other college or university in New England offers this type of program.

This certificate requires 14 credits of course work earned by taking four courses.

Required Courses:

- 98.501 Radiation Safety and Control I (4 credits)
- 98.502 Radiation Safety and Control II (4 credits)
- 19.525 Introduction to Industrial Hygiene/Ergonomics (3 credits)

Elective Courses (choose one 3-credit course from the following):

- 19.517 Physical Hazards Evaluation and Control
- 19.518 Engineering Controls and Protective Equipment
- 19.540 Occupational Safety and Health Engineering
- 19.625 Field Evaluations in Work Environments

Department of Physics and Applied Physics

The Department of Physics and Applied Physics offers programs leading to the degrees of Master of Science and Doctor of Philosophy.

The M.S. degree may be taken in physics or radiological science and protection (health physics) or in the applied physics option in optical sciences. Course requirements for the M.S. program consist of a total of 30 credits, including work on a thesis or project. The M.S. may serve as a basis for further study toward a Ph.D. degree. Students are expected to complete the M.S. program in two years.

The Ph.D. program requires 60 credits, including thesis research. Candidates for the degree must pass a written and oral comprehensive examination and a doctoral research admission examination (taken after successfully completing two semesters of an advanced research project) and demonstrate a proficiency in computer programming. Areas of research include experimental and theoretical nuclear physics, experimental and theoretical solid-state physics and material science, optics, laser physics and far infrared spectroscopy, scattering theory, quantum optics, relativity, particle physics, atmospheric and environmental physics, energy applications, applied mechanics, and radiological sciences.

Research Programs

Members of the Department are engaged in research programs in the following areas in which opportunities for advanced degree research are offered:

- Nuclear Physics,
- Solid State Physics,
- Laser Physics,
- Optics,
- Submillimeter-Wave Science and Technology,
- Theory of Elementary Particles,
- Quantum Field Theory,
- Atomic Physics,
- Relativity,
- Atmospheric Physics,
- Nuclear and Solar Energy,
- Applied Mechanics,
- Computational Physics,
- Radiological Sciences and Medical Physics.

Areas of study in nuclear physics include high-resolution neutron scattering, fission-product properties, and high-spin nuclear states (work conducted at national heavy-ion accelerators via in-beam gamma-ray spectroscopy).

Research equipment includes

- a 5.5-MeV Van de Graaff accelerator,
- neutron time-of-flight spectrometer,
- helium-jet fission-product transfer system,
- fast neutron irradiation facility,
- MW nuclear research reactor,
- 400-kilocurie Co-60 source for gamma-ray irradiation.

Principal areas of optics research include Raman, fluorescence, UV-visible-near-IR spectroscopy, and characterization of nonlinear optical properties of polymeric and semiconductor materials.

Solid state physics and materials science studies include photonic and opto-electronic devices, polymers and biological materials.

Research equipment includes

- an advanced materials characterization laboratory,
- transmission and scanning electron microscopy,
- x-ray analysis and surface science facilities,
- photonics and optoelectronics device development laboratory,
- molecular beam epitaxy,
- lithography of thin films, and
- epilayer characterization facilities.

The Submillimeter-Wave Science and Technology Laboratory develops coherent sources, receivers and novel imaging systems for application at terahertz frequencies. Research equipment includes microwave through infrared spectrometers for design and characterization of material dielectric properties, a CO₂ and far-infrared laser magnetospectroscopy facility, and submillimeter-wave compact ranges for electromagnetic scattering studies.

Entering Graduate Students

Every entering graduate student is assigned a departmental adviser who will counsel the student on programs of study and other academic requirements serve as registration officer, help the student to become acquainted with research opportunities in the Department, and assist in selecting a research supervisor. In addition to the [requirements for admission](#), applicants must submit the official test score report for the GRE general test; the Physics subject test is recommended, but not required. Applicants for the M.S. and Ph.D. degrees in Physics are expected to have a sound background in intermediate level mechanics, electricity and magnetism, quantum mechanics, and modern physics. Any student found deficient in any of these areas may be required to take appropriate courses to remove the deficiency. Students in the Radiological Sciences and Protection M.S. program should have adequate preparation in mathematics, chemistry, physics, biology and nuclear and radiological sciences similar to the undergraduate curriculum in Radiological Health Physics at the University of Massachusetts Lowell.

College of Sciences

The UMass Lowell College of Sciences, led by [Dr. Mark Hines](#), fosters critical and creative thinking for future solutions to environmental, economic and human problems, while helping students to develop the capacity to respond to a changing world.

A wide range of ongoing research and project opportunities exist within the various degree programs, and interdisciplinary study is emphasized. Graduates of these programs are heavily recruited both regionally and nationally by industry and governmental agencies.

[Faculty in the College of Sciences](#) (pdf)

NOTE: [links](#) to department catalog section at bottom of this page.

Graduate Programs Offered

Master of Science (MS) - degree awarded in the following fields:

- Biological Science
- Biotechnology Option
- Professional Science Master's Options (Applied Biotechnology, Biosafety, Environmental Biotechnology, Project Management for Life Sciences)
- Chemistry
- Computer Science
- Environmental Studies
- Atmospheric Sciences (Concentration)
- Marine Sciences and Technology
- Professional Science Master's Option (Coastal and Ocean Administration, Science and Technology)

- Mathematics
- Applied Mathematics Option
- Mathematics for Teachers Option
- Probability and Statistics Option
- Scientific Computing Option
- Professional Science Master's Option (Industrial Mathematics)
- Physics
- Optical Sciences Option
- Radiological Sciences and Protection
- Professional Science Master's Option (Radiological Protection)

Doctor of Philosophy (PH.D.) - degree awarded in the following fields:

- Chemistry
 - Biochemistry Option
 - Environmental Studies Option
 - Green Chemistry Option
- Computer Science
 - Bio/Cheminformatics Option
 - Mathematical Science Option
- Marine Sciences and Technology
- Physics
 - Applied Mechanics Option
 - Atmospheric Sciences Option
 - Energy Engineering Option
 - Radiological Sciences Option
- Polymer Science
- Polymer Science/Plastics
 - Engineering Option

Links to Department Sections in This Graduate Academic Catalog:

- [Biological Sciences](#)
- [Chemistry](#)
- [Computer Science](#)
- [Environmental, Earth & Atmospheric Sciences](#)
- [Marine Sciences and Technology](#)
- [Mathematical Science](#)
- [Physics & Applied Physics](#)
- [Radiological Sciences and Protection](#)

Radiological Sciences and Protection - Master of Science Degree Program

With the increasing use of radiation and radioactive material in society, there is a growing need for research and advanced education in Radiological Sciences and Protection.

The excellent facilities, equipment and supporting staff available at the University of Massachusetts Lowell's Radiation Laboratory and faculty in the Radiological Sciences Program and in other allied departments give students at the University of Massachusetts Lowell (UML) a unique opportunity to obtain rewarding careers in and make significant research contributions to the radiation protection field and to the use of radiation physics in medicine.

The Master of Science Degree Program in Radiological Sciences and Protection is interdisciplinary in nature and should be attractive to engineering students and students in the biological and physical sciences.

[Master of Science - Radiological Sciences and Protection](#)

[Master of Science in Radiological Sciences and Protection - Professional Science Master's Option](#)

Admission Requirements

A student should have a reasonable minimum preparation, including courses in mathematics, chemistry, physics, biology and in nuclear and radiological sciences similar to the University of Massachusetts Lowell Radiological Health Physics undergraduate curriculum. Because there is no advanced test in the field of Radiological Sciences and Protection, and because various undergraduate backgrounds are suitable for graduate study in the program, students are not required to take the Advanced GRE tests. The GRE Aptitude Test, however, is required. It is important that the mathematical preparation of students include differential and integral calculus through differential equations. Physics preparation up to and including Modern Physics is required. Preparatory courses are available at UMass Lowell for applicants who are deficient in these areas.

Master of Science in Radiological Sciences and Protection

Plan of Study

The program allows a student to select courses and a research project consistent with his/her desired area of professional development. Various opportunities for research and professional development are possible through the use of the Radiation Laboratory of the University and through cooperative programs with hospitals, nuclear reactor facilities, government laboratories, and other radiation facilities. A research advisor, other than a University of Massachusetts Lowell faculty member, may be approved for the conduct of research at facilities outside the University. Two M.S. degree options are available: thesis option or project option. In addition to a core curriculum, a master's thesis or project report must be submitted and approved.

Thesis Option

Under the thesis option, a student must complete a minimum of 21 credits of formal courses and a minimum of 9 credits of graduate research. The master's thesis generally will consist of a scholarly laboratory or theoretical investigation in the field of Radiological Sciences and Protection. Proposed research must be approved by the Program Graduate Committee. The format for the final written thesis shall conform to the requirements of the University. The thesis proposal and report requirements may be obtained from the Program Coordinator.

Project Option

Under the project option, a student must complete a minimum of 27 credits of formal courses and 3 credits of graduate research to yield a total of 30 credits. In addition to the project report, the student must pass a comprehensive examination. The master's project consists of a scholarly investigation such as a review, report, design, etc., in the field of Radiological Sciences and Protection. The subject of the project must be approved by the student's advisor in advance. The final report must be approved by the Program Graduate Committee and conform to the format specified by the University.

Oral Defense of Thesis

A thesis committee is appointed to read a student's thesis and to listen to an oral presentation and defense by the student. In general, the committee will include the thesis advisor and two additional members chosen from the Physics faculty or from other departments in which the candidate has taken graduate studies.

Comprehensive Examination for the Project Option

Degree candidates electing the project option are required to pass a Comprehensive written examination administered by the Program Graduate Committee. This examination normally will be administered during the semester in which the student completes his/her course requirements for the M.S. degree. The comprehensive examination may be waived for a student who can document that he/she has passed Part I of the American Board of Health Physics Certification Examination.

Residency and Foreign Language Requirements

No residency or foreign language requirements are specified by the Department.

Core Curriculum

A core curriculum consisting of seven courses and Thesis Research or Graduate Project in Radiological Sciences and Protection are required of all students pursuing the Master's Degree in Radiological Sciences and Protection. These core courses are listed below. If a student has already had a course or courses similar to those listed, then the requirement for such courses may be waived. Courses in Nuclear Engineering, Physics and Applied Physics, Environmental Studies, Biology, Mathematics, Meteorology, Chemistry, Work Environment, and others may be selected for graduate credit with the approval of the Department.

Required Core Courses

- 98.506 Nuclear Instrumentation (4 credits)
- 98.501 Radiation Safety and Control I (4 credits)
- 98.502 Radiation Safety and Control II (4 credits)
- 98.533 External Radiation Dosimetry and Shielding (3 credits)
- 98.534 Internal Radiation Dosimetry and Bioassay Assessment (3 credits)
- 98.562 Radiation Biology (3 credits)
- 98.711/712 Graduate Seminar in Radiological Sciences and Protection 1
- 98.733 Graduate Project in Radiological Sciences and Protection (3 credits), or 98.743 MS Thesis Research in Radiological Sciences and Protection (3/6/9 credits)
- Plus departmental electives as required

Total 30 credits

The Professional Science Master's Option within the Radiological Sciences Program

The development of Professional Science Master's (PSM) degree programs represents a growing trend in the United States with currently 120 such degrees offered at 60 colleges and universities. PSM's maintain a strong science core while incorporating professional communication (oral, written) skills, multidisciplinary training, management courses, and a professional internship into the curriculum. Applicants to PSM's include individuals with baccalaureate degrees currently employed at companies as well as new bachelor degree recipients from the United States and abroad who desire to combine in-depth science education with workplace skills important for their career development.

The Professional Science Master's Option within the Radiological Sciences Program in the Department of Physics and Applied Physics

shares the same core courses as the current master's degree program and, in lieu of a research component, requires courses selected from the foundation courses of the MBA degree program, a communications course, and a professional internship in Radiological Sciences.

Core Courses for Radiological Sciences and Protection

The required core courses for all options for the M.S. Degree in Radiological Sciences and Protection are:

- 98.506 Nuclear Instrumentation (4 credits)
- 98.501 Radiation Safety and Control I (4 credits)
- 98.502 Radiation Safety and Control II (4 credits)
- 98.533 External Radiation Dosimetry and Shielding (3 credits)
- 98.534 Internal Radiation Dosimetry and Bioassay Assessment (3 credits)
- 98.562 Radiation Biology (3 credits)
- 98.711/712 Graduate Seminar in Radiological Sciences and Protection (3 credits)

The required plus courses for the PSM option to the M.S. Degree in Radiological Sciences and Protection are:

- 60.501 Financial Accounting (2 credits)
- 63.501 Operations Fundamentals (2 credits)
- 66.501 Organizational Behavior (2 credits)
- IB.601 Professional Writing & Communication (3 credits)
- 98.xxx Radiological Sciences Internship (1 credit)

Total 34 credits

Students may request alternative courses from the MBA curriculum at UML. Approval from the Radiological Sciences Graduate Coordinator is required in advance for alternative courses.

Professional Internship in Radiological Sciences

The professional internship is required for all students matriculating in the PSM option. The internship should provide a broad experience performing real world tasks related to radiation protection for a minimum of 340 hours. Paid internships with companies and organizations that use radiation are preferred but volunteer on-campus internships with the university's radiation safety office also will be available to students. Internships have to be approved in advance by the graduate committee of the Radiological Sciences Program, including approval of a qualified supervisor for off-campus internships. The graduate committee will provide oversight of all internships. A written report, signed by the internship supervisor, must be submitted by the student upon completion of the internship. An oral presentation by the intern as a Radiological Sciences seminar also is required. For students already employed in Health Physics, the professional internship will be tailored to meet the needs of both employee and employer.

Comprehensive Examination

Candidates for the PSM option to the M.S. Degree in Radiological Sciences and Protection must pass the Comprehensive Master's Examination that is based on the required graduate courses and administered once each semester.

Bachelor's-Master's Program

In recognition of the need for advanced training beyond the bachelor of science level in radiological sciences, the following represents a program by which outstanding undergraduates can pursue an accelerated course of study leading to the B.S. and M.S. degrees in Radiological Sciences and Protection.

1. Undergraduate students who express an interest in this program will be evaluated by the graduate selection committee. Those students deemed commendable by the committee will be advised relative to the correct procedure for successful completion of their B.S. degree as well as a course of study toward the M.S. degree.
2. The first three years of undergraduate study is identical to that specified for students enrolled in the current four year B.S. program.
3. During the second semester of the junior year and upon approval and recommendation by the graduate selection committee, the student will file formal application to the Graduate School. This does not require the student to have taken the Graduate Record Examination. The committee decision will be based on (a) overall grade-point average, (b) grade-point average in selected subjects, (c) recommendations by program faculty, and (d) a one year minimum enrollment requirement at the University of Massachusetts Lowell. Upon approval by the Dean of the Graduate School, the student may be allowed to pursue graduate studies during the Senior year and officially become a provisional graduate student in the first semester of the senior year of the Radiological Health Physics option in Physics.
4. During the senior year, the student is permitted to take up to four graduate-level courses which can be applied towards the M.S. degree. Although advanced undergraduate (i.e., 400 level) courses are acceptable, no more than two such courses are allowed towards the M.S. degree. It should be emphasized that the total number of credits for the combined degrees must be greater than the minimum number of credits required for both the undergraduate and graduate degrees. As an example, a student who has taken 124 credits during the B.S. degree program (required minimum - 120 credits) may, with approval, transfer up to 4 of the credits used to obtain the B.S. degree toward the M.S. degree. A maximum of 12 credits can be transferred toward the M.S. degree program.
5. Upon completion of the fourth year of study, assuming that all program and University requirements have been met, the student will be

awarded the B.S. degree and then may be recommended for full matriculation status by the graduate selection committee and the Dean of the Graduate School prior to the fifth year of study. If the student chooses not to continue toward the M.S. degree (or fails the fifth year), this does not alter receipt of the B.S. degree.

6. Although the options exist for taking an overload in any semester and/or registering for one or more summer sessions, they are not a requirement of this program. However, students wishing to gain a full research experience will be encouraged to initiate their research as early as possible (e.g., during the junior to senior year summer session), which is a distinct advantage of this accelerated program.

7. During the fifth year, as in the standard M.S. degree program, the student may choose the thesis option (9 semester hours of graduate research) or the project option (3 semester hours of graduate project). In either case, the student is required to take two one-credit graduate seminar courses and other courses required for the M.S. degree in radiological sciences that satisfy the 30 credit minimum M.S. degree requirement. Upon completion of all program and graduate school requirements, the student will be awarded the M.S. degree in Radiological Sciences and Protection.

[More information on the Bachelor's/Master's Program](#)

Graduate Certificates in Radiological Sciences

Graduate Certificate Programs in Radiological Sciences:

- [Medical Physics](#)
- [Radiological Health Physics and General Work Environment Protection](#)

[Graduate Certificate Application Form](#) (pdf)

Medical Physics Certificate Program

Dr. Clayton French
Tel. 978-934-3286
clayton_french@uml.edu

[Program Description and Requirements.](#)

Radiological Health Physics and General Work Environment Protection

Dr. Clayton French
Tel. 978-934-3286
clayton_french@uml.edu

[Program Description and Requirements.](#)

Radiological Sciences and Protection

The Profession of Radiological Health Physics

Radiological Health Physics (RHP) involves the study of the effects of radiation and radioactivity on life processes. It also can be called radiation protection science and is particularly involved with the effects of radiation on the human body and the control of such radiation.

Many graduates of this curriculum at the University of Massachusetts Lowell (UML) enter the profession of health physics, which is devoted to the protection of man and the environment from the harmful effects of radiation while at the same time making it possible for our advancing civilization to enjoy all of the benefits resulting from uses of radiation.

Radiation control in its professional aspects requires the skills and knowledge from many disciplines. It has common scientific interests with many areas of specialization: biophysics, physics, biochemistry, chemistry, biology, genetics, ecology, nuclear engineering, metallurgy, medicine, physiology, industrial hygiene, and toxicology.

Other aspects of the profession include a working knowledge of labor relations, public relations, teaching, philosophy, and administration. The wide spectrum of knowledge required of the health physicist makes this profession both challenging and rewarding.

The Profession of Medical Physics

Medical Physics (MP) involves the application of physics to the diagnosis and treatment of disease. The use of radiation producing devices and radioactivity in medical physics is extensive. Many graduates of the Radiological Sciences and Protection curriculum at the University of Massachusetts Lowell (UML) enter the profession of medical physics. Graduate students who intend to enter this profession are encouraged to seek internships and research venues at nearby hospitals for which they can receive graduate credit towards the master's degree.

Employment and Scholarship Opportunities

Health physicists are employed by federal agencies (such as the Nuclear Regulatory Commission and Department of Energy) at

- research, production, and testing facilities;
- state, and local government agencies responsible for regulating the use of radiation sources and radioactive materials;
- the military services;
- electric utilities operating nuclear power plants and many related industries such as engineering support companies;
- industries which use radioisotopes or x-ray equipment to detect flaws or defects in manufactured products, prepare or reprocess nuclear fuels, control nuclear wastes, or produce or use radioactive materials or devices;
- universities (in teaching, research, and equipment monitoring);
- hospitals and medical centers that use radionuclides, x-ray equipment, and accelerators in the diagnosis and treatment of patients; and
- consulting firms which advise the organizations that do not employ full-time health physicists.

Scholarships are available for graduate students who choose the Radiological Sciences Program. These are available from

- the Nuclear Regulatory Commission (NRC),
- the Department of Energy (DOE),
- the National Academy for Nuclear Training,
- the Health Physics Society (HPS),
- the American Nuclear Society (ANS), and
- other organizations concerned with radiation protection.

Teaching Assistantships and Research Assistantships are available on a limited basis for UML graduate students.

Students may gain valuable applied work experience while also earning graduate credit and money through various summer internship programs. They also may gain experience and academic credit through an internship course at the UML Radiation Laboratory. This course is conducted under the direction of the health physics staff who have responsibility for the radiation safety programs at the nuclear reactor facility; accelerator facility, radioisotope research laboratories and x-ray facilities at the University of Massachusetts Lowell.

Financial Assistance & Assistantships

FINANCIAL ASSISTANCE

[Applying for Financial Aid](#)
[Other Types of Assistance](#)
[Tuition and Fees](#)

[Financial Aid](http://www.uml.edu/financialaid/) (www.uml.edu/financialaid/)

Dugan Hall Room 102
 883 Broadway Street
 Lowell, MA 01854
 Telephone: 978.934.3009
 OfficeHours: Mon-Fri 8:30 a.m. to 5:00 p.m.

Applying for Financial Aid:

The University requires students to file a Free Application for Federal Student Aid (FAFSA). Students may apply for the FAFSA online at www.FAFSA.ed.gov. It is recommended that students save time by requesting personal identification numbers called Federal Student Aid PINs before the student applies for aid. The PIN can be used to electronically sign the FAFSA, electronically sign certain loan contracts, and access online information about federal student aid the student has received. The PIN must be requested online at www.pin.ed.gov.

Copies of students' and spouses' federal income tax, W2 forms and other forms may be requested by the Financial Aid Office to verify information provided on the FAFSA. Many forms requested are available on the financial aid website at www.uml.edu/financialaid. All information requested by the Financial Aid Office is required to complete the application process and is held in strictest confidence.

Eligibility Requirements:

To receive financial aid from the various student aid programs, a student must:

- Have demonstrated financial need to qualify for need-based aid programs. Need is defined as the cost of attendance minus the expected family contribution derived from filing the FAFSA. Students may also be eligible for non-need based aid programs, such as the Federal Direct Unsubsidized Loan program and meritorious awards.
- Be a U.S. citizen or eligible non-citizen.
- Have a valid Social Security Number.
- Make satisfactory academic progress.
- Have a high school diploma or a General Education Development (GED) certificate, pass a test approved by the U.S. Department of Education, meet other standards the state of Massachusetts establishes that are approved by the U.S. Department of Education, or complete a high school education in a home school setting that is treated as a home school or private school under state law.
- Be a matriculated student enrolled in a degree granting or approved certificate program. Students enrolled in non-degree programs are not eligible for financial aid.
- Be enrolled at least half-time each semester. (Minimum of six credits for graduate students).

- Cannot be in default or in overpayment on a federal student loan.
- Register with the Selective Service, if required (www.sss.gov)

Determining Financial Need:

Demonstrated financial need is the difference between the cost of attendance and the expected family contribution. The cost of attendance (COA) includes direct expenses such as tuition and fees, and also includes indirect such as room, board, books and transportation. The expected family contribution (EFC) is determined by the federal needs analysis formula and is calculated by completing a Free Application for Federal Student Aid (FAFSA).

Types of Financial Aid:

William D. Ford Federal Direct Subsidized/Unsubsidized Loan Program: The primary source of financial aid recommended for graduate students is the William D. Ford Federal Direct Student Loan Program. This program allows the student to borrow up to \$20,500 per year at a low interest rate in subsidized and/or unsubsidized loans. Eligibility for a ?subsidized? or ?unsubsidized? direct loan is determined from the information provided on the FAFSA. A student may receive a subsidized loan and an unsubsidized loan for the same enrollment period. A ?subsidized? loan is awarded on the basis of financial need. A student will not be charged any interest before repayment begins or during authorized periods of deferment. An ?unsubsidized? loan is not awarded on the basis of need. A student will be charged interest from the time the loan is disbursed until it is paid in full. If a student allows the interest to accumulate, it will be capitalized?that is, the interest will be added to the principal amount of the loan and additional interest will be based upon the higher amount. For more information about graduate student aid contact the Financial Aid Office at 978-934-4220 or visit or website at www.uml.edu/financialaid .

William D. Ford Federal Direct PLUS Loan Program:

A non-need based federal loan offers up to the cost of attendance minus financial aid per academic year to qualified graduate students and parents/stepparents of undergraduate dependent students. Interest rate is fixed and repayment begins 45-60 days after the second disbursement. Refer to the Direct Loan web site (<http://www.ed.gov/offices/OSFAP/DirectLoan/index.html>) for current interest rates. A FAFSA is not required to apply for the PLUS loan; however, students are encouraged to file a FAFSA so that they can receive the maximum aid available. Parents may download an application online from the financial aid webpage www.uml.edu/financialaid by clicking on forms. Applications should be returned to the financial aid for processing. This is a loan that needs to be repaid by the parent/stepparent.

Other Types of Assistance:

Federal Professional Nurse Traineeship Grant Program: Federally funded grant available to graduate nursing students. Award amounts vary and are dependent upon funding. Please contact the School of Nursing for more information.

Federal Teach Grant: Federally funded grant available to qualifying graduate education majors enrolled in coursework or plan to complete coursework toward a career in teaching in a high need subject area. Contact the Graduate School of Education for more information.

Deans Fellowships: \$2,000 awards granted to eligible, newly admitted full-time, in-state Master's candidates not receiving a teaching or research assistantship.

Provost's Fellowships: \$4,000 awards granted to eligible, newly admitted full-time, out-of-state and international Master's candidates not receiving a teaching or research assistantship.

Professional Science Master's Fellowships: A \$5,000 award granted to eligible, newly admitted full-time Professional Science Master's candidates regardless of residency. (PSM candidates are ineligible for a teaching or research assistantship; however, an internship is a required component of their academic program.)

University Fellowships: This merit-based award is \$4,000 per year and is renewable for four years with full-time status and good academic standing. Each PhD degree granting college will grant one award. New applicants to Doctoral Programs regardless of other aid or assistantship will be considered.

ASSISTANTSHIPS

Teaching and Research Assistantships

A limited number of teaching and research assistantships are available for matriculated, full-time (minimum of 9 credits/semester) graduate students. All assistantships are subject to the agreement between UMass Lowell and UAW/Graduate Employees Organization. Teaching assistantships are assigned by the student's department; therefore, queries regarding teaching assistantships should be directed to the departmental [graduate coordinator](#) or chairperson (see www.uml.edu/Grad/coordinators.aspx for a list). Research assistantships are available through special arrangements with individual research advisors. Individuals interested in research assistantships should contact departmental faculty members concerning the availability of this form of financial aid.

Qualifying for an Assistantship

To ensure that assistantships are awarded to the most qualified individuals, the University has established the following requirements:

1. No teaching/research assistantship may be awarded to a graduate student with incompletes, F's, or U's on his or her transcript.

2. No teaching/research assistantship may be awarded to a graduate student who fails to maintain good [academic standing](#) (a grade point average under 3.0 on the official transcript). See the Academic Standing information at www.uml.edu/catalog/graduate/policies/Academic_Standing.htm.

3. No University-funded teaching/research assistantship may be awarded to a master's degree candidate if he/she has completed the total number of credits required for his/her program.

4. Level III teaching/research assistantships may only be awarded to graduate students who have reached doctoral candidacy (i.e. completed all course work, oral/written and language examinations) and are enrolled in dissertation research.

Teaching and Research Assistants are awarded either a semester or a yearly contract. The current negotiated agreement between The University of Massachusetts Lowell Board of Trustees and the Graduate Employee Organization is posted on the Human Resources website. Current stipend levels may be found there as well.

Graduate Student Assistantships

A limited number of student assistantships may be available in the departments. Students in this category are paid an hourly rate and are obligated to pay their own tuition and fees. All queries concerning assistantships should be directed to the [graduate coordinator](#) (www.uml.edu/Grad/coordinators.aspx) in the student's department.

Tuition and Fees

Please see the [Student Financial Services](#) website at www.uml.edu/Tuition-fees/default.aspx for current tuition and fee information. Your tuition rate is determined by your residency status – in-state, out-of-state (which would include international students), New England Regional or Proximity.

Financial Information

University-related costs include tuition and mandatory fees. Please contact the [Student Financial Services](#) (www.uml.edu/Tuition-fees/default.aspx) at 978-934-3570 for more information.

- [New England Regional Program](#)
- [Health Insurance](#)
- [Veterans](#)
- [Residency Classification](#)
- [Overdue Accounts](#)
- [Payment Plans](#)
- [University Charges](#)

New England Regional Student Program

Massachusetts and the University participate in a reciprocal program in which qualified and legal residents of other New England states may attend graduate school in an approved program at the University of Massachusetts Lowell and pay 150% of the Massachusetts in-state tuition charges. (All other applicable fees apply.) Applicants are considered for unique and distinctive graduate level studies not available in their home state university system. Full details regarding eligible programs are available from the New England Board of Higher Education, 45 Temple Place, Boston, Massachusetts 02111 (617-357-9620), or at the University [Graduate Admissions](#) office (www.uml.edu/grad).

*UMass Lowell also participates in the Proximity Allowance of the New England Regional Program. This program allows New Hampshire residents from selected towns within a 20 mile radius of UMass Lowell to be eligible for a tuition discount for most majors. Please visit www.uml.edu/admissions/proximity for details.

Health Insurance

Mandatory on-campus (accident) insurance is charged to all graduate students. All graduate students enrolled in 9 or more credit hours will be charged for health insurance as required by state law. Graduate students may waive student health insurance charges if they maintain comparable insurance coverage and complete an insurance waiver form by the required deadline. Forms are available in the Office of Graduate Admissions and Accounts Receivable Office, Dugan Hall, UMass Lowell South. Family health insurance plans are also available with options for coverage of spouses and/or spouses and dependent children.

International Students: As authorized under the insurance laws for higher education students in Massachusetts (section 275 of Chapter 151 of the Acts of 1996), **the University of Massachusetts Lowell requires that all international students must enroll in the University's Student Health Insurance Plan.**

Veterans

The Veterans Administration has approved the University of Massachusetts Lowell for undergraduate study. For details regarding veteran tuition benefits, refer to the [Registrar's Office](#) website (www.uml.edu/registrar/).

RESIDENCY CLASSIFICATION

Rules for Determination of Domicile

University tuition rates are established on the basis of official state residency as determined by a student's true "domicile." "Domicile" is defined as a person's true, fixed and permanent home and place of habitation where he or she intends to remain permanently or for an indefinite time. Massachusetts residency for tuition purposes is not acquired by mere physical presence in Massachusetts while a person is carrying on a course of study at the University. A student's residency status is based on a determination of one's domicile at the time of entry or re-entry to the University. A student may apply to be reclassified at any time and must provide detailed documentation to support the claim that he or she met the requirements for Massachusetts residency for tuition purposes at the time of his or her entry as a student. One notable exception is made for students who marry Massachusetts residents while enrolled in a course of studies. The complete set of rules are attached to the application for reclassification. These applications are available from the Residency Officer in Dugan Hall (978-934-2596).

Payment of Bills

Graduate students will be permitted to attend classes and to utilize University facilities only after they have cleared all their financial obligations to the University. Financial obligations include indebtedness for library and parking fines, rental payments, and repayment of emergency loans. All bills are payable in advance by check or money order and are due as specified on the student invoice. Major credit cards are also accepted. All payments of fees and tuition should be made payable directly to the University of Massachusetts Lowell. A student in debt to the University at the end of any semester or summer session is not permitted to register again at the University until his or her indebtedness has been discharged. In addition, student transcripts and diplomas will not be released unless all indebtedness has been discharged.

Overdue Accounts

Should it be necessary to utilize the services of a collection agency or attorney for an overdue student account, the student will be liable for any and all legal fees, commissions, and associated service charges.

Payment Plans

The University of Massachusetts Lowell offers a low-cost, interest-free payment option administered by Academic Management Services (AMS). This plan allows students to budget the annual cost of tuition and fees over a ten month period. Please call AMS directly at 1-800-635-0120 or contact the Financial Aid Office, Dugan Hall, UMass Lowell South (978-934-3570) for more information.

University Charges

University-related costs include tuition and mandatory fees. Please contact the [Student Financial Services](http://www.uml.edu/Tuition-fees/default.aspx) (www.uml.edu/Tuition-fees/default.aspx) for more information.

Professional Science Master's (PSM)

[What differentiates the PSM from the core Master's degree?](#)

[PSM Options at UMass Lowell](#)

The Professional Science Master's (PSM) is an innovative, non-thesis degree option designed to allow students to pursue advanced training, while simultaneously developing workplace skills highly valued by employers. These programs consist of core academic training, a required internship and cross-training in business and communications. All programs have been developed in concert with industry in response to employer demands for specific skills and knowledge above and beyond the core science curriculum.

These programs provide students with training and skills both in science and business which allows them to be more competitive in today's global market. The PSM (Professional Science Master) is designed as a terminal degree preparing candidates for entry directly into the workforce by preparing them through professional coursework in business and a 3 credit hour internship in a related setting.

What differentiates a Professional Science Master's option from the core degree?

- The Professional Science Master's (PSM) is a non-thesis option designed to prepare students for science careers in business, government or non-profit organizations.
- The PSM combines rigorous study in science or mathematics with skills-based coursework in business, management, policy, law or other fields.
- It emphasizes the written and verbal communication, leadership, and team-building skills required in professional settings.
- PSM programs are interdisciplinary in nature.
- The degree can be completed in two years of full-time study, including a "real world" internship.
- Most PSM programs have established advisory committees of local employers to ensure their curriculum is responsive to regional workforce needs.

Professional Science Master's Options at UMass Lowell:

- [Biological Sciences](#)
Applied Biotechnology

- Environmental Biotechnology
- Biosafety
- Project Management in Life Sciences
- [Biomedical Engineering and Biotechnology](#)
- [Chemistry](#)
 - Chemistry and Polymer Science
 - Pharmaceutical Biochemistry
- [Clinical Laboratory Sciences](#)
- [Environmental Sciences](#)
 - Atmospheric Sciences
- [Marine Sciences](#)
 - Costal and Ocean Administration, Science and Technology
- [Mathematics](#)
 - Industrial Mathematics
- [Physics](#)
 - Radiological Sciences
- [Work Environment](#)
 - Cleaner Production & Pollution Prevention
 - Environmental Epidemiology
 - Ergonomics and Safety
 - Occupational & Environmental Hygiene

For more information regarding PSM programs at UMass Lowell contact [Ms. Susan Lawton](#).

For more information regarding PSM programs nation-wide: www.sciencemasters.com

Accelerated Bachelor's - Master's Programs

[Eligibility](#)

[Course Credits](#)

[How to Apply](#)

In order to encourage outstanding UMass Lowell undergraduate degree students to continue their studies towards an advanced degree, qualified students may apply for the Accelerated Bachelor's to Master's Degree Option.

This option carries distinct benefits. Graduate Record Examination (GRE) scores are not required (except in the Graduate School of Education) and the application fee is waived. In addition, many departments offer course credit benefits. (For detailed information regarding specific course credit benefits, please see the Graduate Coordinator in the respective Master's degree granting department.)

Eligibility

Any UMass Lowell undergraduate junior or senior with a grade point average of 3.0 or better may apply to a Master's degree program at UMass Lowell (except for the MBA Program which requires a 3.2 GPA) under the Accelerated Bachelor's to Master's Degree Option. However, to be accepted into this option the following minimum conditions must be met (Individual departments may have more stringent requirements. Contact the Graduate Coordinator in the Master's Degree granting department prior to applying.):

1. The student must have a cumulative grade point average of 3.0 or above at the time the baccalaureate degree is conferred in order to maintain eligibility for this option.
2. The student must apply for and receive his/her baccalaureate degree before matriculating into the graduate program.
3. Once accepted a student must begin his/her graduate studies in the semester immediately following conferral of the baccalaureate degree (e.g. if a student receives his/her undergraduate degree in the Spring s/he must matriculate in the Fall semester of the same year; if a student receives his/her undergraduate degree in the Fall semester, s/he must begin her/his graduate studies in the Spring semester immediately following). Admission under this option may not be deferred. Any applicant who is accepted to the Accelerated Bachelor's to Master's Degree Option and who opts not to enroll in at least one course within the graduate department to which they have been accepted in the semester immediately following conferral of the bachelor's degree will be required to take the GRE and have his/her application reassessed.

Course Credits

The graduate degree granting department may allow course credit benefits; however, the following requirements apply:

1. Any graduate courses taken by a baccalaureate degree student that are credited towards the Master's degree must have been obtained with a grade of B or better.
2. Only courses of 500 level or higher may count toward the Master's degree.
3. As defined by the graduate degree granting department, a maximum of 12 graduate credits (500 level or above) may be used for both the baccalaureate and master's degrees provided these graduate credits were taken in excess of the university minimum of 120 baccalaureate degree credits, or a maximum of up to six credits of graduate (500 level or higher) courses may be used by a student in the Accelerated Bachelor's to Master's Degree Option for both the graduate and undergraduate degrees.
4. Students must petition to have specific courses (500 level or above) taken during their undergraduate career apply towards their

graduate degree via an Academic Petition.

How to Apply

Applicants are requested to use the standard paper application form and submit requisite materials to the [Office of Graduate Admissions](#) (Dugan Hall - UMass Lowell South Campus), normally in the second semester of their third year as an undergraduate (up until the last day of classes in their final semester before graduation). Application forms and details on applying may be obtained by contacting the Graduate Admissions Office at 978-934-2390 or [downloaded](#) (pdf).

About Graduate Certificates

Most graduate certificate are comprised of four courses designed to provide specific knowledge and expertise vital to today's changing and complex needs in the work place. In most cases courses may be applied toward a degree program.

Requirements to Complete a Graduate Certificate

The courses to complete the certificate must be completed within a five year period with a minimum 3.0 grade point average, and with no more than 3 credits below B. Courses completed for one certificate may not be used for another certificate.

Certificate Application Process

Individuals must complete a simplified application and provide an official undergraduate transcript indicating that a baccalaureate degree has been awarded. GRE's are not required. NOTE: If your bachelor's degree is from outside of the U.S., you may be required to take the TOEFL examination.

[Graduate Certificate Application Form](#) (pdf)

Gainful Employment Disclosure Information

Completion rates, median loan debts and program costs are outlined for each certificate program and available in PDF format.

[Graduate Programs](#) (pdf)

Master's Programs Offered

Listed by Degree Earned

[Master of Arts](#)

[Master of Business Administration](#)

[Master of Education](#)

[Master of Music](#)

[Master of Science](#)

[Master of Science in Engineering](#)

[Education Specialist](#)

Master of Arts (M.A.)

[Community Social Psychology](#)

[Criminal Justice](#)

[Economic & Social Development of Regions](#)

[Peace & Conflict Resolution](#)

Security Studies

Master of Business Administration (MBA)

[Accounting](#)

[Finance](#)

[Information Technology](#)

Master of Education (M.Ed.)

[Curriculum & Instruction](#)

Autism Studies

Curriculum & Instruction: Initial Certification

Curriculum & Instruction: Science Education, beyond initial

Curriculum & Instruction: Math Education, beyond initial

Teaching English to Speakers of Other Languages

[Educational Administration](#)

Higher Education

[Reading & Language](#)

Master of Music

[Music Education](#)

Teaching

Community Music

[Sound Recording Technology](#)

Master of Science

[Accounting](#)

[Autism Studies](#)

[Biological Sciences](#)

Applied Biotechnology (MS,PSM)

Biotechnology (MS only)

Biosafety (MS, PSM)

Environmental Biotechnology (MS, PSM)

Project Management for Life Sciences (MS,PSM)

[Biomedical Engineering & Biotechnology](#)

Biomedical & Biotechnology (PSM)

[Chemistry](#)

Chem & Polymer Science (PSM)

Pharmaceutical Biochemistry (PSM)

[Clinical Laboratory Sciences](#)

Clinical Lab Science (PSM)

[Computer Science](#)

Bio/Chemical Informatics

Software Entrepreneurship

Entrepreneurship (PSM)

[Environmental Studies](#)

Atmospheric Sciences

Atmospheric Sciences (PSM)

Environmental Engineering Sciences

Environmental Geoscience (MS,PSM)

Health Informatics & Management

Health Informatics

Health Management

Information Technology

Innovation & Technological Entrepreneurship

Marine Sciences & Technology

Coast & Ocean Admin. Science/Technology (PSM)

Mathematics

Applied & Computational Mathematics

Industrial Mathematics (PSM)

Mathematics for Teachers

Probability & Statistics

Nursing

Adult/Gerontological Nursing

Adult Psychiatric & Mental Health Nursing

Family Health Nursing

Physics

Phototonics

Radiological Science & Protection

Radiological Science and Protection (PSM)

Medical Physics

Security Studies

CBRNE Security

Critical Infrastructure Protection

Cybersecurity

Work Environment

Cleaner Production & Pollution Prevention (MS, PSM)

Ergonomics & Safety (MS, PS)

Epidemiology (MS.PSM)

Occupational & Environmental Hygiene (MS, PSM)

Master of Science in Engineering (M.S.E.)

Chemical Engineering

Leadership

Civil Engineering

Leadership
Environmental
Geoenvironmental
Geotechnical
Structural
Transportation

[Computer Engineering](#)

Leadership

[Electrical Engineering](#)

Leadership

Optics

[Energy Engineering](#)

Leadership

Nuclear

Solar

[Mechanical Engineering](#)

Leadership

[Plastics Engineering](#)

Leadership

Coatings & Adhesives

Fibers & Composites

Synthetic Fibers

Education Specialist (Ed.S.)

[Administration, Planning & Policy](#)

[Curriculum & Instruction](#)

Education of Diverse Populations

[Reading & Language](#)

Graduate Certificate

Peace and Conflict Resolution Studies

Contact:

Dr. Paula Rayman

978-934-4307

Paula_Rayman@uml.edu

It is vitally important that we understand the causes of conflict, learn constructive ways to resolve them, and build peaceful relationships. Social injustice is a key source of conflict, and the dynamics of inequality and diversity are at the core of this program.

The certificate will be particularly valuable for:

- Those who have encountered conflict in their personal and/or professional lives.
- People working in very diverse fields, such as human services, law enforcement, health care, business, education and community organizing, who need skills in understanding and handling conflicts.
- Undergraduates interested in graduate studies.

This certificate program requires the completion of 12 credits comprised of one required course and three approved electives.

[About Graduate Certificates](#)

[Graduate Certificate Application Form](#)

Requirements:

- Strategies of Conflict Transformation (PCS.501 - 3 credits) - required core course
- Three Elective Courses (total of 9 credits)

Elective Courses

Some courses have relevance to multiple options and are therefore included in more than one option. Other courses may be added with the permission of the Graduate Coordinator.

Conflict Resolution

47.500 Introduction to Community Social Psychology
47.503 Applied Social Psychology
47.522 Psychology of Diversity
47.542 Working with Groups
57.511 Dynamics of Power and Authority
57.512 Community Conflict Resolution
57.532 Advanced Community Dynamics or 47.625 Advanced Community Dynamics: Lowell
57.605 Social Movements and Empowerment
05.652 Managing Change and Conflict

Organizational Leadership

44.513 Crisis and Emergency Management
47.500 Introduction to Community Social Psychology
47.526 Workplace Diversity
47.545 Community and Organizational Change
57.511 Dynamics of Power and Authority
57.532 Advance Community Dynamics
57.598 Organizational Dynamics and Regional Development
47.546 Grant Writing or 57.546 Grant Writing

Policy Analysis

44.526 Domestic Terrorism and Hate Crimes
44.549 Terrorism and Counter Terrorism
44.568 Contemporary Security Studies
47.500 Introduction to Community Social Psychology
47.527 Immigrant Psychology and Communities
47.547 Community Mapping or 57.514 Community Mapping
57.513 Foundations of Comparative Regional Development
57.515 Politics and Economics of Public Policy
57.540 China and India in the Global Economy
57.550 Analyzing Peace, Violence & War
57.553 Nationalism, Revolution and Religion in Modern Middle East Politics
57.554 Latin American Politics

Other Links:

- [Peace and Conflict Studies website](#)
- [Undergraduate Course of Study in Peace and Conflict Studies](#)
- [Minor in Peace and Conflict Studies](#)
- [Graduate Course of Study in Peace and Conflict Studies](#)

Peace and Conflict Studies

Graduate Programs offered:

- [Master of Arts in Peace and Conflict Studies](#)
- Graduate Certificates offered:
 - [Graduate Certificate in Peace and Conflict Resolution Studies](#)
 - [Bachelor's - Master's Program](#)

Master of Arts in Peace and Conflict Studies Program Objectives

Peace and Conflict Studies is an inter-disciplinary academic field that studies the causes and conditions which generate and sustain violent conflict, the mechanisms and models for the resolution of violent conflict and the norms, practices and institutions for building peace. Peace and Conflict Studies professionals engage in policy analysis, strategic peace-building, mediation, advocacy, and organizational leadership.

Curriculum Overview

The 30 credit M.A. program requirements include coursework in research methods, strategies for conflict transformation, and a two semester seminar that helps students integrate and synthesize their learning across disciplines. Students select electives within one of three professional options: Conflict Resolution, Organizational Leadership, or Policy Analysis. To complete the M.A., students choose a practicum at a local or international organization, a project, or a thesis.

Professional Options

The professional options are designed to help students advance their career trajectories within the broad field of peace studies. Each option offers core knowledge and skills relevant for work in the area.

- **The Conflict Resolution option** deepens student understanding of the nature and dynamics of conflict as well as strategies for managing and transforming conflict into more positive relationships, sustainable peace, and just societies. Students gain skills in identifying key factors and dilemmas in conflict settings and in fostering constructive change processes. Individuals in this option could pursue careers involving mediation and facilitation from the grassroots to the international level, restorative justice, and program development and training in conflict transformation.
- **The Organizational Leadership option** orients students for careers as professionals in peace-related local and international NGOs, governmental and intergovernmental agencies, and religious and other civil society organizations. Students gain a deeper understanding of the role of various kinds of organizations in peace-building and the challenges they face. Students reflect on what it means to be a leader in an organization, the ingredients of effective leadership, and their own leadership style. They also acquire skills and tools needed to manage organizational peace-building efforts effectively.
- **In the Policy Analysis option**, students analyze policy formation, implementation, and evaluation designed to build sustainable peace. Students gain skills in developing policies as well as broader initiatives to promote normative and structural change. This option provides a strong background for pursuing careers in areas such as policy advising in government, in regional or global international organizations, or in NGO settings; political organizing and advocacy work; and human rights implementation, monitoring, and evaluation.

Admissions Requirements:

1. Bachelor's degree from an accredited institution college or university.
2. An undergraduate grade point average of 3.0 or better. Applicants must submit an official transcript from the undergraduate institution that awarded their degree and an official transcript from any other undergraduate institution at which the applicant was awarded course credit. At the discretion of the Graduate Admissions Committee, students may be admitted with a grade point average below 3.0.
3. 18 credits of Peace and Conflict Studies related coursework. Courses dealing with the general themes of causes of conflict, resolution of conflict or the building of peace will be considered Peace and Conflict Studies coursework. Additionally, courses that are similar to the Peace and Conflict Studies elective courses will be considered as prior coursework. At the discretion of the Graduate Admissions Committee, a student may be admitted with fewer credits, especially in the case of a student with work experience in the field.
 - The Graduate Admissions Committee is aware that while some of the applicants will have a Bachelor's degree in Peace and Conflict Studies, many will be applying with degrees in related fields. This requirement will ensure that all incoming Master's students will have some familiarity with the key topics in the field. At the same time, this requirement is not expected to be prohibitive for applicants.
 - In the event that a student does not have the necessary background credits in Peace and Conflict Studies and does not have relevant work experience in the field, the student may be admitted under the condition that they complete relevant courses during the summer prior to matriculation or during the first semester.
4. An application fee as set by the Office of Graduate Admissions.
5. Acceptable scores on the Graduate Record Examination Aptitude Test. (Use of GMAT or LSAT scores may be approved by the Graduate Admissions Committee.) Students for whom English is not a national language must also submit a score for the Test of English as a Foreign Language (TOEFL). GREs are waived for BA/MA students and will be waived for UML alumni who graduated with 3.0 or higher.
6. Three letters of reference from individuals familiar with the educational and/or professional performance of the applicant.
7. A personal statement about the applicant's professional interests, educational and work qualifications, and future goals as related to the program.
8. A resume or curriculum vitae summarizing education and work experience.
9. An interview may be requested by the Graduate Admissions Committee.

Program Requirements: (30 credits total)

- **Required Core Courses** (9 credits):
PCS.501 Strategies for Conflict Transformation
57.506 or 47.512 Research Methods
PCS.550 Integrative Seminar

- **Professional Option Requirement:** Students must select four courses (total of 12 credits) from one of the professional options listed below. (Some courses have relevance to multiple options and are therefore included in more than one option.)

- **Conflict Resolution**

- 47.500 Introduction to Community Social Psychology
- 47.503 Applied Social Psychology
- 47.522 Psychology of Diversity
- 47.542 Working with Groups
- 57.511 Dynamics of Power and Authority
- 57.512 Community Conflict Resolution
- 57.532 Advanced Community Dynamics or 47.625 Advanced Community Dynamics: Lowell
- 57.605 Social Movements and Empowerment
- 05.652 Managing Change and Conflict

- **Organizational Leadership**

- 44.513 Crisis and Emergency Management
- 47.500 Introduction to Community Social Psychology
- 47.526 Workplace Diversity
- 47.545 Community and Organizational Change
- 57.511 Dynamics of Power and Authority
- 57.532 Advance Community Dynamics
- 57.598 Organizational Dynamics and Regional Development
- 47.546 Grant Writing or 57.546 Grant Writing

- **Policy Analysis**

- 44.526 Domestic Terrorism and Hate Crimes
- 44.549 Terrorism and Counter Terrorism
- 44.568 Contemporary Security Studies
- 47.500 Introduction to Community Social Psychology
- 47.527 Immigrant Psychology and Communities
- 47.547 Community Mapping or 57.514 Community Mapping
- 57.513 Foundations of Comparative Regional Development
- 57.515 Politics and Economics of Public Policy
- 57.540 China and India in the Global Economy
- 57.550 Analyzing Peace, Violence & War
- 57.553 Nationalism, Revolution and Religion in Modern Middle East Politics
- 57.554 Latin American Politics

- **Practicum, Project or Thesis:** (three to six credits)

1. Thesis - six credits
2. Practicum - Three credits are earned for a one-semester practicum; six credits are earned for a two-semester practicum.
3. Project - Three credits are earned for a one-semester project; six credits are earned for a two-semester project.

- **Elective Requirement:** (three or six credits, depending upon duration or practicum or project or whether the student has chosen to complete a thesis)

- Three credits of electives are required for students pursuing a six-credit thesis or two-semester (six credit) project or practicum.
- Six credits of electives are required for students completing a one-semester project or one-semester practicum.
- Elective courses may be chosen from within any of the courses listed under any of the professional options. This provides students the opportunity to take an elective course outside of their professional option.

Other Links:

- [Peace and Conflict Studies website](#)
- [Undergraduate Course of Study in Peace and Conflict Studies](#)
- [Minor in Peace and Conflict Studies](#)
- [Graduate Certificate Course of Study in Peace and Conflict Studies](#)

Peace and Conflict Studies

Through the Peace and Conflict Studies Inter-disciplinary Program at UMass Lowell, undergraduate and graduate students explore the causes of violence, methods to resolve violence, and practices to build peace. We combine theoretical and experiential education to prepare students for success in graduate school and their careers.

The need for practitioners trained in conflict resolution, human rights advocacy, and violence prevention has never been greater. Peace and Conflict Studies graduates go into government, the business sector, and non-profit organizations in order to make a difference and apply their skills towards improving the world.

Undergraduate students can major or minor in Peace and Conflict Studies. UMass Lowell juniors and seniors can apply for the Accelerated BA to MA. Graduate Students can earn a Graduate Certificate or Master of Arts in Peace and Conflict Studies.

Other Links:

- [Peace and Conflict Studies website](#)
- [Undergraduate Course of Study in Peace and Conflict Studies](#)
- [Minor in Peace and Conflict Studies](#)
- [Graduate Course of Study in Peace and Conflict Studies](#)
- [Graduate Certificate Course of Study in Peace and Conflict Studies](#)

Medical Physics Doctor of Philosophy Degree

There are two paths towards earning a Ph.D. degree in Medical Physics at UMass Lowell: Via the Department of Physics and Applied Physics' Ph.D. Program with Radiological Sciences – Medical Physics option and via the University's interdisciplinary doctoral program in Biomedical Engineering/Biotechnology (BMEBT) with Medical Physics/Radiological Sciences specialization. The Ph.D. in Physics path invariably appeals to traditional physics students. Students with engineering background often choose the BMEBT path. While retaining their respective Physics and Biomedical Engineering ancestry, these programs offer a common Medical Physics curriculum, which is based on the required courses in the MS curriculum.

Both Ph.D. programs, via Physics or BMEBT, offer an en-route MS degree option: Students who entered the program with a BS or non-Medical Physics MS degree and pass the Comprehensive Examination may be eligible for the MS degree in Medical Physics if he/she has satisfied the relevant MS degree requirements as detailed above.

Sample curricula available as pdfs

- [Leading to the Ph.D. Degree in Physics – Medical Physics Option, entering with BS in Physics](#)
- [Leading to the Ph.D. Degree in Physics – Medical Physics Option, entering with MS in Physics](#)
- [Leading to the Ph.D. Degree in BMEBT – Medical Physics Specialization, entering with BS in a technical discipline](#)

Detailed description of the programs of study is published each year by the Department of Physics and Applied Physics, which includes the Medical Physics Programs, and it is available from the Physics Graduate Coordinator.

Medical Physics Master of Science Degree

The MS Degree in Medical Physics requires 31 hours of didactic courses, 2 hours of clinical training (counting as laboratory courses), and a thesis of publishable quality that includes a minimum of 6 hours of thesis research. Elective courses may be taken to meet particular educational needs, especially for the student's research.

- [Sample curriculum leading to the MS Degree in Medical Physics](#) (pdf)

Medical Physics

Overview and Program Goals

The University of Massachusetts Lowell's Department of Physics and Applied Physics offers a Master of Science degree in Medical Physics and a Ph.D. in Radiological Sciences with Medical Physics Concentration. A Ph.D. in Biomedical Engineering and Biotechnology with Medical Physics Specialization is also available. In collaboration with local and regional hospitals and cancer centers in the Boston area, the program is designed for individuals who seek the MS or Ph.D. degree and wish to be educated in therapeutic and imaging medical physics.

Students gain education and training in fundamental radiation sciences, medical physics and dosimetry, which includes laboratory work and clinical internship. The MS program duration is designed to be two years plus one summer semester, although the typical academic plan may be different due to elective courses and the length of thesis research. The duration of the Ph.D. program depends on the student's academic progress, and it is usually between four and six years. Both the MS thesis and Ph.D. dissertation must be based on hypothesis- or development-driven research, and the student is expected to submit the results to a peer-reviewed journal.

Program Objectives

The MS Degree in Medical Physics qualifies students for all medical physics specialties and prepares them for residency programs, junior medical physics positions, and future ABR exams. The clinical component provides the students with training dominantly in radiation therapy.

The Ph.D. degree program provides the students with fundamental knowledge of physics with a specialization in medical physics. Students receive advanced research training in particular areas of medical physics, which will prepare them for entry-level research positions in academia or industry, or for a medical physics resident position under the supervision of a board-certified medical physicist.

Historically, most students have concentrated on therapy physics but because sometimes the cooperating hospitals have imaging or nuclear medicine research projects, over the last decade a number of students have focused on other medical physics specialties as well.

Upon graduation, medical physics students are prepared to receive advanced clinical training through working under the direction of a board-certified medical physicist or entering a medical physics residency program. The students will be prepared for a career as:

- A professional clinical medical physicist.
- A medical physicist in a research laboratory.
- A medical physicist in industry.
- For Ph.D. students, career as a medical physicist in an academic environment.
- For MS students, further research training in a Ph.D. medical physics program.

Qualification for Admission

Applicants are expected to have a strong foundation in physics, documented by either a degree in physics or in a related engineering or physical science with the following undergraduate coursework at the minimum:

- Physics: Core physics courses, including two semesters of general physics plus Classical Mechanics, Electricity and Magnetism, and Modern Physics or Quantum Mechanics;
- Mathematics: Three semesters of calculus and one semester of differential equations;
- Computer Science: Proficiency in a scientific/engineering programming language and knowledge of fundamental numerical methods;
- Chemistry (preferred): Two semesters of general chemistry;
- Biology (preferred): One semester of general biology;
- Anatomy (preferred): One semester of human anatomy.

Successful applicants typically have an undergraduate major in physics, engineering, or a similar technical field. Students with other undergraduate degrees may be accepted if the prerequisite coursework is satisfied. Applicants with minor deficiencies, such as the undergraduate anatomy course, may be admitted with the provision of satisfying the prerequisite during the first year of graduate study.

Further information on the graduate admission process, including on-line and downloadable application forms, may be accessed at the [UMass Lowell Graduate Admission website](#).

Programs of Study

Master of Science Degree

The MS Degree in Medical Physics requires 31 hours of didactic courses, 2 hours of clinical training (counting as laboratory courses), and a thesis of publishable quality that includes a minimum of 6 hours of thesis research. Elective courses may be taken to meet particular educational needs, especially for the student's research.

- [Sample curriculum leading to the MS Degree in Medical Physics](#)

Doctor of Philosophy Degree

There are two paths towards earning a Ph.D. degree in Medical Physics at UMass Lowell: Via the Department of Physics and Applied Physics' Ph.D. Program with Radiological Sciences ? Medical Physics option and via the University's interdisciplinary doctoral program in Biomedical Engineering/Biotechnology (BMEBT) with Medical Physics/Radiological Sciences specialization. The Ph.D. in Physics path invariably appeals to traditional physics students. Students with engineering background often choose the BMEBT path. While retaining their respective Physics and Biomedical Engineering ancestry, these programs offer a common Medical Physics curriculum, which is based on the required courses in the MS curriculum.

Both Ph.D. programs, via Physics or BMEBT, offer an en-route MS degree option: Students who entered the program with a BS or non-Medical Physics MS degree and pass the Comprehensive Examination may be eligible for the MS degree in Medical Physics if he/she has satisfied the relevant MS degree requirements as detailed above.

Sample curricula

- [Leading to the Ph.D. Degree in Physics ? Medical Physics Option, entering with BS in Physics](#) (pdf)
- [Leading to the Ph.D. Degree in Physics ? Medical Physics Option, entering with MS in Physics](#) (pdf)
- [Leading to the Ph.D. Degree in BMEBT ? Medical Physics Specialization, entering with BS in a technical discipline](#) (pdf)

For the latest course information please visit the UMass Lowell Online Academic Catalog.

Detailed description of the programs of study is published each year by the Department of Physics and Applied Physics, which includes the Medical Physics Programs, and it is available from the Physics Graduate Coordinator.

Medical Physics and Radiological Science Faculty, Research and Resources

- [Faculty](#)
- [Resources](#)

Doctoral Programs Offered

Listed by Degree Earned

[Doctor of Education](#)

[Doctor of Engineering](#)

[Doctor of Nursing Practice](#)

[Doctor of Philosophy](#)

[Doctor of Physical Therapy](#)

[Doctor of Science](#)

Doctor of Education

[Leadership in Schooling](#)

[Language Arts & Literacy](#)

[Mathematics & Science Education](#)

Doctor of Engineering (D.Eng./Ph.D)

[Business Management Curriculum](#)

[Chemical Engineering](#)

[Civil Engineering](#)

[Electrical Engineering](#)

[Energy Engineering](#)

[Mechanical Engineering \(D.Eng. only\)](#)

Mechanical Engineering/Chemical Engineering

Mechanical Engineering/Civil & Environmental Engineering

Mechanical Engineering/Energy Engineering

Mechanical Engineering/Manufacturing

Mechanical Engineering/Manufacturing Engineering

[Plastics Engineering](#)

Doctor of Nursing Practice (DNP)

Nursing

Doctor of Philosophy (Ph.D.)

[Biomedical Engineering & Biotechnology](#)

Business Administration

Technology Management

International Business

Accounting

Leadership

Finance

Management Information Systems

[Chemistry](#)

Biochemistry

Environmental Studies

Green Chemistry

[Computer Science](#)

Bio/Chemical Informatics

Computational Mathematics

[Criminology and Criminal Justice](#)

Crime, Criminals & Community

Global Perspectives on Crime & Justice

Justice System & Policy

Technology & Criminal Justice

Victims, Crime & Justice

Global Studies

Security & Human Rights

Socio-Economic Development

Comparative Cultures

[Marine Sciences & Technology](#)

[Nursing](#)

[Physics](#)

Applied Mechanics

Energy Engineering

Atmospheric Sciences

Radiological Sciences

[Polymer Science](#)

Polymer Science/Plastics Engineering

Doctor of Physical Therapy (DPT)

[Physical Therapy](#)

Doctor of Science

[Work Environment](#)

Cleaner Production & Pollution Prevention

Ergonomics

Epidemiology

Hygiene

Policy

Graduate Certificates Offered

[Adult Psychiatric and Mental Health Nursing](#) (Post-Master's)

[Applied Statistics](#)

[Behavioral Intervention in Autism](#)

[Biomedical Engineering](#)

[Biotechnology & Bioprocessing](#)

[Chemistry](#)

[Clinical Pathology](#)
[Commercial Development for Plastics Engineers](#)
[Communications Engineering](#)
[Composites and Materials](#)
[Criminal Justice Informatics](#)
[Criminal Justice Leadership & Policy Development](#)
[Medical Plastics Design and Manufacturing Engineering](#)
[Disability Outcomes](#)
[Diversity in the Workplace](#)
[Domestic Violence Prevention](#)
[Economic & Social Development of Regions](#)
[Elastomeric Materials](#)
[Energy Conversion](#)
[Environmental Biotechnology](#)
[Environmental Risk Assessment](#)
[Family Studies](#)
[Forensic Criminology](#)
[Foundations of Business](#)
[Geropsychiatric & Mental Health Nursing](#)
[Health Informatics](#)
[Health Management](#)
[Health Policy](#)
[Human-Computer Interaction](#)
[Identification & Control of Ergonomic Hazards](#)
[Integrated Engineering Systems \(interdisciplinary\)](#)
[Job Stress & Healthy Job Redesign](#)
[Laboratory and Biosafety](#)
[Criminal Justice: Leadership & Policy Development](#)
[Materials Sciences & Engineering](#)
[Mathematics for Teachers](#)
[Medical Plastics Design & Manufacturing](#)
[Microelectromechanical Systems/Nanoelectromechanical Systems \(interdisciplinary\)](#)
[Microwave and Wireless Engineering](#)
[Modeling, Simulation, and Control of Systems and Processes](#)
[Molecular & Cellular Biotechnology](#)
[Nanotechnology \(interdisciplinary\)](#)
[Network Security](#)
[New Venture Creation](#)
[Nursing Education \(Post-Master's\)](#)
[Nutritional Sciences](#)
[Palliative and End-of-Life Nursing Care](#)
[Peace and Conflict Studies](#)
[Photonics & Opto-Electronic Devices](#)
[Plastics Design](#)
[Plastics Engineering Fundamentals](#)
[Plastics Materials](#)
[Plastics Processing](#)
[Public Health Laboratory Sciences](#)
[Radiological Health Physics & General Work Environment Protection](#)
[Renewable Energy Engineering \(interdisciplinary\)](#)
[School Based Music Methods](#)
[Security Studies](#)
[Sleep and Sleep Disorders in Health and Disease](#)
[Stochastic Systems](#)
[Structural Dynamics and Acoustic Modeling Techniques](#)
[Sustainable Infrastructure for Developing Nations](#)
[Sustainable Polymeric Materials & Additives](#)
[System Models and Management](#)
[Teaching Children with Moderate Disabilities](#)
[Teaching English as a Second Language](#)
[Telecommunications](#)
[VLSI & Microelectronics](#)
[Victim Studies](#)

Graduate Programs

UMass Lowell offers more than three dozen [master's programs](#), including Education Specialist (Ed.S.) post-graduate programs. Many of our programs have [non-thesis options](#). If you're not ready to matriculate into a full program, consider our [certificate programs](#). If you are looking for a [doctoral program](#), we offer more than two dozen in a wide range of disciplines.

Business Administration Minor for Civil & Environmental Engineering

The Business Administration Minor for Civil & Environmental Engineering is a program delivered by the College of Management. It consists of a focused set of 5 courses plus two courses already in the Civil and Environmental Engineering (CEE) core program, of which two may be used as CEE senior year Professional electives. The net additional course work (over and above the 128 credits needed for the CEE degree) is three courses (some of which may be taken during the summer).

This Minor provides management training which is very desirable in industry, and allows an easy transition into a later MBA program.

For students in Civil & Environmental Engineering, the following courses are required in the Business Administration Minor:

- 49.201 Economics I (already in CEE core)
- 60.201 Accounting/Financial *
- 61.301 Business Finance *
- 62.201 Marketing Principles
- 66.301 Organizational Behavior * (may be used as a CEE Professional Elective)
- 14.372 Civil Engineering Systems (already in CEE core)
- 14.475 Construction Management (CEE Professional Elective)

Courses marked with an asterisk * are available during the summer or on-line.

To enroll in this Minor, students need to file a Declaration of Minor form with the College of Management before registering for 300 level courses, and indicate their intention to pursue this Minor with their CEE Faculty Advisor. Immediately after registering for the final courses which complete the minor, the student should file an academic petition, indicating approval by the College of Management, with the Office of Enrollment Services.

This Minor differs from the "regular" Minor in Business Administration offered by the College of Management in that 14.372 Civil Engineering Systems is used in lieu of one of the CoM electives, and 14.475 Construction Management is used in lieu of an MIS course.

Master of Science in Innovation and Technological Entrepreneurship (MSITE) Degree Program

- [Program of Study](#)
- [Program Core](#)
- [Program Electives](#)
- [Program Capstone](#)
- [Part-Time and Full-Time Study](#)
- [Admissions Process](#)

From a competitive perspective, the shift from a manufacturing base to a technology-innovation and knowledge-based economy requires new skills among organizational employees. In conversations with executive staff in major companies in the region we have been told repeatedly that the region's engineers and scientists need to be entrepreneurial. As competition and costs rise, research and development efforts must clearly contribute to business growth and the company bottom line. Thus, companies are looking for technical professionals who can generate new ideas and new businesses.

The goal of the Master of Science in Innovation and Technological Entrepreneurship (MSITE) is to provide engineers, business majors and scientists with the skills and knowledge required to drive innovation in today's collaborative, global workforce. Using a combination of class work, case work and real-world project activity, students will:

- Understand and leverage the business opportunities accompanying technology innovation within established companies and through the launch of new ventures.
- Develop an understanding of technology innovation and entrepreneurship from both an academic and applied perspective.
- Learn how to appropriately value and finance technology innovations and new ventures.
- Develop the market research and sales skills necessary to position technology innovations to create competitive advantage.
- Develop the management skills required to identify, launch and execute innovative products, services and new ventures.
- Develop an applied understanding of the regulatory and property law issues accompanying the innovation and entrepreneurship processes.
- Develop the project management and interdisciplinary team skills required to manage in an open collaboration environment.

A graduate of the MSITE program should be prepared to manage innovation in established firms or to launch new technology-oriented ventures.

Program of Study

The MSITE consists of ten courses (30 credits), including 4 core courses (12 credits), 4 elective courses (12 credits, 6 of which must be in Engineering and/or Science) and a 2 course (6 credit) practicum. Each student will participate in the development and delivery of a team capstone project (through the 2 course practicum) which will be reviewed by an external professional panel. Complete course descriptions are available in [this document](#) (pdf).

The program is outlined below.

Program Core

12 Credits

4 courses

- 64.650 - Innovation & Emerging Technology
- 62.630 - Market Research for Entrepreneurs
- 61.640 - Financing Innovation & Tech. Ventures
- 66.630 - New Product Development

Program Electives

12 Credits

4 Courses

(2 Eng. Or Sci.)

- 66.635 - Project Management or
- 22.576 - Engineering Project Management
- 64.655 - Corporate Entrepreneurship
- 66.640 - Managing Entrepreneurial Teams
- 26.590 - Intellectual Property
- 26.537 - Business Law for Engineers

*Special Topics

Additional electives with department approval

Program Capstone

6 Credits

2 Courses

- 64.680 - Practicum I New Venture Planning
- 64.681 - Practicum II New Venture Implementation

Part-Time and Full-Time Study

Students are admitted on either a part-time or full-time basis. Courses meet during the evening hours beginning at 6 p.m., with additional online and blended course options.

Part-time students are expected to graduate within five years. For an MBA student, the full-time course load is nine credits. Degree requirements usually are completed in two years for students attending full-time.

Admissions Process

For more information on the MSITE admissions process, please visit the [MSITE Prospective Student page](#).

Master of Science in Accounting

- [Program of Study](#)
- [Admissions Requirements](#)
- [Curriculum](#)

Program of Study

The Master of Science in Accounting (MSA) program at UMass Lowell is a 30 credit program which prepares qualified students to meet the licensing requirements to become Certified Public Accountants (CPAs) or to prepare for an accounting career in the corporate or government/nonprofit environment. Most courses are available online, and the program is open to either full-time or part-time students. For the entering class in September 2012, applications will be accepted only from students who majored in Accounting as undergraduates. In subsequent academic terms, non-Accounting undergraduates may apply. Non-Accounting undergraduate majors must first complete five prerequisite undergraduate Accounting courses (totaling 15 credits or more) with a grade of B- or better from an AACSB institution. These five courses (some of which may have prerequisites of their own) are Intermediate Accounting I, Intermediate Accounting II, Cost Accounting, Federal Income Taxes, and Auditing, and they must be completed before entering the 30-credit MSA program. For courses that have different names from the above, contact the MSA Coordinator to ascertain whether they are equivalent.

Admission Requirements

- GPA - Minimum undergraduate GPA of 3.0 (overall); comparable Accounting GPA.
- GMAT (500+); can be waived if the undergraduate GPA is at least 3.5 at an AACSB-accredited school and upon receipt of a recommendation by a faculty member; GMAT can also be waived for students in the UMass Lowell Plus 1 Program and undergraduate GPA of 3.0 or greater.

- Successful completion of all other University of Massachusetts Lowell Graduate Admissions requirements including three letters of recommendation and Manning School of Business TOEFL minimums.
- Exceptions or modifications to the above will be considered on a case-by-case basis.
- An internship or other relevant employment in the field is strongly encouraged, either before or during the program. Admissions Process

The MSA program can be completed on a full-time or part-time basis. For a full-time student, the 10-course, 30-credit program can typically be completed in one calendar year (e.g., four courses in the fall, four in the spring, and two in the summer). Part-time students will typically, on average, complete the program in about three years. The MSA program will accept up to six graduate credits from other AACSB institutions on a case-by-case basis. On a case-by-case basis, the College will also allow students from other programs/schools to earn up to six credits in the MSA program.

Curriculum

For undergraduate Accounting majors, the MSA curriculum consists of 10 courses (30 credits), five in Accounting and five electives (two of which are recommended to be in Accounting); for undergraduate non-Accounting majors, this program is preceded by five undergraduate prerequisite courses (with grades of B- or better) representing key foundation material in Accounting. These prerequisite course credits will not count toward the degree. UMass Lowell MS Accounting Curriculum Outline **Required Core Courses** (five courses required, three credits each)

- 60.601 Accounting Information for Management Decisions
- 60.640 Corporate Financial Reporting I
- 60.622 Globalization and Accounting
- 60.623 Relevant Accounting Issues
- 60.621 Tax Effects of Business Decisions

Total Core Credits Required Credits - 15 Elective Courses (5 courses required, three credits each)

- 60.603 Accounting Information Systems
- 60.655 Advanced Auditing
- 60.602 Advanced Management and Sustainability Acct.
- 60.641 Corporate Financial Reporting II
- 6p 645 Fraud Examination and Forensic Accounting
- 60.650 International Accounting
- 60.630 Taxation of Business Entities

Other graduate elective courses (taken with prior with approval of the MSA Coordinator) in Entrepreneurship, Finance, International Business, Management, Marketing, and MIS/OIS may be chosen to fulfill the electives requirements.

Elective Credits - Required Total - 15

Other Requirements:

At least 2 of a student's first 4 courses must be from the five Concentration Courses listed above.

It is recommended but not required that at least 2 of a student's Elective Courses (listed above) be in Accounting.

For more information about the Master of Science in Accounting, contact:

Khondkar Karim
MSA Coordinator
Phone: 978-934-2831
Email: Khondkar_Karim@uml.edu

Master's in Pharmaceutical Sciences

Admission and Degree Requirements

Applicants to the M.S. or Professional Science Master's programs in Pharmaceutical Sciences must have a B.S. degree or be in the last semester of their baccalaureate program. Up to 12 credits of graduate work of appropriate course work with a grade of B or better can be transferred into the UMass Lowell MS Pharmaceutical Science programs if approved by the Graduate Coordinator.

Upon admission or through the successful completion of prerequisite courses, students will be expected to have successfully demonstrated undergraduate level knowledge in biochemistry, calculus, general and organic chemistry and physics.

The M.S. curriculum will consist of 37 credits of coursework. Coursework will generally be scheduled in the fall and spring semesters. Full-time students should finish in two years. Students who attend part-time should finish within five years.

The Program Director and advisors in the program will guide M.S. students through a part-time or full-time program of study. Full-time study is equivalent to 9 credits per semester.

Plan of Study by Semester for Full-Time MS Students

Semester 1	PHSC.610 – Principles of Pharmaceutical Sciences	4 credits
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	84.550 – Biochemistry I	3 credits
	30.550 – Human Development and Pathophysiology	3 credits
	Total: 10 credits	
Semester 2	84.562 – Pharmaceutical Biochemistry	3 credits
	81.542 – Cell Biology	3 credits
	PHSC.620 – Pharmacokinetics	3 credits
	Total: 9 credits	
Semester 3	84.7xx – Principles of Medicinal Chemistry I	3 credits
	36.707 – Drug Metabolism	3 credits
	PHSC.630 – Pharmaceutical Research Design and Ethics	3 credits
	Total: 9 credits	
Semester 3	PHSC.640 – Pharmaceutical Analysis	4 credits
	PHSC.641 – Drug Delivery	3 credits
	PHSC.710 – Advanced Topics in Pharmaceutical Sciences	2 credits
	Total: 9 credits	
	Total Credits for MS degree: 37 credits	

Professional Science Masters in Pharmaceutical Sciences

Admissions and Degree Requirements

Applicants to the Professional Science Masters (PSM) program in Pharmaceutical Sciences must possess a BS degree or be in their last semester of a baccalaureate program. Up to 12 credits of appropriate courses with a grade of B or better can be transferred into the program if approved by the Graduate Coordinator of the Pharmaceutical Sciences programs.

The Professional Science Masters in Pharmaceutical Sciences program will consist of 36 credits of coursework to be completed either full-time or part-time. Full-time students should complete the program within two years and part-time students should complete the program within five years. The Program Director and advisors in the program will advise PSM students about course selections. Upon admission or through the successful completion of prerequisite courses, students will be expected to have successfully demonstrated undergraduate level knowledge in calculus, general and organic chemistry, biochemistry and physics.

Curriculum Plan:

Pharmaceutical Science Core Courses		(26 credits)
PHSC.610	Principles of Pharmaceutical Sciences	4 credits
84.550	Biochemistry 1	3 credits
84.562	Pharmaceutical Biochemistry	3 credits
PHSC.620	Pharmacokinetics	3 credits
84.7XX	Principles of Medicinal Chemistry I	3 credits
36.707	Drug Metabolism	3 credits
PHSC.640	Pharmaceutical Analysis	4 credits
PHSC.641	Drug Delivery	3 credits
PLUS Courses		(9 credits)
PSM555	Leadership for Scientists	3 credits
PSM 545	Professional and Scientific Communication	3 credits
XX.XXX	PLUS Elective	3 credits

PHSC.770 Professional Internship and Seminar (1 credit):

A Professional Internship is required for students in this program and must be a minimum of 350 hours and 3-6 months in length. The internship is designed to provide students with an opportunity to obtain real-world experience in business, government agencies, non-profit organizations or research laboratories. Internships or research project experiences will typically take place in pharmaceutical, biotechnological or medical device companies or institutions. Consideration will be given for students that have previous or current professional employment in the pharmaceutical sciences, however, in these cases, a new project experience will be required that adds to the student's current set of skills.

Ph.D. in Pharmaceutical Sciences

Admissions and Degree Requirements

Applicants to the Ph.D. in Pharmaceutical Sciences program must have a B.S. or M.S. degree or be in the last semester of their baccalaureate or master's program. For courses from prior masters' degrees to be applied toward meeting course credit requirements in the doctoral program, courses must be closely related to courses within the Ph.D. program.

Beyond the prerequisite courses, the curriculum will consist of a minimum of 49 credits of coursework and 12 credits of dissertation. Coursework will generally be scheduled in the fall and spring semesters. The expectation is that full-time students will finish the program in 4 to 5 years. The Program Director and advisors in the Ph.D. program will guide graduate students through a full-time program of study. Full-time study is equivalent to 9 credit hours per semester.

Plan of Study by Semester for Ph.D. Students

Semester 1	PHSC.610 – Principles of Pharmaceutical Sciences	4 credits
	84.550 – Biochemistry I	3 credits
	30.550 – Human Development and Pathophysiology	3 credits
Semester 2	84.562 – Pharmaceutical Biochemistry	3 credits
	81.542 – Cell Biology	3 credits
	PHSC.620 – Pharmacokinetics	3 credits
Semester 3	84.7xx – Principles of Medicinal Chemistry I	3 credits
	36.707 – Drug Metabolism	3 credits
	PHSC.630 – Pharmaceutical Research Design and Ethics	3 credits
Semester 4	PHSC.640 – Pharmaceutical Analysis	4 credits
	PHSC.641 – Drug Delivery	3 credits
	PHSC.710 – Advanced Topics in Pharmaceutical Sciences	2 credits
	Exit point for Master's Degree	37 credits
Semester 5	Option course	3 credits
	Dissertation and seminar	3 to 6 credits
Semester 6	Option course	3 credits
	Dissertation and seminar	3 to 6 credits
Semester 7	Option course	3 credits
	Dissertation and seminar	3 to 6 credits
Semester 8	Option course	3 credits
	Dissertation and seminar	3 to 6 credits
	Total: 6 to 9 credits	
	Ph.D. degree – minimum credits required 61 credits	

Ph.D. in Pharmaceutical Sciences

Option Course Choices (Total courses required = 4)

Clinical Research Option		
PHSC.711	Clinical Research Design and Methodology	3 credits
PHSC.712	Pharmacoepidemiology	3 credits
19.577	Biostatistics for Health Data	3 credits
PHSC.713	Applied Clinical Pharmacokinetics	3 credits
Nanopharmacology Option		
84.566	Nanomaterials and Nanostructures	3 credits
PHSC.714	Nanotechnology and Drug Delivery	3 credits
81.576	Cell Culture	4 credits
81.588	Structural Biology	3 credits
Nuclear Pharmacology and Imaging Option		
98.596	Introduction to Medical Imaging	3 credits
98.534	Internal Radiation Dosimetry & Bioassay	3 credits
98.541	Radiochemistry	3 credits
98.562	Radiation Biology	3 credits
Medicinal Chemistry Option		

84.7xx	Principles of Medicinal Chemistry II	3 credits
36.708	Mechanisms of Drug Action	3 credits
84.551	Biochemistry II	3 credits
84.xx	Chemistry elective (see choices below)	3 credits
Pharmacogenomics/Personalized Pharmacotherapy Option		
36.709	Pharmacogenomic Principles and Applications	3 credits
36.551	Advanced Pathophysiology	3 credits
36.580	Clinical Applications of Molecular Genetics	3 credits
PHSC.xx	Pharmaceutical Sciences elective	3 credits
Drug Discovery Option		
81.528	Molecular Biotechnology: Recombinant Protein Production	3 credits
81.576	Cell Culture	4 credits
81.588	Structural Biology	3 credits
36.708	Mechanisms of Drug Action	3 credits
SubTotal # Option Credits Required: 12 -13 credits		
Dissertation and Seminar Courses (Total courses required = 4)		
4 courses		12 - 24 credits
SubTotal Dissertation & Seminar Credits Required: 12 - 24 credits		
Other/Elective Course Choices (Total courses required = 0 to 1)		
81.567	Molecular Biology	3 credits
81.569	Molecular Biology Laboratory	2 credits
81.576	Cell Culture	4 credits
81.532	Genomics	3 credits
81.534	Genomics Laboratory	1 credit
36.710	Nutrigenomics	3 credits
36.560	Molecular Pathology	3 credits
84.538	Biochemical Mechanisms	3 credits
84.560	Advanced Physical Biochemistry	3 credits
84.568	Organic Structural Analysis	3 credits
84.570	Advanced Protein Chemistry	3 credits
84.514	Advanced Analytical Chemistry	3 credits
98.599	Advanced Medical Imaging	3 credits
SubTotal # Elective Credits Required 0 - 4		

Curriculum Summary

Total number of courses required for the degree: 20

Total credit hours required for degree: 61

Prerequisite or Other Additional Requirements:

Qualifying Examination for Doctoral Candidacy after completion of major required courses.

01.501 Teaching Diverse Populations

Course ID: 2314

Course Details: Students examine, confront and learn to manage the challenge of successfully educating all children, regardless of racial, cultural, linguistic, gender or physical differences.

Max Credits: 3

Min Credits: 3

01.502 Adolescent Development and Behavior

Course ID: 2315

Course Details: This course provides an overview of adolescent development issues and classroom management practices. Adolescent development is examined through research into major theorists in developmental psychology: Piaget, Vygotsky, and Erikson

etc. Classroom management strategies are explicitly taught through case study analyses, and examination of core beliefs, focusing on interpersonal relationships between students, teachers, parents, mentors and supervisors.

Max Credits: 3

Min Credits: 3

01.503 Understanding Child Development in a Diverse Society

Course ID: 36642

Course Details: Examines the major theoretical frameworks of child development and how cultural differences affect development and learning. Focus is on helping students make responsive and culturally relevant pedagogical decisions.

Max Credits: 3

Min Credits: 3

01.504 Methods of Teaching Students with Moderate Disabilities

Course ID: 2316

Course Details: Examines the methods of teaching students with moderate disabilities. Topics include curriculum (including the Massachusetts frameworks), IEPs, and instructional modifications appropriate for students with special needs.

Max Credits: 3

Min Credits: 3

01.505 Children with Disabilities in the Classroom

Course ID: 33095

Course Details: This course examines the nature of cognitive emotional, developmental, sensory, and physical disabilities that compromise student capacity to make adequate academic progress without special intervention. Legal and ethical responsibilities of the educator in inclusive classroom settings and as an active member of a multidisciplinary learning team are emphasized.

Max Credits: 3

Min Credits: 3

01.600 Multiculturalism

Course ID: 37785

Course Details: This course will provide a broad overview of the explicit (overt) and hidden (implicit/covert) elements of culture and their implications for language learning and teaching practice. Course participants will explore the ways in which their cultures influence their world view and their perceptions of self and others, thereby exploring their awareness of culture, as well as their openness or resistance to difference. Through course readings, discussions, and interactive learning activities, participants will understand the intersection of culture and language, how culture shapes language as how language is shaped by culture. The relationships between language and power will also be examined. Throughout the course participants will engage in self-reflection as they apply cultural theories to their own development, their attitudes, their perspectives, how they think and the way they use language.

Max Credits: 3

Min Credits: 3

01.607 The Adult Learner

Course ID: 2335

Course Details: This course will focus on the learning and development of adolescent young adults, adults and older adults in both school-based and non-school based settings. Cognitive, emotional, social and professional learning will be addressed as well as differing and changing learning styles across the lifespan and different learning settings.

Max Credits: 3

Min Credits: 3

01.608 Student Development Theory

Course ID: 2336

Course Details: the Student Development Theory course will provide students with a theoretical background in the developmental processes of college students. The course will cover pertinent models of student development pertaining to cognitive, moral, psycho/social, environmental, and identity development. Students will gain an understanding of each theory, and understand their practical application.

Max Credits: 3

Min Credits: 3

01.610 Theories of Learning

Course ID: 2338

Course Details: This course offers a detailed analysis of the major contemporary learning theories, both behavioral and cognitive.

Max Credits: 3

Min Credits: 3

01.625 Organization of Schools and School Systems

Course ID: 2351

Course Details: This course is designed to help students understand the organizational dynamics of schools. The knowledge gained should assist students in identifying and suggesting alternatives to programmatic and behavioral regularities found in a school or human service organization.

Max Credits: 3

Min Credits: 3

01.630 Educating Diverse Populations

Course ID: 2353

Course Details: "Diversity Issues for School Leaders" is designed to prepare experienced educators to provide effective leadership in a diverse community. Drawing from the Graduate School of Education's conceptual framework of "Education for Transformation," students will be expected to: examine their own cultural heritage and experiences; gain increased understanding of equity issues concerning race, language, gender, sexual orientation, and special education needs; develop new insights for culturally responsive pedagogy; assess alternative strategies for facing illustrative conflicts in culturally diverse school settings; and consider how to ameliorate the pervasive impact of poverty on children in today's schools.

Max Credits: 3

Min Credits: 3

01.632 The Inclusive School

Course ID: 37813

Course Details: School leaders must create environments that are welcoming to all students and their families and that capitalize on the strengths students bring to the learning environment as well as address the needs of students. As the population of students in our schools has continued to become more diverse, building an inclusive environment in which all are valued and in which all student can succeed has become increasingly complex. Participants in this course will explore their values and beliefs as well as the dominant culture and prevailing belief systems present in the majority of today's public schools. Participants will learn about ways in which many students, their families, and their communities may differ from this dominant culture, and the possible effects of this mismatch. Through readings and interactive discussions, participants will examine ways to build a school culture that is inclusive for all students and their families. Participants will develop detailed plans of action to actively and meaningfully involve parents and community members in all aspects of the school.

Max Credits: 3

Min Credits: 3

01.636 Sociocultural Contexts of Educational Communities

Course ID: 2356

Course Details: Examines the social, cultural, and political forces that shape the school environment and provide context for teaching

and learning. Additionally, the types of existing and desired relationships among schools, families and communities will be discussed.

Max Credits: 3

Min Credits: 3

01.642 Sem:Technology and American Mat Culture

Course ID: 2361

Course Details:

Max Credits: 3

Min Credits: 3

01.645 Perspectives and Visions of Schooling I

Course ID: 2363

Course Details: Open to matriculated doctoral candidates only. This foundational course provides new doctoral students with an understanding of differing perspectives on the purpose of public education in the United States during the last 150 years. The philosophical and political perspectives which influenced educational reform during this period will be examined. The course will culminate in reading and discussion of contemporary visions for schooling. This course must be taken before 01.646.

Max Credits: 3

Min Credits: 3

01.646 Perspectives and Visions of Schooling II

Course ID: 2364

Course Details: This course examines how psychology and education have been intertwined throughout the history of American education. Various psychological perspectives for educational practice will be considered. The role of research in education, including the use of psychological research methods will be considered as you begin preparing to conduct educational research. Visions of educational psychologists for utilizing psychological research findings in creating future educational practice and policies will also be explored.

Max Credits: 3

Min Credits: 3

02.507 Academic Writing for English Language Learners

Course ID: 2397

Course Details: This course will enable graduate level English language learners to become competent academic writers who can critically and creatively evaluate, analyze, construct and present their ideas and arguments. This is a student oriented, pro-active course where writing skills are connected to reading skills. Through attentive, detailed and critical reading of various materials students will further enhance their writing skills by applying effective planning, drafting, rewriting and editing strategies. Must e a TA or RA. Instructor Consent Required

Max Credits: 3

Min Credits: 3

02.515 Internship in English as a Second Language PreK-6

Course ID: 2405

Course Details: On-site field experience in an ESL classroom, under the supervision of a qualified ESL teacher and faculty of the Graduate School of Education.

Max Credits: 3

Min Credits: 3

02.516 Internship in English as a Second Language 5-12

Course ID: 2406

Course Details: On-site field experience in an ESL classroom, under the supervision of a qualified ISL teacher and faculty of the Graduate School of Education.

Max Credits: 3

Min Credits: 3

02.517 Community Organization and Parental Partnership

Course ID: 2407

Course Details: The aim is to prepare school personnel to work effectively with community groups and bilingual parent organization.

Max Credits: 3

Min Credits: 3

02.520 Teaching Reading and Writing in English to the Bilingual Student

Course ID: 2410

Course Details: This course examines the development of reading and writing necessary for the ESL child to learn to read and write in English. Students gain familiarity with the various perspectives and practices that have been found to be effective in the teaching of reading and writing to students whose first language is not English.

Max Credits: 3

Min Credits: 3

02.524 Educational Assessments of Students with Moderate Disabilities

Course ID: 2414

Course Details: A review of the various assessments and standardized tests that are used to identify students with moderate disabilities. The interpretation of assessment results and how to communicate them effectively to parents and school personnel will be examined.

Max Credits: 3

Min Credits: 3

02.528 Teaching and Assessing Academic Reading and Writing I

Course ID: 37786

Course Details: This course is designed to provide candidates with a broad overview of topics and approaches to teaching English language learners to become competent academic readers and writers who can critically and creatively evaluate, analyze, construct and present their ideas and arguments. Emphasis is on demonstrating teaching methods which are student oriented, pro-active and where writing skills are connected to reading skills; also, effective planning, drafting, rewriting and editing strategies will be emphasized.

Max Credits: 3

Min Credits: 3

02.529 Teaching and Assessing Academic Reading and Writing II

Course ID: 37787

Course Details: This course is a continuation of Teaching Reading and Writing I. The level is advanced; effective teaching methods of writing, reading and editing are emphasized using relevant and real life examples of academic texts. Detailed analyses and discussions of academic texts through analytical, critical and constructive readings will provide candidates with a solid understanding of teaching methods in advanced reading and writing.

Max Credits: 3

Min Credits: 3

02.531 Internship in English as a Second Language 5-12

Course ID: 38485

Course Details: On-Site field experience in an ESL classroom, under the supervision of a qualified ESL teacher and faculty of the Graduate School of Education.

Max Credits: 3

Min Credits: 3

02.539 Pre-Practicum: Alternate Route

Course ID: 37202

Course Details: The pre-practicum occurs in the semester before the practicum. The course focuses on what it means to be a teacher by examining the content, dispositions and skills necessary to succeed in the profession. Students observe other teachers in their school and must spend one day observing in a district with different demographics. While there is no credit assigned to the pre-practicum, it is a required component of the program. Students complete a pre-practicum binder based on their observations.

Max Credits: 0

Min Credits: 0

02.540 Pre-Practicum

Course ID: 37201

Course Details: The pre-practicum occurs in the semester before the practicum. The course focuses on what it means to be a teacher by examining the content, dispositions and skills necessary to succeed in the profession. Through a combination of site observations in schools of different demographics, personal/professional teaching opportunities and participation in professional seminars, elementary and secondary preservice teachers gain additional information and skills to prepare them for their practicum. While there is no credit assigned to the pre-practicum, it is a required component of the program. A fee is assessed.

Max Credits: 0

Min Credits: 0

02.541 Teaching English Language Learners

Course ID: 33080

Course Details: The purpose of this course is to prepare new teachers with the knowledge and skills to effectively shelter their content instruction, so that the growing population of English language learners (ELLs) in K-12 schools can achieve academic success, and contribute their multilingual and multicultural resources. The course will provide aspiring teachers with practical research-based protocols, methods, and strategies to integrate subject area content, language, and literacy development. Successful completion of this course provides the SEI (Sheltered English Immersion) endorsement required for teaching in the Commonwealth of Massachusetts.

Max Credits: 3

Min Credits: 3

02.542 Methods of Early Childhood Education II: Social Studies, Arts, Health and Physical Education

Course ID: 33081

Course Details: Students learn basic principles and concepts of history, geography, government, economics, the arts, health and physical education appropriate to the prekindergarten to second grades. Students learn to use project approaches appropriate for teaching young children.

Max Credits: 3

Min Credits: 3

02.543 Classroom Management and Integrative Techniques

Course ID: 2367

Course Details: Examines the theories and models of behavior management that assist teachers in helping students with moderate disabilities to be integrated into mainstream classroom settings.

Max Credits: 3

Min Credits: 3

02.551 Elementary Math Methods

Course ID: 2422

Course Details: New approaches in the curriculum and teaching of mathematics in the elementary school; analysis and use of current materials, national and state standards, multimedia approaches, and inductive and problem-solving techniques.

Max Credits: 3

Min Credits: 3

02.553 Language Arts and Childrens Literature

Course ID: 2424

Course Details: Approaches in the teaching and assessment of the language arts in the elementary school will be analyzed. Assorted genres of literature and the development of literature programs for children in multicultural environments will be studied.

Max Credits: 3

Min Credits: 3

02.556 Reading and Reading Disabilities

Course ID: 2427

Course Details: A critical analysis of fundamental issues and principles in the teaching of reading, including all phases of the elementary reading program. Analysis and remediation of reading disabilities which explores the use of critical diagnostic tools.

Max Credits: 3

Min Credits: 3

02.562 Elementary Social Studies

Course ID: 2433

Course Details: Examines teaching strategies and materials appropriate for the teaching of K-8 social studies. Examines national and state standards for the discipline.

Max Credits: 3

Min Credits: 3

02.563 Elementary Science Methods

Course ID: 2434

Course Details: Models the teaching of science as guided discovery while exploring developmentally appropriate concepts in science. Examines national and state standards as well as nationally developed curriculum kit-based materials.

Max Credits: 3

Min Credits: 3

02.568 Internship in Moderate Disabilities 5-12

Course ID: 38462

Course Details: Practicum in a special education setting under the supervision of qualified teachers, principal, and university faculty.

Max Credits: 3

Min Credits: 3

02.569 Tchng Middle Sch:English

Course ID: 2439

Course Details:

Max Credits: 12

Min Credits: 6

02.572 Curriculum and Teaching: English

Course ID: 2442

Course Details: The purpose of this course is to prepare preservice teachers for the content-specific dimensions of their practicum. The course is designed not only to develop pedagogical skills but to encourage prospective English teachers to examine their own beliefs, expectations, and dispositions about the nature of the discipline, the practice of teaching, the process of learning, and the nature of the learners themselves.

Max Credits: 3

Min Credits: 3

02.573 Curriculum and Teaching History

Course ID: 2443

Course Details: Students analyze the content, methods, materials, and management techniques used in teaching History. Examination of national and state standards for the discipline. The course will include micro-teaching and self-evaluation, as well as school-based observation and participation in schools.

Max Credits: 3

Min Credits: 3

02.575 Curriculum and Teaching Math

Course ID: 2445

Course Details: Students analyze the content, methods, materials, and management techniques used in teaching mathematics, and examine national and state standards for the discipline. The course includes micro-teaching, self-evaluation, school-based observation, and participation in schools.

Max Credits: 3

Min Credits: 3

02.576 Curriculum and Teaching Science

Course ID: 2446

Course Details: Students analyze the content, methods, materials, and management techniques used in teaching science. Examination of national and state standards for the discipline. The course will include micro-teaching and self-evaluation, as well as school-based observation and participation in schools.

Max Credits: 3

Min Credits: 3

02.578 Teaching Elementary Education and Seminar

Course ID: 2448

Course Details: This full time practicum in the elementary school covers 12 weeks under the supervision of qualified teachers, principals, and faculty of the Graduate School of Education. Weekly seminar and portfolio development address the Massachusetts professional teaching standards. Matriculated students only. All coursework must be completed with a minimum 3.25 GPA. Before beginning the practicum.

Max Credits: 9

Min Credits: 9

02.579 Internship in Moderate Disabilities PreK - 8

Course ID: 2449

Course Details: Practicum in a special education setting under the supervision of qualified teachers, principal, and university faculty.

Max Credits: 3

Min Credits: 3

02.583 Teaching English and Seminar

Course ID: 2453

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.584 Teaching History and Seminar

Course ID: 2454

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.589 Teaching Mathematics and Seminar

Course ID: 2459

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.590 Teaching Biology and Seminar

Course ID: 2460

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.591 Teaching Chemistry and Seminar

Course ID: 2461

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.592 Teaching Earth Science and Seminar

Course ID: 2462

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.593 Teaching Physics and Seminar

Course ID: 2463

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.594 Teaching General Science and Seminar

Course ID: 2464

Course Details: Full time practicum in the elementary, middle or secondary schools under the supervision of qualified classroom teachers and faculty of the Graduate School of Education. Weekly seminar and performance assessment addressing the Massachusetts Professional Standards for Teachers.

Max Credits: 9

Min Credits: 9

02.600 Introduction to Second Language Acquisition

Course ID: 37782

Course Details: This course is designed to facilitate students' understanding of how people learn, or acquire, a second (or third, fourth etc.) language. This understanding then facilitates and benefits language teaching and assessment. In this course, we will examine current second language acquisition (SLA) research; we will study some of the current language teaching approaches and techniques and discuss how to apply them in specific situations. Students will become familiar with SLA terminology, research and data and will be able to connect SLA research with teaching and assessment (i.e. connecting theory with prax), other crucial and relevant topics, such as universal features of SLA (age, critical periods, environmental triggers, cross-linguistic influences), individual factors (aptitude, motivation), social factors (class, gender, social, cultural contexts), etc. will be covered. As part of the learning process in the class, students will be asked to develop their own theory of SLA and SL teaching or to analyze in detail the theory (or theories) they most identify with. Discussions and active participation are crucial in the course.

Max Credits: 3

Min Credits: 3

02.601 Introduction to Linguistics

Course ID: 37783

Course Details: All language teachers benefit from understanding of how language in general works. This course is designed to help students to understand and use in their language teaching the basic concepts, methods and approaches of linguistics. The following topics are covered in the course; phonetics (sounds/sound inventory of a language), phonology (how we understand and organize the sounds and patterns), morphology (word structure, morphemes; how smaller units of meaning make up words), syntax (sentence structure, how words make up sentences), semantics (how we understand and parse sentences, structural ambiguity, context within sentences), pragmatics (how context impacts meaning on a textual level), social aspects of language (dialects, sociolects, language change, etc.). Although most of the examples will involve English, for comparative and contrastive purposes other languages will be used (no need to understand them). Students will be encouraged to come up with as many of their own examples as possible.

Max Credits: 3

Min Credits: 3

02.607 Advanced Academic Writing I

Course ID: 36918

Course Details: This course will enable graduate level English language learners to become competent academic writers who can critically and creatively evaluate, analyze, construct and present their ideas and arguments. This is a student oriented, pro-active course where writing skills are connected to reading skills. Through attentive, detailed and critical reading of various materials students will further enhance their writing skills by applying effective planning, drafting, rewriting and editing strategies.

Max Credits: 3

Min Credits: 3

02.650 Capstone TESOL

Course ID: 37784

Course Details: The capstone project requires participants to apply the theories and strategies they have learned throughout the TESOL program to analyze a case study. Participants will be presented with a case study and will apply principles of learning, linguistics, second language acquisition, and methods of ESL (or sheltered) instruction to analyze the case and provide a comprehensive instructional plan to address the needs of the case student. The final project for the capstone is a comprehensive paper of approximately 25 pages. Participants will be graded on the content of the project as well as the quality of writing.

Max Credits: 3

Min Credits: 3

03.651 Web-based Technologies in the Learning Environment: Teaching and Learning

Course ID: 2512

Course Details: Students will research, discuss and examine web-based educational technologies and the pedagogical practices associated with them. We will also interrogate the way that these technologies and their requisite literacies have changed, are changing and will change the nature of institutional instruction. In addition, we will investigate the policy implications that arise from the existence of these technologies. This course is taught online. It is suitable for students at the Masters, Ed.S or Doctoral level.

Max Credits: 3

Min Credits: 3

04.501 Mathematics for Elementary Teachers III: Basic Principles of Euclidean Geometry

Course ID: 2529

Course Details: This course integrates the study of geometry and measurement and includes lines, angles, investigations of triangles, quadrilaterals, polygons, area and perimeter; congruency, similarity, and Pythagoras' Theorem. The students will explore mathematical explanation, argument, justification and how these processes connect to geometric proof. Also systems of units and concepts related to measurement will be investigated.

Max Credits: 3

Min Credits: 3

04.512 History for Teachers

Course ID: 2540

Course Details: This course examines the major concepts, people and events of US and World history using the ten themes outlined by the NCSS (National Council for the Social Studies). These standards are grouped under the four strands for teaching social studies in the state of Massachusetts (history, economics, geography and civics) and guide the focus for teacher preparation and instruction.

Max Credits: 3

Min Credits: 3

04.513 Teaching World History

Course ID: 2541

Course Details: In an increasingly globalized and diverse age, courses in world history have become a growing teaching field at the secondary level in the United States. The overarching purpose of this class is to help students prepare to teach classes in world history.

This course will introduce the field and concepts of world history. It will familiarize students with available materials such as textbooks, readers, primary documents, academic books and articles, novels, films, websites, and podcasts. The class will introduce and align with the state, national, and AP standards in world history.

Max Credits: 3

Min Credits: 3

04.525 Science for Secondary Science Teachers

Course ID: 2547

Course Details: This course emphasizes content knowledge which includes the facts, concepts, laws, theories and organizing frameworks of science and syntactic knowledge which includes values, beliefs and assumptions that the science teacher has about the generation of scientific knowledge.

Max Credits: 3

Min Credits: 3

04.530 Interactions and Assessment in Science

Course ID: 2549

Course Details: This course examines the ways in which students interact and learn in the science classroom. Construction of a Science, Technology, and Society (STS) unit plan, as well as the development of assessment tools that align to lesson and unit goals are key features of this course.

Max Credits: 3

Min Credits: 3

04.533 Mathematics for Elementary Teachers I: Basic Principles of Arithmetic

Course ID: 2552

Course Details: Participants will be engaged in constructing solid conceptual understanding of the language and operations of arithmetic; topics include place value and the history of counting, inverse processes, a large repertoire of interpretations of operations with numbers, concepts of integers and rational numbers, multi-digit calculations, including standard algorithms and non-standard methods the reasoning behind the procedures.

Max Credits: 3

Min Credits: 3

04.534 Mathematics for Teachers I

Course ID: 2553

Course Details: This course revisits the content related to the development of number and operation, proportions, ratios and percent; modeling operations with fractions, beginning algebra and geometry. The course emphasizes the meanings of operations and relationships among those operations; multiple representations of concepts and connections across different representations. It also examines basic Number Theory concepts, such as factors and multiples, as well as divisibility tests, at both concrete and abstract levels.

Max Credits: 3

Min Credits: 3

04.535 Mathematics for Teachers II

Course ID: 2554

Course Details: This course revisits the mathematics content related to the grades 8-12. It examines in depth elementary functions, and different mathematical models such as linear, quadratic, exponential, logarithmic and trigonometric, to describe real life situations. The course includes some topics from Euclidean geometry. The course emphasizes multiple representations of concepts, connections across different representations, as well as different levels of representations from concrete to abstract.

Max Credits: 3

Min Credits: 3

04.537 Mathematics for Elementary Teachers II: Basic Principles of Algebra

Course ID: 2556

Course Details: The course examines the topics related to ratio and proportion, slope, the notion of function, absolute value, linear and non linear functions, sets, equations, inequalities, simultaneous equations, reading and creating graphs of functions, formulas (in closed and recursive forms), and tables; studying characteristics of particular classes of functions on integers. It will also investigate some topics related to statistical analysis and probability.

Max Credits: 3

Min Credits: 3

04.553 Lowell and Industrial Revolution

Course ID: 2569

Course Details: Participants in this National Endowment for the Humanities-sponsored Landmarks Workshop, offered through the Tsongas Industrial History Center, examine the causes and consequences of America's Industrial Revolution, using Lowell as a case study. The course covers the nineteenth-century shift from an agrarian to an industrial society, with a focus on water-powered factory systems, textile production and corporations, the issue of slavery in a cotton textile city, labor and women's history, environmental impacts, immigration, globalization, and literary responses. Limited to NEH participants only.

Max Credits: 3

Min Credits: 3

04.554 Creation of a Nation

Course ID: 2570

Course Details: This course will focus on the meeting of three worlds: Africa, Europe and the Americas and will explore the cultural and ecological interactions.

Max Credits: 3

Min Credits: 3

04.558 Becoming A Nation

Course ID: 32025

Course Details: This course looks at the westward expansion of the United States from the signing of the Constitution to the pre-Civil War period.

Max Credits: 3

Min Credits: 3

04.559 Teaching Founding Documents

Course ID: 2572

Course Details: This course examines the founding documents and how these documents are relevant in the lives of middle school children.

Max Credits: 3

Min Credits: 3

04.576 Promoting Healthy Lifestyles Among Students

Course ID: 30298

Course Details: The focus of this course is on applying nutrition concepts relevant to elementary and middle school children and how these concepts can be integrated into the classroom at an age appropriate level. This course will address a broad range of issues including eating habits, disordered eating, sports nutrition, food allergies and school wellness policies.

Max Credits: 3

Min Credits: 3

04.603 Curricular Practical Training

Course ID: 2602

Course Details: CPT provides students with the opportunity to apply their learning from coursework in an educational setting. Candidates are required to submit a culminating assignment before the end of the academic semester.

Max Credits: 1

Min Credits: 1

04.622 Science, Mathematics and the Educated Mind

Course ID: 2619

Course Details: Examination of interaction of Science and Mathematics in the growth of knowledge, and current considerations of literacy.

Max Credits: 3

Min Credits: 3

04.623 Policy & Practice in Science, Technology, Engineering, & Mathematics Education

Course ID: 2620

Course Details: This course explores the dynamic relationship between educational policy and classroom teaching. By comparing the similarities and differences for this relationship within each of these fields, students will gain a practical and theoretical understanding of both the historical role policy plays in education and its chronic shortcomings. Finally, the educator's role in implementing effective change in these fields is considered.

Max Credits: 3

Min Credits: 3

04.624 Assessment of Learning

Course ID: 2621

Course Details: Students examines various approaches to the formative and summative assessment of learning. This course examines the importance of assessment in planning curricula and individual lessons.

Max Credits: 3

Min Credits: 3

04.626 Developments of concepts in Science

Course ID: 2622

Course Details: Students explore the historical development of selected science concepts and the emergence of the philosophy of science. Progress in science is examined together with views of the nature of science.

Max Credits: 3

Min Credits: 3

04.627 Development of Mathematics Concepts

Course ID: 2623

Course Details: Participants will analyze the nature of mathematics content knowledge and the nature of mathematics process knowledge, as well as the nature and process of knowledge acquisition. A conceptual framework will emerge from the synthesis of existing information.

Max Credits: 3

Min Credits: 3

04.628 Reasoning and Problem Solving in Science

Course ID: 2624

Course Details: An analysis of the development of procedural knowledge, with particular emphasis on reasoning and problem solving, as they are currently conceptualized in educational and psychological literature.

Max Credits: 0

Min Credits: 0

04.630 Reasoning and Problem Solving

Course ID: 2626

Course Details: The course is designed to direct and encourage critical examination of the theory of problem solving. Students analyze current research literature relating to reasoning, problem solving and critical thinking. Synthesis of this literature serves as a foundation for examining curriculum decisions.

Max Credits: 3

Min Credits: 3

04.635 Dynamics of Curricular Change

Course ID: 2631

Course Details: This course considers alternative perspectives of curriculum and explores issues and strategies involved in the process of changing the curricular visions and practices of schools.

Max Credits: 3

Min Credits: 3

04.637 History & Theory of Curriculum

Course ID: 2633

Course Details: This course examines the historical development of American curriculum from the colonial period to the present, with a focus on theories that shaped what was taught in schools, and how those theories reflected social, cultural and political values and conflicts. Particular attention will be paid to curriculum theories that have shaped contemporary curriculum, and to examination of programs that reflect those theories.

Max Credits: 3

Min Credits: 3

04.638 Curriculum Design K-12

Course ID: 2634

Course Details: A review of state mandates which, by law, shape the curriculum of the school. Examination of "new" curricula and their sources, as well as the development of a rationale for curriculum design and an evaluation of the personnel and techniques by which these curricula can be developed.

Max Credits: 3

Min Credits: 3

04.643 The Skillful Teacher

Course ID: 2639

Course Details: This course is designed to help teachers and educational leaders view teaching from a reflective stance. Video material of teaching situations will be examined for the application of skills discussed in the course.

Max Credits: 3

Min Credits: 3

04.645 Directed Study Curriculum and Instruction

Course ID: 2641

Course Details:

Max Credits: 3

Min Credits: 3

04.650 Capstone Project: Advanced Programs

Course ID: 2645

Course Details: Students will have the opportunity to develop a teacher work sample consisting of work in six major areas: (1) contextual factors, (2) learning goals, (3) assessment plan, (4) design for instruction, (5) analysis of student learning, and (6) reflection.

Max Credits: 3

Min Credits: 3

04.655 Directed Study Curriculum and Instruction

Course ID: 2649

Course Details: Through frequent consultation with the instructor, the student will investigate and define a problem for research and will present the findings in a significant paper. The directed study may not be substituted for a required course.

Max Credits: 3

Min Credits: 3

04.656 Ed.S Seminar

Course ID: 2650

Course Details: Candidates undertake an in-depth study of issues pertinent to PK-12 education and develop a product to address these issues. Candidates must complete 24 credits prior to registering for the Ed.S Seminar.

Max Credits: 3

Min Credits: 3

04.674 Research into Learning in Science

Course ID: 30756

Course Details: In this course, we shall be reading research articles and examining how the research was carried out. You will conduct an "action research" project. Those who engage in action research have a commitment to bring about change. In this case, you will be investigating something in your own classroom or school that concerns you and therefore the results of your research will help you to think about what might be done to change the situation. Through the collection and sorting of data we can gain insights into situations that were previously muddy. Teachers often have to make judgments based on experience, but this is not persuasive to outsiders. With data we can convince others that the course of action we choose is justified.

Max Credits: 3

Min Credits: 3

04.675 Leadership in Science Education

Course ID: 30757

Course Details: There are many issues in science education that can be clarified as a result of reading current literature and engaging in discussion with other teachers. In this course, we will examine some of the most pressing issues that face us as science teachers e.g. What is science literacy? What role should inquiry play in a science curriculum? What is the role of technology in science education? Is ability grouping appropriate for learning in science? Each week we will examine a different issue and share our expertise, as we explore what it means to be a leader in science education. You will share your own science teaching expertise by developing an article to be submitted to an NSTA publication via a peer review process. Additionally, you will put your program learning into practice and will be assessed through written evidence captured in a professional portfolio.

Max Credits: 3

Min Credits: 3

04.676 Exploring the Nature of Science

Course ID: 30758

Course Details: If you were asked to describe the characteristics of science what would you say and would you know whether professional scientists agree with you? National professional societies such as the NSTA and the AAAS, believe that if middle and high school students understand how science has been and is practiced, they will be more likely to question their own thinking, recognize the power of scientific theories and understand that there are no absolute truths. This course will take you on an exploration of some fascinating discoveries in the history of science, engage you in debate about controversial issues in science, and involve you in raising your own scientific questions.

Max Credits: 3

Min Credits: 3

04.729 Directed Study: Mathematics and Science Education

Course ID: 2662

Course Details: Participants will develop a focused line of investigation with the supervision of a faculty member in the college. Approval of advisor is required.

Max Credits: 3

Min Credits: 3

04.753 Doctoral Dissertation/Education

Course ID: 2665

Course Details:

Max Credits: 3

Min Credits: 3

04.756 Doctoral Dissertation/Education

Course ID: 2666

Course Details:

Max Credits: 6

Min Credits: 6

04.759 Doctoral Dissertation

Course ID: 2667

Course Details:

Max Credits: 9

Min Credits: 9

05.501 Introduction to Leading Professional Learning Communities

Course ID: 36996

Course Details: This course introduces participants to strategies that will enable them to cultivate and lead school-based professional learning communities. During a week-long summer institute, students develop an action plan. In the fall, students will keep in contact (electronically) with peers and the instructor and will attend a final face-to-face session to support their efforts. The grade for the one credit course is awarded at the end of the fall semester.

Max Credits: 1

Min Credits: 1

05.502 Issues, Mandates and Ethics in Special Education

Course ID: 2671

Course Details: This course will examine special education laws and ethical practices in K-12 settings.

Max Credits: 3

Min Credits: 3

05.592 Practicum I, Elementary Principal PK-6

Course ID: 30303

Course Details: The practicum is a two-semester (1+2=3credits) field-based experience in which the student engages in administrative responsibilities at the level of a school principal. These responsibilities are supervised by an on-site supervisor/mentor who holds certification in the appropriate area. A minimum of 500 hours must be completed during the course of the year. The responsibilities must be real and varied enough to allow the student to actively apply their knowledge and skills, thus demonstrating competence in the 'Standards for Advanced Programs in Educational Administration' of the ELCC (Educational Leadership Constituent Council).' and the Massachusetts Administrative Leadership Standards.

Max Credits: 1

Min Credits: 1

05.593 Practicum II, Elementary Principal PK-6

Course ID: 30304

Course Details: The practicum is a two-semester (1+2=3credits) field-based experience in which the student engages in administrative responsibilities at the level of a school principal. These responsibilities are supervised by an on-site supervisor/mentor who holds certification in the appropriate area. A minimum of 500 hours must be completed during the course of the year. The responsibilities must be real and varied enough to allow the student to actively apply their knowledge and skills, thus demonstrating competence in the 'Standards for Advanced Programs in Educational Administration' of the ELCC (Educational Leadership Constituent Council).' and the Massachusetts Administrative Leadership Standards.

Max Credits: 2

Min Credits: 2

05.594 Practicum I, Middle School Principal 5-8

Course ID: 30305

Course Details: The practicum is a two-semester (1+2=3credits) field-based experience in which the student engages in administrative responsibilities at the level of a school principal. These responsibilities are supervised by an on-site supervisor/mentor who holds certification in the appropriate area. A minimum of 300 hours must be completed during the course of the year. The responsibilities must be real and varied enough to allow the student to actively apply their knowledge and skills, thus demonstrating competence in the 'Standards for Advanced Programs in Educational Administration' of the ELCC (Educational Leadership Constituent Council).' In addition to the field-based activities, candidates participate regularly in an on-line seminar with the university supervisor/instructor and meet for 3-4 face-to-face seminar sessions at the university. Students develop a practicum action plan, document their activities in a journal, participate in regular on-line discussions, complete several reflection assignments, and compile a final Practicum Portfolio. The basis of all work in the online seminar relates directly to the issues, experiences, and questions from the candidate's field-based activities. The Practicum aims to help all students achieve a fuller realization of their professional and personal resources as leaders and learners and strengthen their effectiveness as educational administrators now and into the future.

Max Credits: 1

Min Credits: 1

05.595 Practicum II, Middle School Principal (5-8)

Course ID: 30306

Course Details: The practicum is a two-semester (1+2=3credits) field-based experience in which the student engages in administrative responsibilities at the level of a school principal. These responsibilities are supervised by an on-site supervisor/mentor who holds certification in the appropriate area. A minimum of 300 hours must be completed during the course of the year. The responsibilities must be real and varied enough to allow the student to actively apply their knowledge and skills, thus demonstrating competence in the 'Standards for Advanced Programs in Educational Administration' of the ELCC (Educational Leadership Constituent Council).' In addition to the field-based activities, candidates participate regularly in an on-line seminar with the university supervisor/instructor and

meet for 3-4 face-to-face seminar sessions at the university. Students develop a practicum action plan, document their activities in a journal, participate in regular on-line discussions, complete several reflection assignments, and compile a final Practicum Portfolio. The basis of all work in the online seminar relates directly to the issues, experiences, and questions from the candidate's field-based activities. The Practicum aims to help all students achieve a fuller realization of their professional and personal resources as leaders and learners and strengthen their effectiveness as educational administrators now and into the future.

Max Credits: 2

Min Credits: 2

05.596 Practicum I, High School Principal 9-12

Course ID: 30307

Course Details: The practicum is a two-semester (1+2=3credits) field-based experience in which the student engages in administrative responsibilities at the level of a school principal. These responsibilities are supervised by an on-site supervisor/mentor who holds certification in the appropriate area. A minimum of 300 hours must be completed during the course of the year. The responsibilities must be real and varied enough to allow the student to actively apply their knowledge and skills, thus demonstrating competence in the 'Standards for Advanced Programs in Educational Administration' of the ELCC (Educational Leadership Constituent Council).' In addition to the field-based activities, candidates participate regularly in an on-line seminar with the university supervisor/instructor and meet for 3-4 face-to-face seminar sessions at the university. Students develop a practicum action plan, document their activities in a journal, participate in regular on-line discussions, complete several reflection assignments, and compile a final Practicum Portfolio. The basis of all work in the online seminar relates directly to the issues, experiences, and questions from the candidate's field-based activities. The Practicum aims to help all students achieve a fuller realization of their professional and personal resources as leaders and learners and strengthen their effectiveness as educational administrators now and into the future.

Max Credits: 1

Min Credits: 1

05.597 Practicum II, High School Principal (9-12)

Course ID: 30308

Course Details: The practicum is a two-semester (1+2=3credits) field-based experience in which the student engages in administrative responsibilities at the level of a school principal. These responsibilities are supervised by an on-site supervisor/mentor who holds certification in the appropriate area. A minimum of 300 hours must be completed during the course of the year. The responsibilities must be real and varied enough to allow the student to actively apply their knowledge and skills, thus demonstrating competence in the 'Standards for Advanced Programs in Educational Administration' of the ELCC (Educational Leadership Constituent Council).' In addition to the field-based activities, candidates participate regularly in an on-line seminar with the university supervisor/instructor and meet for 3-4 face-to-face seminar sessions at the university. Students develop a practicum action plan, document their activities in a journal, participate in regular on-line discussions, complete several reflection assignments, and compile a final Practicum Portfolio. The basis of all work in the online seminar relates directly to the issues, experiences, and questions from the candidate's field-based activities. The Practicum aims to help all students achieve a fuller realization of their professional and personal resources as leaders and learners and strengthen their effectiveness as educational administrators now and into the future.

Max Credits: 2

Min Credits: 2

05.601 Seminar: Portfolio Development and Defense

Course ID: 36760

Course Details: The Portfolio Development and Defense seminar provides each doctoral student with a guided experience to develop a portfolio, which demonstrates the ways in which she or he has met established program outcomes for the first phase of the Leadership in Schooling doctoral degree. The one-credit option is for the student who anticipates submitting required materials and defending her or his portfolio over two or more semesters.

Max Credits: 1

Min Credits: 1

05.602 Seminar: Portfolio Development and Defense

Course ID: 36761

Course Details: The Portfolio Development and Defense seminar provides each doctoral student with a guided experience to develop a portfolio, which demonstrates the ways in which she or he has met established program outcomes for the first phase of the Leadership in Schooling doctoral degree. The two-credit accelerated option is for the student who will submit all required materials and defend her or his portfolio in one semester.

Max Credits: 2

Min Credits: 2

05.603 Seminar: Portfolio Development and Defense

Course ID: 36762

Course Details: The Portfolio Development and Defense seminar provides each doctoral student with a guided experience to develop a portfolio, which demonstrates the ways in which she or he has met established program outcomes for the first phase of the Leadership in Schooling doctoral degree. The three-credit accelerated option is for TAs and RAs only.

Max Credits: 3

Min Credits: 3

05.604 Leadership of Community Engagement I

Course ID: 37685

Course Details: The purpose of Leadership of Community Engagement I is to expose teacher leaders to the variety of issues associated with family and community engagement. Through critical examinations of theory, personal experiences and collective knowledge, teacher leaders will learn how to engage families and community members (i.e., business, health and service agencies and community-based organizations) and recognize the different forms of engagement. This course will highlight collaborative strategies that "shares power" with parents, families, and community organizations in schools.

Max Credits: 2

Min Credits: 2

05.605 Leadership of Community Engagement II

Course ID: 37686

Course Details: The purpose of Leadership of Community Engagement II is to continue the conversation and exploration of family and community engagement with teacher leaders from 05.604. The second course focus is on the implementation and analysis of the Research Action Plan drafted in the first semester. Teacher leaders will explore the challenges, barriers, successes and unintended consequences of their family and community engagement action plan. This course will highlight collaborative strategies of "critical friend groups" and participatory action research. Teacher leaders will lead group discussions and share ideas and strategies to help them address their family and community engagement issues.

Max Credits: 1

Min Credits: 1

05.606 Leadership and Learning I

Course ID: 37687

Course Details: "Leadership and Learning: Course One" is the first in a sequence of three one credit courses that provide strategies, practical training, and the intellectual foundation necessary for teachers to cultivate and lead school-based professional learning communities. For Course One, students participate in a three day summer institute (9 AM to 3 PM) and develop an action plan for the coming school year in which they will lead the development of a professional learning community. Students are invited to participate in an ongoing research study of professional learning communities.

Max Credits: 1

Min Credits: 1

05.607 Leadership and Learning II

Course ID: 37688

Course Details: "Leadership and Learning: Course Two" is the second in a sequence of three one credit courses that provide strategies, practical training, and the intellectual foundation necessary for teachers to cultivate and lead school-based professional learning communities. For course two, students participate in three online learning modules and two face-to face seminars during the fall semester. Students receive coaching and instruction as they pursue action plans developed in Course One and write a reflective journal. Students also read literature comprising the intellectual foundation for the professional learning community and write two critical essays.

Max Credits: 1

Min Credits: 1

05.608 Leadership and Learning III

Course ID: 37689

Course Details: "Leadership and Learning: Course Three" is the third in a sequence of three on credit courses that provide strategies, practical training, and the intellectual foundation necessary for teachers to cultivate and lead school-based professional learning communities. For Course three, students participate in three online learning modules and two face-to-face seminars during the spring semester. Students receive coaching and instruction as they pursue action plans developed in Course One and write a reflective journal. Students also read literature comprising the intellectual foundation for the professional learning community and write two critical essays.

Max Credits: 1

Min Credits: 1

05.609 Seminar I: Professional Accomplishments

Course ID: 37690

Course Details: Candidates are asked to document a limited number of verifiable accomplishments outside the classroom from both the professional and local communities. Candidates must explain how each accomplishment impacts student learning. Accomplishments are limited to the last five years. Later in the program, more recent accomplishments may be added to the entry. The portfolio entry is 20 pages in length.

Max Credits: 1

Min Credits: 1

05.610 Seminar II: Active Learning

Course ID: 37691

Course Details: In this seminar, candidates must analyze an inquiry approach to education and its relation to their current practices. They must examine the connections between inquiry, teaching, learning, and the standards of accomplished teaching. The portfolio entry requires a video in which candidates are asked to document a class meeting where students are learning through inquiry based instruction. Documentation takes the form of a 20 minute video edited into three sections. Section one shows how the lesson is introduced. Section two records students engaged in inquiry learning. Finally, section three records the lesson's closure. The analysis focuses on the available evidence from the video; specifically, how the candidate's actions (or inaction's) resulted in student learning. The portfolio entry is limited to 12 pages.

Max Credits: 2

Min Credits: 2

05.611 Introduction to Higher Education Administration

Course ID: 2677

Course Details:

Max Credits: 3

Min Credits: 3

05.613 Leading the Professional Learning Community

Course ID: 37814

Course Details: it is well documented that teachers who habitually examine their shared work based on inquiry, observation, analysis of data, dialogue, and experimentation tend to be more effective than those who are not reflective and work in isolation. How do we help all teachers become highly effective: How do we spread reflective practice from isolated pockets to all teachers in a school? The answer lies in the transformation of a school's professional staff from isolated practitioners into a professional learning community. A professional learning community is a work culture in which educators regularly learn with and from each other through collaborative inquiry. This course provides the practical know-how and deep understanding need for educators to introduce and lead collaborative inquiry within their school or district and transform the teaching staff into a professional learning community. Furthermore, this course introduces the idea of collaborative inquiry by transforming participants into a professional learning community during the course. Thus, participants focus collaborative inquiry on their shared practice, read and reflect on selected authors, and develop action plans to help them introduce or advance collaborative inquiry in their own work settings.

Max Credits: 3

Min Credits: 3

05.615 Seminar II: Teaching Cycle

Course ID: 37692

Course Details: This seminar focuses on the teaching cycle (planning, implementing, assessing) in conjunction with the standards of accomplished teaching in specific content areas. The portfolio entry emanates from the day to day work of each teacher and requires teachers to document the decisions and choices which directly impact the student learning experience. The entry includes lessons plans associated with specified learning objectives, detailed assignments, examples of student work from two of those assignments representing high and low achieving groups, and an analytical reflection of how the teachers work fostered (or did not foster) student understanding. The portfolio entry is 12 pages in length.

Max Credits: 1

Min Credits: 1

05.617 Seminar IV: Whole Class Discussion

Course ID: 37693

Course Details: Candidates develop the knowledge, skills, and dispositions necessary to foster student engagement. They will examine formal and informal assessment techniques associated with whole class discussions and analyze the importance of an equitable learning environment in fostering student participation. Candidates are required to submit a second, 20 minute unedited video of a whole class discussion. They closely analyze the video and interpret the student exchanges and teacher actions according to the standards of accomplished teaching. The portfolio entry is limited to 12 pages in length.

Max Credits: 2

Min Credits: 2

05.622 Managing Resources and Finances.

Course ID: 2684

Course Details: This course will provide students with an understanding of the financial principles and budget management in the operation of our public schools. We will analyze economic and demographic data, review local/state and federal education budgets, examine the legal principles of school finance, review local, state and federal laws and policies on public education and evaluate case studies in the operation of public schools. Students will prepare budget documents, develop financial forecasts and prepare policy briefs on various topics related to school finance.

Max Credits: 3

Min Credits: 3

05.623 School Policy and Law

Course ID: 2685

Course Details: This course will provide students with an understanding of the law and legal basis for making decisions in our public schools. We will analyze court decisions, state and federal constitutional provisions and laws and public policies and regulations as they pertain to the operation of the public schools in the United States. With a solid understanding of the legal framework of governance at the federal, state and local level and the decisions derived through court cases, educators will be better equipped to respond to the numerous challenges and decisions they face throughout the school year.

Max Credits: 3

Min Credits: 3

05.630 Leadership & Learning

Course ID: 2691

Course Details:

Max Credits: 3

Min Credits: 3

05.638 Planning, Technology and School Improvement

Course ID: 2699

Course Details: This course helps educators develop a broad grasp of the educational possibilities and concerns the Internet raises, for K-12 educators as well as those in higher education. Through the course, students develop in-depth knowledge of Internet resources and problems related to a specific issue of professional interest.

Max Credits: 3

Min Credits: 3

05.641 Issues in Staff Development

Course ID: 2702

Course Details: Includes understanding of how to work with adult learners who are peers, as well as techniques for assessing staff needs, design of programs to improve staff performance and strategies to ensure productive in-service education.

Max Credits: 3

Min Credits: 3

05.642 Principles of Supervision

Course ID: 2703

Course Details: This course is designed to help current and aspiring supervisors explore the skills, knowledge and personal attributes central to instructional leadership and supervision. A paradigm shift away from an historical/traditional view of supervision towards a more collegial model is emphasized. Students will complete field work including two observations of a colleague and pre and post-lesson conferences.

Max Credits: 3

Min Credits: 3

05.643 Principalship PK - 12

Course ID: 2704

Course Details: This course is designed to help aspiring principals explore the skills, knowledge and personal attributes central to effective leadership. The course aims to acquaint students with research, theories, and frameworks from the knowledge base on school leadership; explore the issues, daily experiences, and decisions of the principal within the action context of the school; assist students to think critically and systematically about leadership; help students become more conscious of their own values, assumptions and purposes as school leaders; further develop leadership skills, insight, and vision for schooling; assist students to think of themselves as educators for transformation.

Max Credits: 3

Min Credits: 3

05.649 Directed Study: Administration

Course ID: 2710

Course Details: Through frequent consultation with the instructor, the student will investigate and define a problem for research and will present the findings in a significant paper. The directed study may not be substituted for a required course.

Max Credits: 3

Min Credits: 3

05.650 Instructional Leadership and School Reform

Course ID: 2711

Course Details: Addresses the way in which an instructional leader initiates changes in organizations—whether curricular or in the systems which make organizations function.

Max Credits: 3

Min Credits: 3

05.651 Transformative Leadership for Schools

Course ID: 2712

Course Details: This course considers ways in which school leaders can facilitate transformative change in all aspects of school life. Focusing on theory, research, and pragmatic strategies, the course examines approaches to school design for school startup and redesign for schools undergoing significant change.

Max Credits: 3

Min Credits: 3

05.652 Managing Change and Conflict

Course ID: 2713

Course Details: Examines theories in the changing process, strategies for effective adoption and implementation of innovations and conflict resolution.

Max Credits: 3

Min Credits: 3

05.658 Role of the Curriculum and Instructional Leader

Course ID: 2715

Course Details: This course provides prospective leaders with the theoretical and empirical bases for understanding the instructional core and how to create the conditions needed for high quality teaching and learning to occur in their schools. Course participants will explore how to (i) establish a vision that promotes high standards for learning and is shared by all stakeholders; (ii) promote a positive school culture that is anchored in professional behavior and trusting relationships; (iii) promote effective instructional programs and the application of best practices to student learning; (iv) make decisions grounded in reliable data integrity, fairness, and ethical conduct.

Max Credits: 3

Min Credits: 3

05.670 CAGS Capstone Seminar I

Course ID: 2722

Course Details:

Max Credits: 3

Min Credits: 3

05.673 Advanced Research Seminar

Course ID: 2725

Course Details:

Max Credits: 3

Min Credits: 3

05.680 Leadership of Community Engagement I

Course ID: 37009

Course Details: This course will examine the intricacy of community engagement. Parent and community engagement in education is widely recognized as important, yet very few teacher leaders are taught how to foster engagement more broadly and deeply in schools. Teachers will learn community-based relational approach and other theories related to parent and community engagement. Through action plans, they will create opportunities for community partnerships necessary for promoting the success of all students.

Max Credits: 2

Min Credits: 2

05.681 Leadership of Community Engagement II

Course ID: 37010

Course Details: In this course, students will implement and evaluate their community engagement action plan from Leadership of Community Engagement I. Students will begin to unravel and document best practices seminal to community and school partnerships. Through the sharing of important resources such as social networks and community capital. Teachers will create a learning community to support each other and colleagues engaged in this important work.

Max Credits: 1

Min Credits: 1

05.682 Peer Leadership I

Course ID: 37011

Course Details: This is the first in a sequence of three one credit courses that provide strategies, practical training, and a foundation in adult learning theory necessary for teachers to cultivate and lead school-based professional learning communities. For Course One, students participate in a three day summer institute (9am-3pm) and develop an action plan for the coming school year in which they will lead the development of a professional learning community. Students are invited to participate in an ongoing research study of professional learning communities.

Max Credits: 1

Min Credits: 1

05.683 Peer Leadership II

Course ID: 37012

Course Details: This is the second in a sequence of three one credit courses that provide strategies, practical training, and intellectual foundation necessary for teachers to cultivate and lead school-based professional learning communities. For Course Two, students participate in three online learning modules and two face-to-face seminars during the fall semester. Students receive coaching and instruction as they pursue the action plans developed in Course One and write a reflective journal. Students also read literature comprising the intellectual foundation for the professional learning community and write two critical essays.

Max Credits: 1

Min Credits: 1

05.684 Peer Leadership III

Course ID: 37013

Course Details: This is the third in a sequence of three one credit courses that provide strategies, practical training and the intellectual foundation necessary for teachers to cultivate and lead school-based professional learning communities. For Course Three, students participate in three online learning modules and two face-to-face seminars during the spring semester. Students receive coaching and instruction as they pursue action plans developed in Course One and write a reflective journal. Students also read literature comprising the intellectual foundation for the professional learning community and write two critical essays.

Max Credits: 1

Min Credits: 1

05.685 Accomplished Teaching Seminar I; Professional Accomplishments

Course ID: 37014

Course Details: Candidates are asked to document a limited number of verifiable accomplishments outside the classroom from both the professional and local communities. Candidates must explain how each accomplishment impacts student learning. Accomplishments are limited to the last five years. Later in the program, more recent accomplishments may be added to the entry. The portfolio entry is 20 pages in length.

Max Credits: 1

Min Credits: 1

05.686 Accomplished Teaching Seminar II; Active Learning

Course ID: 37015

Course Details: In this seminar, candidates must analyze an inquiry approach to education and its relation to their current practices. They must examine the connections between inquiry, teaching, learning, and the standards of accomplished teaching. The portfolio entry requires a video in which candidates are asked to document a class meeting where students are learning through inquiry based instruction. Documentation takes the form of a 20 minute video edited into three sections. Section one shows how the lesson is introduced. Section two records students engaged in inquiry learning. Finally, section three records the lesson's closure. The analysis focuses on the available evidence from the video; specifically, how the candidate's actions (or inaction's) resulted in student learning. The portfolio entry is limited to 12 pages.

Max Credits: 2

Min Credits: 2

05.687 Accomplished Teaching Seminar III; Teaching Cycle

Course ID: 37016

Course Details: This seminar focuses on the teaching cycle (planning, implementing, assessing) in conjunction with the standards of accomplished teaching in specific content areas. The portfolio entry emanates from the day to day work of each teacher and requires teachers to document the decisions and choices which directly impact the student learning experience. The entry includes lesson plans associated with specified learning objectives, detailed assignments, examples of student work from two of those assignments representing high and low achieving groups, and an analytical reflection of how the teachers work fostered (or did not foster) Student understanding. The portfolio entry is 12 pages in length.

Max Credits: 1

Min Credits: 1

05.688 Accomplished Teaching Seminar IV; Whole Class Discussion

Course ID: 37018

Course Details: Candidates develop the knowledge, skills, and dispositions necessary to foster student engagement. They will examine formal and informal assessment techniques associated with whole class discussions and analyze the importance of an equitable learning environment in fostering student participation. Candidates are required to submit a second, 20 minute unedited video of a whole class discussion. They closely analyze the video and interpret the student exchanges and teacher actions according to the standards of accomplished teaching. The portfolio entry is limited to 12 pages in length.

Max Credits: 2

Min Credits: 2

05.701 Seminar: Qualifying Paper Development

Course ID: 36763

Course Details: The Qualifying Paper Development seminar provides the student with constructive feedback and scaffolding as he or she develops the qualifying paper. The one-credit option is for the student who anticipates developing the qualifying paper over two semesters, and submitting the paper at the end of the second semester.

Max Credits: 1

Min Credits: 1

05.702 Seminar: Qualifying Paper Development

Course ID: 36764

Course Details: The Qualifying Paper Development seminar provides the student with constructive feedback and scaffolding as he or she develops the qualifying paper. The two-credit accelerated option is for the student who anticipates developing and submitting the final draft of the qualifying paper in one semester.

Max Credits: 2

Min Credits: 2

05.703 Seminar: Qualifying Paper Development

Course ID: 36765

Course Details: The Qualifying Paper Development seminar provides the student with constructive feedback and scaffolding as he or she develops the qualifying paper. The three-credit accelerated option is for TAs and RAs only.

Max Credits: 3

Min Credits: 3

05.710 Research Planning: Leadership

Course ID: 2728

Course Details: Research Planning: Leadership is a scaffolded-experience to guide students in the development of their qualifying paper (the second comprehensive exam), a structured review of the literature. Only students who are at the appropriate stage of their program may enroll with permission of the instructor.

Max Credits: 3

Min Credits: 3

05.729 Directed Study : Leadership in Schooling

Course ID: 2729

Course Details: Participants will develop a focused line of investigation with the supervision of a faculty member in the college. Approval of advisor is required.

Max Credits: 3

Min Credits: 3

05.753 Doctoral Dissertation/Education

Course ID: 2736

Course Details:

Max Credits: 3

Min Credits: 3

05.756 Doctoral Dissertation/Education

Course ID: 2737

Course Details:

Max Credits: 6

Min Credits: 6

05.759 Doctoral Dissertation/Education

Course ID: 2738

Course Details:

Max Credits: 9

Min Credits: 9

05.760 Dissertation Research

Course ID: 35285

Course Details: Doctoral candidates must be enrolled in this course if they have completed their required dissertation research and wish to defend their dissertation.

Max Credits: 1

Min Credits: 1

05.766 Continued Graduate Research

Course ID: 2740

Course Details:

Max Credits: 6

Min Credits: 6

06.511 Teaching Reading in Content Area

Course ID: 2746

Course Details: This course presents the theoretical foundation and current best practices for content area reading, writing, and study skills. The focus is on motivation, cognition, memory, and verbal processing theories as they apply to methodology. Students learn to develop lessons and units that integrate reading and writing while covering concepts in the content areas.

Max Credits: 3

Min Credits: 3

06.522 Young Adult Literature

Course ID: 2747

Course Details: The major emphasis of the course will be discussion and analysis of the goals of a literature curriculum and the exploration of various methods for achieving these goals. The characteristics of the different genres of literature will be discussed in detail

Max Credits: 3

Min Credits: 3

06.527 Language Acquisition

Course ID: 30802

Course Details: This course will focus on the study of the acquisition of language and the relationship of language learning to the development of literacy. Students will examine both first and second language acquisition. Students will be expected to apply their knowledge of language acquisition to best teaching practices for enhancing first and second language development in the classroom and to the development of literacy.

Max Credits: 3

Min Credits: 3

06.528 Assessment of Reading and Language Disabilities

Course ID: 2749

Course Details: This course examines the selection and use of procedures to make an adequate clinical and educational diagnosis. Includes the assessment of function and dysfunction in factors associated with language development; receptive, expressive, writing, reading; and the administration and interpretation of individual and group tests of perceptual, motor, and conceptual functioning in reading and language.

Max Credits: 3

Min Credits: 3

06.529 Treatment Reading and Language Disabilities

Course ID: 2750

Course Details: This course will explore the specific practices in remedial teaching in grades K-12, using published materials, and developing new materials for small group, whole class, and tutoring settings. Students will develop and implement realistic corrective programs based on the interpretation of literacy assessments. These programs will include selecting strategies of instruction and materials, and establishing a framework of time and evaluation.

Max Credits: 3

Min Credits: 3

06.530 Reading and Thinking: Secondary School

Course ID: 2751

Course Details: This course examines the relationships among reading, writing, and thinking in high school, particularly in diverse populations and with second language learners. Emphasis will be placed upon practical work in classrooms and the development and assessment of new teaching practices.

Max Credits: 3

Min Credits: 3

06.549 Theory and Research: Reading and Language

Course ID: 2755

Course Details: A final course on the national and international research in reading and language and the pertinence and proposed implementation of research findings to instruction and the various roles of the reading supervisor or director.

Max Credits: 3

Min Credits: 3

06.550 Reading Specialist: Practicum I

Course ID: 33548

Course Details: The Reading Specialist Practicum requires students to use the knowledge gained in their coursework to design, implement, and analyze a program for struggling readers in a clinical experience. The practicum meets both Massachusetts and IRA standards for Reading Specialist/Literacy Coach.

Max Credits: 3

Min Credits: 3

06.551 Literacy Coach: Practicum II

Course ID: 33715

Course Details: This is the second of two clinical practicum experiences in the Reading and Language program. Candidates will design a professional development project in their school setting which will allow them to model lessons, observe and co-teach with peers, and provide feedback to teachers and paraprofessionals. The online seminar provides support for implementing the program. The practicum meets the guidelines for the International Reading Association

Max Credits: 3

Min Credits: 3

06.607 Methods of Sheltered Language Instruction

Course ID: 32101

Course Details: Different approaches and teaching procedures in Second Language instruction will be discussed as well as the methodological models of English as a Second Language instruction.

Max Credits: 3

Min Credits: 3

06.612 Topics in Language Arts and Literacy

Course ID: 31958

Course Details: This is an elective course in the doctoral program that covers a range of topics in language arts and literacy.

Max Credits: 3

Min Credits: 3

06.625 Teaching Of Writing

Course ID: 2769

Course Details: This course reviews the research and literature on writing instruction, grades K through 14, and examines points of view, approaches, methodologies, and assessments

Max Credits: 3

Min Credits: 3

06.627 Second Language Acquisition and Assessment

Course ID: 2771

Course Details: A Study of the general schools of thought that have formed the basis of teaching English as a Second Language. This course is designed to assist students in conceptualizing the foundations of second language acquisition. The course will also inform students about appropriate procedures for assessing the skill development of second language learners.

Max Credits: 3

Min Credits: 3

06.636 Literacy Coach Institute

Course ID: 2777

Course Details:

Max Credits: 3

Min Credits: 3

06.675 History, Theory, and Contemporary Issues in Language, Literacy and Culture.

Course ID: 31880

Course Details: The purpose of this course is to engage students in the complexities and debates regarding theoretical perspectives and research on language, literacy, and culture that have affected language and literacy learning. This course will begin with introduction to the history of research done on concepts of language, literacy and culture. Students then look at the evolution of sociolinguistic and stenographic research language, literacy and culture as well as other modes of inquiry on language and literacies. Most of the course is spent closely examining studies for how they conceptualize the mutual construction of language, literacy, and culture, and for what they can tell use about the nature of literacy learning. In addition, students will explore the questions those studies raise such as cultural diversity, identity, learning, curriculum and instruction school-community relationships and social justice in literacy and language learning.

Max Credits: 3

Min Credits: 3

06.676 History, Theory, and Research in the Teaching of Writing

Course ID: 32981

Course Details: This course covers the history of the teaching of composition from the ancient Greeks to the present day, the development of both theory and pedagogy, and the current research into how writers learn, which teaching methods work best, and which issues continue to be of concern. Students will learn to critique writing pedagogy, to place programs and issues into historical perspective, and to analyze and design research into the teaching of writing.

Max Credits: 3

Min Credits: 3

06.677 Theories of Verbal Communication

Course ID: 33001

Course Details: The course will examine various theories and models of verbal communication appropriate for study in the Language Arts and Literacy. The specific theories and models will be determined each semester.

Max Credits: 3

Min Credits: 3

06.678 History, Research and Contemporary Issues in Reading Instruction

Course ID: 33002

Course Details: Students will trace the history of reading instruction in the United States from The New England Primer in the 1600s to the present with special attention to the ways in which those milestones may have impacted reading instruction today. Each of the key philosophical orientations to reading instruction will be explored from the point of view of the research that informs that instruction. Contemporary issues in reading instruction will be examined with ties to both the research and the history. Contemporary issues will be drawn from, but not limited to, politics, curriculum design, instructional materials, and instructional design.

Max Credits: 3

Min Credits: 3

06.729 Directed Study: Language and Literature

Course ID: 2806

Course Details: Students will work on individually designed projects in language arts and literacy in close cooperation with a faculty member.

Max Credits: 3

Min Credits: 3

06.753 Doctoral Dissertation/Education

Course ID: 2812

Course Details:

Max Credits: 3

Min Credits: 3

06.756 Doctoral Dissertation/Education

Course ID: 2813

Course Details:

Max Credits: 6

Min Credits: 6

06.759 Doctoral Dissertation/Education

Course ID: 2814

Course Details:

Max Credits: 9

Min Credits: 9

07.541 Practitioner Action Research

Course ID: 2823

Course Details: This course examines how action research helps educators to learn to explore pressing classroom and school issues in systematic ways. Action research provide educators with opportunities to deepen their knowledge and skills as reflective practitioners, allowing them to contribute to the achievement of students and the improvement of schools.

Max Credits: 3

Min Credits: 3

07.642 Program Evaluation

Course ID: 2829

Course Details: Evaluation tasks will be identified and the policy issues attendant to evaluation will be examined. Students will identify and discuss several models of program evaluation, understand what needs to be considered and addressed in needs assessment, learn to identify an appropriate design for a new evaluation. Students will be expected to conduct program evaluation, present their ideas and illustrate how evaluation results can be useful for program decision making.

Max Credits: 3

Min Credits: 3

07.660 Ethnographic Inquiry

Course ID: 2835

Course Details: This course provides the theoretical underpinnings of the nature, principles and processes of ethnographic research which focuses on the understanding of human cultures. Students will study how an ethnographic research project is developed and will conduct an aspect of a study during the semester. There will be particular emphasis on collecting and analyzing data in ethnographic research.

Max Credits: 3

Min Credits: 3

07.700 Introduction to Research Design and Methods

Course ID: 37812

Course Details: In this course students will be introduced to: Principles of research design in social sciences; Understanding how to plan for research using quantitative and/or qualitative data collection methods; Ethics of research conduct; Understanding and preparing for the Institutional Review board (IRB) process; Evaluating the trustworthiness of research; How to critically review research; The historical and philosophical issues undergirding qualitative research; Paradigms; Sampling procedures; Types of measurement error; Methodologies appropriate for educational research; Recent developments in education research.

Max Credits: 3

Min Credits: 3

07.701 Data Analysis

Course ID: 2836

Course Details: Prerequisite: A descriptive statistics or research methods course satisfactory to the Program Faculty. This course covers basic statistics used in the analysis of educational research.

Max Credits: 3

Min Credits: 3

07.702 Research Methods and Design

Course ID: 2837

Course Details: Methods of data collection suitable for answering a variety of educational research questions. Considers both qualitative and quantitative strategies for research and evaluation needs. Prerequisite: 07.701 or acceptable substitute.

Max Credits: 3

Min Credits: 3

07.704 Qualitative Research Methods

Course ID: 2839

Course Details: This course concentrates on the use of qualitative methods for educational research. Strategies for conducting qualitative studies are described and techniques for analyzing and reporting findings are emphasized.

Max Credits: 3

Min Credits: 3

07.705 Survey Research

Course ID: 2840

Course Details: Focusing on survey research methods, this course will familiarize students with the strategies, techniques, tactics, and issues in developing and administering questionnaires and interviews.

Max Credits: 3

Min Credits: 3

07.706 Intermediate/Advanced Data Analysis

Course ID: 2841

Course Details: Mixed methods research and evaluation uses both quantitative and qualitative data and information to answer research and evaluation questions. Mixed methods research and evaluation integrates these two general methodologies to design more complete and powerful scholarship and produce more informative answers to research, instructional, and educational questions of both the formative and the summative kind. These questions may be research hypotheses, instructional program effects, or educational program and policy evaluations. This course is designed to meet the needs and goals of the students who enroll in it and is conducted by a learning contract model. Advanced univariate and multivariate design and statistical techniques will be selectively covered, including: meta-analysis, instrument design and development. It includes various qualitative techniques and analytical models, such as development and use of protocols, interviewing, content and discourse as well as text analysis, analytic and observational scoring procedures and systems, document analysis, policy analysis. Scholarly text development such as histories, white papers, or professional literature reviews will be included.

Max Credits: 3

Min Credits: 3

07.707 Writing for Professional Development

Course ID: 2842

Course Details: In this course individuals will develop mastery of the elements of style, techniques of argument, and other writing skills such as audience, voice, and genre. They will prepare to propose and report research clearly and concisely for publication.

Max Credits: 3

Min Credits: 3

07.709 Measurement & Evaluation

Course ID: 2844

Course Details: Basic measurement and evaluation theories and techniques are surveyed, including achievement, attitudes, opinions, abilities, personality, skills and trait variables. Emphasis is given to methods of establishing reliability and validity of various measures.

Max Credits: 3

Min Credits: 3

08.601 Leadership, Law & Policy in Higher Education

Course ID: 2847

Course Details: This course examines theory, research and practice that inform us about the problem of scholarship, teaching, change and innovation in higher education. Students study academic life in the larger context of the institutional structure.

Max Credits: 3

Min Credits: 3

08.654 Student Development & Leadership in Higher Education

Course ID: 2852

Course Details: This course will examine the role of higher education in creating leaders for a diverse and democratic society Grounded

in student development theory and practice, this course will engage participants in reflective and critical exploration of leadership theories, frameworks, concepts and skills that focus on social justice and purposeful change. The course is designed to provide foundational grounding in the study of leadership theory and research, with a focus on the leadership paradigms emphasizing transformation, collaboration and empowering group members in an effort to improve the world in which we live. During this course you will read current ideas about student development and the nature of leadership, you will engage in class activities and assignments which challenge you to think critically with multiple perspectives and frameworks and you will undertake a self-examination about who you are and what you believe as someone who will facilitate student development and leadership in student affairs and within higher education.

Max Credits: 3

Min Credits: 3

08.659 Strategies for Instruction in Higher Education

Course ID: 2855

Course Details: A variety of theories, methods and multi-media techniques of teaching will be explored in order to familiarize students with the many options available to facilitate learning by adults

Max Credits: 3

Min Credits: 3

08.660 Diversity in Higher Education

Course ID: 2856

Course Details: Focuses on the preparation, admission, retention, and achievements of minorities in higher education, both past and present.

Max Credits: 3

Min Credits: 3

08.670 Practicum I: Higher Education Option

Course ID: 38127

Course Details: The Practicum I: Higher Education is the first of two culminating requirements for those students striving to earn the M.Ed. in Education Administration: Higher Education Option. Practicum I and II require students to engage in a project that demonstrates the practical application of their knowledge and skills in real-life higher education leadership activities and responsibilities over the course of two semesters; both semesters involve significant leadership work in partnership with a supervisor/mentor in an appropriate higher education site. Selection of the focus and scope of the project will be tailored to students area of focus in the Higher Education Option and their current work responsibilities.

Max Credits: 3

Min Credits: 3

08.671 Practicum II: Higher Education

Course ID: 38343

Course Details: Practicum II: Higher Education is the second in the series of two culminating requirements for those students striving to earn the M.Ed. in Education Administration: Higher Education Option. Similar to Practicum I (08.670), Practicum II (08.671) requires students to engage in the continuation of the project from Capstone I that demonstrates the practical application of their knowledge and skills in real-life higher education leadership activities and responsibilities over the course of the semester. Both Practicum semesters involve significant leadership work in partnership with a supervisor/mentor in an appropriate higher education site. Practicum II content will be tailored to students' area of focus in the Higher Education Option and their current work responsibilities.

Max Credits: 3

Min Credits: 3

10.501 Paper Industry Processes

Course ID: 2897

Course Details: Processes of fiber separation from raw materials, fiber purification and mechanical processing of fiber and sheet formation. Chemical engineering theory is applied to the analysis of these operations.

Max Credits: 3

Min Credits: 3

10.502 Principles of Chemical Engineering

Course ID: 34592

Course Details: Introduction to the field of chemical engineering and solution of problems involving units and dimensions, mass balances, flow sheets and gas relationships.

Max Credits: 3

Min Credits: 3

10.506 Colloidal, Interfacial and Nanomaterials Science and Engineering

Course ID: 35692

Course Details: Unifying principle and the three main classes of colloids (dispersions, macromolecular solutions and micelles) are considered. Topics covered include surface tension, work and energy, effect of surface curvature, zeta potential, surface activity and diverse applications of interest to chemical engineers.

Max Credits: 3

Min Credits: 3

10.508 Material Science and Engineering

Course ID: 2900

Course Details: An advanced overview of solid materials that are likely to be considered for engineering applications in, or be produced by the chemical process industries. They will be discussed from the viewpoints of their unit cell structures, appropriate phase diagrams, their chemical and physical attributes, and the association of these to end use applications. Discussion of metals, ceramics, polymers, and composites. For Non-UML graduates.

Max Credits: 3

Min Credits: 3

10.510 Advanced Separation Processes

Course ID: 2902

Course Details: This course emphasizes separation processes requiring a rate analysis for adequate understanding, which includes most of the newer separation methods of industrial importance such as membrane, sorption and chromatographic separations. Unifying fundamental relations and concepts are emphasized. Graphical and numerical design procedures are covered.

Max Credits: 3

Min Credits: 3

10.512 Industrial Chemistry

Course ID: 36645

Course Details: Survey of the major sources and uses of chemicals, industrial chemical processes, fundamental raw materials, and career paths available in the chemical industry. More intensive treatment of selected industrial processes with emphasis of green/sustainable chemical processes.

Max Credits: 3

Min Credits: 3

10.518 Microprocessor Control

Course ID: 2906

Course Details: Single board computers and single chip controllers and how they are used in chemical process control. Programming methods for using minicomputers as process controllers; interfacing requirements and communications. Laboratory projects include

both software and hardware.

Max Credits: 3

Min Credits: 3

10.520 Advanced Thermodynamics

Course ID: 2907

Course Details: Classical and statistical thermodynamics are applied to develop procedures for obtaining estimates of equilibrium properties required for chemical process design. An introduction to surface energy as an important parameter in the processing of colloids, especially in the nanometer size range, will also be undertaken.

Max Credits: 3

Min Credits: 3

10.522 Chemical Process Design

Course ID: 2909

Course Details: Process synthesis, definition, and characterization. Introduction to modular process simulation packages such as ASPEN PLUS, Recycle and tear stream analysis. Stream convergence, Unit operations models, Flow sheet manipulation. Data records and physical property estimation techniques.

Max Credits: 3

Min Credits: 3

10.523 Nanodevices and Electronics Materials Processing

Course ID: 2910

Course Details: Materials processing methods in electronics and related industries; crystal contamination control, growth, diffusion, etching, epitaxy, ion implantation, lithography, and other topics.

Max Credits: 3

Min Credits: 3

10.524 Self Assembly and Nanotechnology

Course ID: 2911

Course Details: This course will describe two of the most fast-growing area/fields with both fundamental importance and practical relevance: self-assembly and nanotechnology. The first half of the course will discuss the theories and applications of self-assembly phenomena. The second half will focus on nanomaterials and nanotechnology.

Max Credits: 3

Min Credits: 3

10.528 Advanced Transport Phenomena

Course ID: 2914

Course Details: An advanced study of the mechanisms of the transport processes. Transport equations are developed from both microscopic and macroscopic viewpoints. Analogies and similarities between the transport processes are discussed. Considerable emphasis is placed upon solutions to problems.

Max Credits: 3

Min Credits: 3

10.529 Recent Advances in Nanotechnology and Green Chemistry

Course ID: 2915

Course Details: This course is designed to expose students to a variety of concepts in chemistry and challenge them to think critically about experiments used to interrogate these concepts. Organic polymer chemistry with an emphasis on electronically conducting

polymers will be the main area of focus. Students would first be introduced to scientific subject matter outside their realm of familiarity and be expected to identify new concepts and links to existing experimental paradigms. The course is divided into 3 parts: (i) introduction to nanotechnology and green chemistry with a focus on nanoscale electronic polymers, (ii) green chemistry and the overlap area with nanotechnology, and (iii) green engineering.

Max Credits: 3

Min Credits: 3

10.530 Advanced Control Strategies

Course ID: 2916

Course Details: An introduction to computer control and to some of the common control strategies applied to the design of complex chemical process control systems.

Max Credits: 3

Min Credits: 3

10.532 Principles of Chemical Engineering II

Course ID: 2918

Course Details: Continuation of Principles of Chemical Engineering including real gas relationships, humidity, energy balances, and combined mass-energy balance systems. Introduction to the first law of thermodynamics. Note: Non-majors only.

Max Credits: 3

Min Credits: 3

10.533 Macromolecular Colloidal Science and Engineering

Course ID: 2919

Course Details: This course treats both synthetic and natural macromolecules (i.e., polymers, and biopolymers), interrelating synthesis commercial manufacture, molecular, macroscopic and application properties as well as the colloidal nature of their solutions. Pertinent fundamental principles are reviewed.

Max Credits: 3

Min Credits: 3

10.535 Cell and Microbe Cultivation

Course ID: 2921

Course Details: This course presents the principles of biochemical engineering with an emphasis on the unit operation of cell cultivation for production of commercially important products, especially biopharmaceuticals. The bioreactor is viewed as a device for controlling the environment of recombinant and traditional cultures. Major topics include media design, kinetics of growth and production, expression systems, bioreactor types, cell physiology, and bioprocess economics.

Max Credits: 3

Min Credits: 3

10.538 Advanced Separations in Biotechnology

Course ID: 30314

Course Details: This course provides in depth analysis of the two methods used most often in Bioseparations, filtration and chromatography. For both techniques, basic concepts are reviewed. Membrane, depth, sterile and tangential flow filtration, as well as ion exchange, hydrophobic interaction, and hydroxyapatite chromatography are considered. The emphasis for both methods is on specific applications, scale-up, validation and cleaning

Max Credits: 3

Min Credits: 3

10.539 Mathematical Methods for Engineers

Course ID: 1261

Course Details: Ordinary and partial differential equations, linear algebra, matrix/vector calculus, numerical methods, introduction to optimization methods, and other topics as time permits. Both analytical and numerical techniques are integrated to give good analytical skills coupled with practical problem solving tools. Extensive computer work with the MATLAB package is required. (Same as 24.539).

Max Credits: 3

Min Credits: 3

10.541 Nchrtzn by SEM, TEM & AFM

Course ID: 2924

Course Details: The principles and practical applications of analytical methods for examining ceramics, electronic materials, polymers, and biological materials are covered. Students learn the practical and theoretical use of analytical techniques such as transmission electron microscopy, scanning electron microscopy, secondary ion mass spectroscopy, electron spectroscopy chemical analysis for materials research and for problem solving in materials science.

Max Credits: 3

Min Credits: 3

10.542 Colloidal Nanoscience and Nanoscale Engineering

Course ID: 1259

Course Details: This course will cover the fundamentals of nanoscale colloidal processes, intermolecular forces and electrostatic phenomena at interfaces, boundary tensions and films at interfaces, electrostatic and London forces in disperse systems, interactions and self-assembly of polymer colloids, nanoparticles, surfactants and biomolecules. Applications include microfluidics; lab-on-a-chip; nano-biocolloids, vesicles, colloidosomes, polymersomes and polymer hydrogel microcapsules for drug delivery and nanostructured materials and devices.

Max Credits: 3

Min Credits: 3

10.544 Formulation of Biotherapeutics

Course ID: 38069

Course Details: Biotherapeutics, particularly antibodies, are currently the fastest growing pharmaceuticals. Ideally, biotherapeutics are formulated in aqueous solutions and are often a great challenge due physical and chemical stability issues. This course addresses the latest trends and challenges in biologics formulation with a focus on the important role of preformulation in understanding the biological molecule itself for greater "formulatability" and "developability". The course will feature interactive discussions on early formulation screening, thorough biophysical and analytical characterization, improving the feedback loop in the early formulation-development interface, overcoming aggregation and other heterogeneity challenges, and improving overall product profile. In addition, the course will also cover an optimization of the formulation process through rational iterative approach and in-depth case studies. As a whole, this course focuses on providing you with additional tools and knowledge to help streamline solutions to formulation and stability issues for biologics.

Max Credits: 3

Min Credits: 3

10.545 Isolation and Purification

Course ID: 1236

Course Details: Efficient isolation and purification of biological products, especially proteins, from complex natural mixtures.

Max Credits: 3

Min Credits: 3

10.548 Process Analytical Technology and Quality by Design for Biopharmaceuticals

Course ID: 37586

Course Details: Process analytical technology (PAT) and Quality by Design (QbD) are the initiatives started by FDA to improve efficiency and productivity of manufacturing and development of life science industries. This course will discuss the basic concepts of these initiatives and their applications in biopharmaceuticals. Multivariate data analysis and experimental design will be studied as tools for implementing PAT and QbD.

Max Credits: 3

Min Credits: 3

10.550 Biomedical Applications of Nanotechnology

Course ID: 38427

Course Details: The course will aim to give students an introduction to the applications of nanotechnology in biomedicine. The course will cover the basics of nanomaterials including synthesis and characterization, use of nanotheranostics platforms for drug delivery and imaging, nanomaterials for tissue engineering; nanobiodevices and nanotoxicology. The course is designed for graduate students in the Chemical Engineering and the Biomedical Engineering/Biotechnology programs as well as seniors in Chemical Engineering.

Max Credits: 3

Min Credits: 3

10.552 Directed Study: Chemical Engineering

Course ID: 2927

Course Details:

Max Credits: 3

Min Credits: 3

10.555 Biopharmaceutical GMP and Licensing

Course ID: 2928

Course Details: This course examines the regulatory framework in which "drugs", biologics" and "cellular therapies" are evaluated in the United States, including the laws, regulations and the state of industrial practice.

Max Credits: 3

Min Credits: 3

10.586 Biotechnology Processing Projects Laboratory

Course ID: 2929

Course Details: Development of manufacturing processes for the products of biotechnology are followed through a series of process unit operations. Following the synthesis, purification and formulation of a specific enzyme throughout the course, students examine interactions between process steps and evaluate the impact of each on the total production process. As a final project, students assume the role of project team leader, developing a commercial-scale production process for the enzyme.

Max Credits: 3

Min Credits: 3

10.593 Cooperative Education

Course ID: 2931

Course Details:

Max Credits: 0

Min Credits: 0

10.601 Seminar

Course ID: 2932

Course Details: Required for all graduate students.

Max Credits: 0

Min Credits: 0

10.602 Graduate Seminar

Course ID: 2933

Course Details: Required for all graduate students.

Max Credits: 0

Min Credits: 0

10.650 Nanoscale Transport Phenomena for Manufacturing Nanodevices

Course ID: 38291

Course Details: An interdisciplinary course taught by faculty from the Chemical, Mechanical and Plastics Engineering Departments, who have special knowledge in nanoscale fluid mechanics and heat transfer. The course on nanoscale transport phenomena constitutes a bridge between existing fluid and heat transfer courses in multiple disciplines and emerging nanoscale science and engineering concepts to reflect the forefront of nanomanufacturing. The course is designed to incorporate recent advances in manufacturing polymer-based nanodevices. Key issues of the implementation and maintenance costs for fabrication will be addressed. Hands-on laboratory experiments will be performed to complement the lectures with the ultimate goal of designing and building a complete nanodevice at the end of the course. The course will prepare graduates for employment focused on designing and manufacturing nano/microfluidic systems, lab-on-a-chip devices, electronics devices, medical devices, and other emerging technologies.

Max Credits: 3

Min Credits: 3

10.720 Special Projects in Chemical Engineering

Course ID: 2942

Course Details: Special projects undertaken by a student to expand his/her knowledge in specific fields related to his/her master's project.

Max Credits: 3

Min Credits: 3

10.733 Graduate Project - Chemical Engineering

Course ID: 2945

Course Details: Advanced research project required of students electing non-thesis option performed under the supervision of a senior faculty member in the Chemical Engineering Program. The project must be approved by an examining committee and the Department Chairperson.

Max Credits: 3

Min Credits: 3

10.736 Graduate Project - Chemical Engineering

Course ID: 2946

Course Details:

Max Credits: 6

Min Credits: 6

10.741 Thesis Review

Course ID: 35264

Course Details:

Max Credits: 1

Min Credits: 1

10.743 Master's Thesis - Chemical Engineering

Course ID: 2948

Course Details: Advanced research work required of students electing thesis option performed under the supervision of a senior faculty member in the Chemical Engineering Program. The thesis must be approved by an examining committee and the Department Chairperson.

Max Credits: 3

Min Credits: 3

10.746 Master's Thesis - Chemical Engineering

Course ID: 2949

Course Details:

Max Credits: 6

Min Credits: 6

10.753 Doctoral Dissertation/Chemical Engineering

Course ID: 2952

Course Details: Advanced research work required of students performed under the supervision of a senior faculty member in the Chemical Engineering Program. The dissertation topic must be approved by the doctoral committee.

Max Credits: 3

Min Credits: 1

10.756 Doctoral Dissertation/Chemical Engineering

Course ID: 2953

Course Details:

Max Credits: 6

Min Credits: 6

10.759 Doctoral Dissertation/Chemical Engineering

Course ID: 2954

Course Details:

Max Credits: 9

Min Credits: 9

11.512 Adv Fiber Processing

Course ID: 2958

Course Details:

Max Credits: 3

Min Credits: 3

11.563 Calculus II

Course ID: 2959

Course Details:

Max Credits: 4

Min Credits: 4

14.504 Advanced Strength Of Material

Course ID: 3012

Course Details: Stress and strain at a point; curved beam theory, unsymmetrical bending, shear center, torsion of non-circular sections; theories of failure; selected topics in solid mechanics.

Max Credits: 3

Min Credits: 3

14.505 Concrete Materials

Course ID: 3013

Course Details: This course introduces fundamental and advanced topics on the properties of concrete materials. Fundamental topics include the formation, structure, mechanical behavior, durability, fracture, and deterioration of concrete. Theoretical treatments on the deformation, fracture and deterioration of concrete are also addressed. Advanced topics include the electromagnetic properties of concrete, high performance concrete (HPC), high-strength concrete (HSC), fiber-reinforced concrete, other special concretes, and the green construction of concrete.

Max Credits: 3

Min Credits: 3

14.508 Practice of Structural Engineering

Course ID: 36644

Course Details: This course covers the practice of structural engineering as it deals with the design of structures such as buildings and bridges, the identification of loads, and design variables, and design detailing for concrete and steel structures. The emphasis will be placed on the use and interpretation of the ACI318-09, AISD and AASHTO codes and the GTSTRUDL software.

Max Credits: 3

Min Credits: 3

14.511 Inspection and Monitoring of Civil Infrastructure

Course ID: 35284

Course Details: In this course, principles and applications of inspection and monitoring techniques for the condition assessment of aged/damaged/deteriorated civil infrastructure systems such as buildings, bridges, and pipelines, are introduced. Current nondestructive testing/evaluation (NDT/E) methods including optical, acoustic/ultrasonic, thermal, magnetic/electrical, radiographic, microwave/radar techniques are addressed with a consideration of their theoretical background. Wired and wireless structural health monitoring (SHM) systems for civil infrastructure are also covered. Applications using inspection and monitoring techniques are discussed with practical issues in each application.

Max Credits: 3

Min Credits: 3

14.512 Structural Stability

Course ID: 35733

Course Details: This course provides a concise introduction to the principles and applications of structural stability for their practical use in the design of steel frame structures. Concepts of elastic and plastic theories are introduced. Stability problems of structural members including columns, beam-columns, rigid frames, and beams are studied. Approaches in evaluating stability problems, including energy and numerical methods, are also addressed.

Max Credits: 3

Min Credits: 3

14.521 Reliability Analysis

Course ID: 3018

Course Details: A review of the elementary principles of probability and statistics followed by advanced topics including decision analysis, Monte Carlo simulation, and system reliability. In-depth quantitative treatment in the modeling of engineering problems, evaluation of system reliability, and risk-benefit decision management.

Max Credits: 3

Min Credits: 3

14.527 Geotechnical and Environmental Site Characterization

Course ID: 3020

Course Details: This course is designed to give students a comprehensive understanding of various site investigation and site assessment technologies employed in geotechnical and environmental engineering. The course begins with introduction to site investigation planning and various geophysical methods including: seismic measurements, ground penetrating radar, electrical resistivity, electromagnetic conductivity, time domain reflectometry. Drilling methods for soil, gas and ground water sampling; decontamination procedures; and long term monitoring methods are studied. Emphasis in this course is placed on conventional and state-of-the-art in situ methods for geotechnical and environmental site characterization: standard penetration test, vane shear test, dilatometer test, pressuremeter test and cone penetration tests. Modern advances in cone penetrometer technology, instrumented with various sensors (capable of monitoring a wide range of physical and environmental parameters: load, pressure, sound, electrical resistivity, temperature, PH, oxidation reduction potential, chemical contaminants) are playing a major role in site characterization. Principles underlying these methods along with the interpretation of test data will be covered in detail. The course will also look into emerging technologies in the area of site characterization. (3-0)3

Max Credits: 3

Min Credits: 3

14.528 Drilled Deep Foundations

Course ID: 37401

Course Details: Design and analyses of drilled deep foundations including: Deep foundations classification and historical perspective. Cost analysis of foundations. Construction methods and monitoring techniques. Static capacity and displacement analyses of a single drilled foundation and a group under vertical and lateral loads. Traditional and alternative load test methods - standards, construction, interpretation, and simulation. Integrity testing methods. Reliability based design using the Load and Resistance Factor design (LRFD) methodology application for drilled deep foundations.

Max Credits: 3

Min Credits: 3

14.529 Engineering with Geosynthetics

Course ID: 3021

Course Details: Rigorous treatment in the mechanism and behavior of reinforced soil materials. Laboratory and insitu tests for determining the engineering properties of geosynthetics (geotextiles, geomembranes, geogrids and geocomposites). Design principles and examples of geosynthetics for separation, soil reinforcement and stabilization, filtration and drainage.

Max Credits: 3

Min Credits: 3

14.530 Driven Deep Foundations

Course ID: 3022

Course Details: design and analyses of driven deep foundations including: Deep foundations classification and historical perspective. Effects of pile installation. Static capacity and settlement analysis of a single pile and a pile group under vertical loads. Insight of pile resistance including soil behavior and interfacial friction. Driven pile load test standards, construction, interpretation, and simulation. Dynamic analysis of driven piles, the wave equation analysis, dynamic measurements during driving and their interpretation. Reliability based design using the Load and Resistance Factor design (LRFD) methodology application for driven deep foundations.

Max Credits: 3

Min Credits: 3

14.531 Advanced Soil Mechanics

Course ID: 3023

Course Details: Theories of soil mechanics and their application. Drained and undrained stress-strain and strength behavior of soils. Lateral earth pressures, bearing capacity, slope stability, seepage and consolidation. Lab and insitu testing.

Max Credits: 3

Min Credits: 3

14.532 Theoretical Soil Mechanics

Course ID: 3024

Course Details: Development and solution of the theories important in geotechnical engineering. Analytical and approximate methods of solution including finite element and finite difference. Elasticity theory for stress distributions. Upper and lower bound theory applied to retaining structures and shallow foundations. Soil structure interaction. Seepage and consolidation theory.

Max Credits: 3

Min Credits: 3

14.533 Advanced Foundation Engineering

Course ID: 3025

Course Details: Design and analysis of shallow foundations, excavations and retaining structures including: site exploration, bearing capacity and settlement theories, earth pressures, braced and unbraced excavations, rigid and flexible retaining structures, reinforced earth, dewatering methods and monitoring techniques.

Max Credits: 3

Min Credits: 3

14.534 Soil Dynamics and Earthquake Engineering

Course ID: 3026

Course Details: Effects of dynamic loading on foundations and earth structures. Single and multiple degree-of-freedom systems. Modal analysis. Basic seismology. Stress-strain and strength behavior of soils during cyclic and dynamic loading, including liquefaction. Soil amplification. Effect of earthquakes on retaining walls and dams. Dynamically loaded foundations.

Max Credits: 3

Min Credits: 3

14.536 Soil Engineering

Course ID: 3027

Course Details: The study of soil as an engineering material, and its use in earth structures (e.g. dams, road embankments), flow control, and compacted fills. Stability of natural and man made slopes, soil reinforcement and stabilization.

Max Credits: 3

Min Credits: 3

14.537 Experimental Soil Mechanics

Course ID: 3028

Course Details: Application of testing procedures to the evaluation of soil type and engineering properties. Testing for classification, permeability, consolidation, direct and triaxial shear and field parameters. The technical procedures are followed by data analysis, evaluation and presentation. Critical examination of standard testing procedures, evaluation of engineering parameters, error estimation and research devices.

Max Credits: 3

Min Credits: 3

14.539 Ground Improvement

Course ID: 3030

Course Details: Design and construction methods for strengthening the properties and behavior of soils. Highway embankments, soil nailing, soil grouting, landslide investigation and mitigation, dynamic compaction, stone columns.

Max Credits: 3

Min Credits: 3

14.540 Urban Transportation Planning

Course ID: 3031

Course Details: Objectives and procedures of the urban transportation planning process. Characteristics and current issues of urban transportation in the United States (both supply and demand). Techniques of analysis, prediction and evaluation of transportation system alternatives. Consideration of economic, environmental, ethical, social and safety impacts in the design and analysis of transportation systems.

Max Credits: 3

Min Credits: 3

14.541 Traffic Engineering

Course ID: 3032

Course Details: Engineering principles for safe and efficient movement of goods and people on streets and highways, including aspects of (a) transportation planning; (b) geometric design; (c) traffic operations and control; (d) traffic safety, and; (e) management of transportation facilities. Topics include: traffic stream characteristics; traffic engineering studies; capacity and level-of-service analysis; traffic control; simulation of traffic operations; accident studies; parking studies; environmental impacts.

Max Credits: 3

Min Credits: 3

14.543 Traffic Principles for Intelligent Transportation Systems

Course ID: 3034

Course Details: The objective of this course is to introduce the student to the traffic principles that are pertinent for the planning, design and analysis of Intelligent Transportation Systems (ITS). The course is oriented toward students that come from different disciplines and who do not have previous background in traffic or transportation principles. It is designed as an introductory course that will enable the student to pursue more advanced courses in transportation systems subsequently.

Max Credits: 3

Min Credits: 3

14.544 Transportation Economics and Project Evaluation

Course ID: 3035

Course Details: The course offers an overview of the fundamental principles of transportation economics. Emphasizes theory and applications concerning demand, supply and economics of transportation systems. Covers topics such as pricing, regulation and the evaluation of transportation services and projects. Prerequisites: Students should have knowledge of transportation systems and basic microeconomics.

Max Credits: 3

Min Credits: 3

14.545 Public Transit Plan and Design

Course ID: 3036

Course Details: Planning and design of public transportation systems and their technical, operational and cost characteristics. Discussion of the impact of public transportation on urban development; the different transit modes, including regional and rapid rail transit (RRT), light rail transit (LRT), buses, and paratransit, and their relative role in urban transportation; planning, design, operation and

performance of transit systems (service frequency and headways, speed, capacity, productivity, utilization); routes and networks; scheduling; terminal layout; innovative transit technologies and their feasibility.

Max Credits: 3

Min Credits: 3

14.546 Pavement Design

Course ID: 3037

Course Details: Fundamentals of planning, design, construction and management of roadway and airport pavements. Introduction to the theory and the analytical techniques used in pavement engineering. Principal topics covered: pavement performance, analysis of traffic, pavement materials; evaluation of subgrade; flexible and rigid pavement structural analysis; reliability design; drainage evaluation; design of overlays; and pavement distresses.

Max Credits: 3

Min Credits: 3

14.547 Airport Planning and Design

Course ID: 3038

Course Details: Planning and design of civil airports. Estimation of air travel demand. Aircraft characteristics related to design; payload, range, runway requirements. Analysis of wind data, runway orientation and obstruction free requirements. Airport configuration, aircraft operations, and capacity of airfield elements. Design of the terminal system, ground access system, and parking facilities.

Max Credits: 3

Min Credits: 3

14.548 Traffic Management and Control

Course ID: 3039

Course Details: The course presents modern methods of traffic management, traffic control strategies and traffic control systems technology. Main topics covered, include: transportation systems management (TSM); traffic control systems technology; control concepts - urban and suburban streets; control and management concepts - freeways; control and management concepts - integrated systems; traveler information systems; system selection, design and implementation; systems management; ITS plans and programs. The course will also include exercises in the use and application of traffic simulation and optimization models such as: CORSIM, TRANSYT and MAXBAND/ MULTIBAND.

Max Credits: 3

Min Credits: 3

14.549 Traffic Flow Theory

Course ID: 3040

Course Details: Traffic flow theory seeks to describe through precise mathematical models (a) the interactions between the vehicle and the roadway system and (b) the interactions among vehicles. Such theories forms the basis of all the models and procedures used in design and operational analysis of streets and highways. The course examines the fundamental traffic flow characteristics: time headway, flow, time-space trajectories, speed, distance headway and density. In depth treatment of related analytical techniques including traffic stream modeling at both microscopic and macroscopic levels, supply and demand analysis, shock wave analysis, queuing analysis and simulation modeling of traffic systems.

Max Credits: 3

Min Credits: 3

14.550 Behavior of Structures

Course ID: 3041

Course Details: Classical and matrix methods of structural analysis applied to complex plane trusses. Elementary space truss analysis. Elementary model analysis through the use of influence lines for indeterminate structures. The digital computer and problem oriented languages as analytical tools.

Max Credits: 3

Min Credits: 3

14.551 Advanced Steel Design

Course ID: 3042

Course Details: Elastic and plastic design of structural steel systems, residual stresses, local buckling, beam-columns, torsion and biaxial bending, composite steel-concrete members, load and resistance factor design.

Max Credits: 3

Min Credits: 3

14.552 Behavior - Concrete Structure

Course ID: 3043

Course Details: The main objective of this course is to expand the students' knowledge and understanding of reinforced concrete behavior and design. Advanced topics at material, element, and system level are built on quick reviews of undergraduate level knowledge and are related to current design codes.

Max Credits: 3

Min Credits: 3

14.553 Wood Structures

Course ID: 3044

Course Details: Review of properties of wood, lumber, glued laminated timber and structural-use panels. Review of design loads and their distribution in wood-frame buildings. Design of wood members in tension, compression and bending; and design of connections.

Max Credits: 3

Min Credits: 3

14.557 Structural Dynamics

Course ID: 3048

Course Details: Analysis of typical structures subjected to dynamic force or ground excitation using direct integration of equations of motion, modal analysis and approximate methods.

Max Credits: 3

Min Credits: 3

14.558 Bridge Design

Course ID: 3049

Course Details: Analysis and design of modern bridges, using computer software for the 3-D modeling of sample bridges under dead and live loading and seismic excitation. AASHTO specifications are used for the design of superstructures and substructures (abutments, piers, and bearings) under group load combinations.

Max Credits: 3

Min Credits: 3

14.561 Physical Chemical Treatment Processes

Course ID: 3051

Course Details: Course provides a theoretical understanding of various chemical and physical unit operations, with direct application of these operations to the design and operation of water and wastewater treatment processes. Topics include colloid destabilization, flocculation, softening, precipitation, neutralization, aeration and gas transfer, packed & tray towers, oxidation, disinfection, reverse osmosis, ultrafiltration, settlings, activated carbon adsorption, ion exchange, and filtration.

Max Credits: 3

Min Credits: 3

14.562 Physical and Chemical Hydrology Geology

Course ID: 3052

Course Details: Well hydraulics for the analysis of groundwater movement. A review of the processes of diffusion, dispersion, sorption, and retardation as related to the fate and transport of organic contaminants in groundwater systems. Factors influencing multi-dimensional contaminant plume formation and migration are addressed. It is the goal of this course to provide environmental scientists and engineers with the technical skills required to understand groundwater hydrology and contaminant transport within aquifers. A term paper and professional presentation in class regarding a relevant topic is required.

Max Credits: 3

Min Credits: 3

14.564 Hydrology & Hydraulics

Course ID: 3054

Course Details: This course utilizes engineering principles to quantitatively describe the movement of water in natural and manmade environmental systems. Topics include: hydrologic cycle, stream flow and hydrographs, flood routing, watershed modeling, subsurface hydrology, and probability concepts in hydrology, hydraulic structures, flow in closed conduits, pumps, open channel flow, elements of storm and sanitary sewer design will be addressed.

Max Credits: 3

Min Credits: 3

14.567 Environmental Aquatic Chemistry

Course ID: 3056

Course Details: This course provides environmental understanding of the principles of aquatic chemistry and equilibria as they apply to environmental systems including natural waters, wastewater and treated waters.

Max Credits: 3

Min Credits: 3

14.568 Environmental Fate and Transport

Course ID: 3057

Course Details: The fate of contaminants in the environment is controlled by transport processes within a single medium and between media. The similarities in contaminant dispersion within air, surface water and groundwater will be emphasized. Interphase transport processes such as volatilization and adsorption will then be considered from an equilibrium perspective followed by the kinetics of mass transfer across environmental interfaces. A professional presentation of a select paper or group of paper concerning a course topic is required.

Max Credits: 3

Min Credits: 3

14.570 Wastewater Treatment and Storm Water Management Systems

Course ID: 3058

Course Details: The era of massive subsidies for construction of sanitary sewers and centralized, publicly operated treatment works (POTWs) has passed. Non - point pollution from sources such as onsite disposal systems has become a major focus of concern in our efforts to protect and improve ground and surface water quality. Much of the new construction in areas not already served by centralized collection and treatment must use the alternative technologies. This course is design oriented. The variously available technologies are studied in depth. Students evaluate various technologies as they may be applied to a complex problem for which information is available, and develop an optimum problem solution.

Max Credits: 3

Min Credits: 3

14.571 Surface Water Quality Modeling

Course ID: 3059

Course Details: Theory and application of surface water quality modeling will be combined interactively throughout the course. Data from a stream will be utilized in order to bring a public domain model into operation

Max Credits: 3

Min Credits: 3

14.572 Marine and Coastal Processes

Course ID: 3060

Course Details: This course focuses on the coastal dynamics of currents, tides, waves, wave morphology and their effects on beaches, estuaries, mixing and sediment transport/accretion processes. Generalized global aspects of atmospheric and hydrospheric interactions with ocean currents are also presented.

Max Credits: 3

Min Credits: 3

14.573 Solid Waste Engineering

Course ID: 3061

Course Details: Characterization, handling and disposal of municipal, industrial and hazardous wastes. Technologies such as landfills, recycling, incineration and composting are examined. A term paper and professional presentation in class regarding a relevant topic is required.

Max Credits: 3

Min Credits: 3

14.575 Groundwater Modeling

Course ID: 3063

Course Details: Groundwater Modeling is designed to present the student with fundamentals, both mathematical and intuitive, of analytic and numeric groundwater modeling. An introductory course in groundwater hydrology is a prerequisite for Groundwater Modeling, and the student should be familiar with IBM computers in running text editors and spreadsheets. The semester will start with basic analytic solutions and image theory to aid in the development of more complex numeric models. Emphasis will then switch to numeric groundwater flow models (MODFLOW) and the use of particle tracking models (GWPATH) to simulate the movement of solutes in groundwater. The numeric modeling process will focus on forming the problem description, selecting boundary conditions, assigning the model parameters, calibrating the model, and preparing the model report. Course topics include: Analytic Methods, Numeric Methods, Conceptual Model and Grid design, Boundary Conditions, Sources, and Sinks, and Particle Tracking.

Max Credits: 3

Min Credits: 3

14.576 GIS Applications in Civil and Environmental Engineering

Course ID: 3064

Course Details: This course is to introduce students to the basic concepts of Geographic Information Systems (GIS) and GIS applications in Civil and Environmental Engineering. Topics to be covered include GIS data and maps, queries, map digitization, data management, spatial analysis, network analysis, geocoding, coordination systems and map projections, editing. Examples related to transportation, environmental, geotechnical and structural engineering will be provided to help students better understand how to apply GIS in the real world and gain hands-on experience. This course will consist of lectures and computer work.

Max Credits: 3

Min Credits: 3

14.578 Biological Wastewater Treatment

Course ID: 3066

Course Details: Course covers the theoretical and practical aspects of biological wastewater treatment operations. Topics include kinetics of biological growth and substrate utilization, materials balance in chemostats and plug flow reactors, activated sludge process analysis and design, sedimentation and thickening, nitrification and denitrification, phosphorus removal, fixed-film processes analysis

and design, anaerobic processes analysis and design, aerated lagoons and stabilization ponds, and natural treatment systems.

Max Credits: 3

Min Credits: 3

14.579 Green and Sustainable Civil Engineering

Course ID: 35734

Course Details: This course focuses on various green and sustainable materials and technologies applicable to five areas of civil engineering: environmental engineering, water resources engineering, structural engineering, transportation engineering, and geotechnical engineering. This course also covers current green building laws and introduces fundamentals of entrepreneurship and patent/copyright laws.

Max Credits: 3

Min Credits: 3

14.580 Construction Law

Course ID: 34708

Course Details: An introduction to contract, statutory and tort law governing the relationships between the multitude of parties involved in the construction process. The purpose of this course is to give students an understanding of how the law interacts with the construction industry. Course introduces students to the obligations, rights and risks of architects, engineers, general contractors, subcontractors, sureties and insurers throughout the construction process.

Max Credits: 3

Min Credits: 3

14.581 Engineering Systems Analysis

Course ID: 3067

Course Details: The course presents advanced methods of operations research, management science and economic analysis that are used in the design, planning and management of engineering systems. Main topics covered, include: the systems analysis methodology, optimization concepts, mathematical programming techniques, Network analysis and design, project planning and scheduling, decision analysis, queuing systems, simulation methods, economic evaluation. The examples and problems presented in the course illustrate how the analysis methods are used in a variety of systems applications, such as: civil engineering, environmental systems, transportation systems, construction management, water resources, urban development, etc.

Max Credits: 3

Min Credits: 3

14.591 Capstone Practicum

Course ID: 33229

Course Details: The course will include: directed study regarding the technical and also social, political and financial aspects of a project; and on-site project review and assessment and culminate with preparation of a professional project report and presentations. Not-for-profit domestic and international projects may be studied. Course will be open to those having completed preparatory work. Project availability will be by agreement of faculty advisor and project sponsors prior to enrollment. (Offered only upon availability of suitable projects and adequate outside financial support.)

Max Credits: 3

Min Credits: 3

14.595 Hazardous Waste Site Remediation

Course ID: 3074

Course Details: This course focuses on the principles of hazardous waste site remediation (with an emphasis on organic contaminants) using physical, chemical or biological remediation technologies. Both established and emerging remediation technologies including: bioremediation, intrinsic remediation, soil vapor extraction (SVE), in situ air sparging (IAS), vacuum-enhanced recovery (VER), application of surfactants for enhanced in situ soil washing, hydraulic and pneumatic fracturing, electrokinetics, in situ reactive walls, phytoremediation, and in situ oxidation, will be addressed. A term paper and professional presentation in class regarding a relevant topic is required.

Max Credits: 3

Min Credits: 3

14.596 Grad Industrial Exposure

Course ID: 3075

Course Details:

Max Credits: 0

Min Credits: 0

14.651 Special Topics in Civil Engineering

Course ID: 3078

Course Details: Course content and credits to be arranged with instructor who agrees to direct the student.

Max Credits: 3

Min Credits: 3

14.653 Special Topics

Course ID: 3079

Course Details:

Max Credits: 3

Min Credits: 3

14.693 Civil Engineering Individual Project

Course ID: 3082

Course Details:

Max Credits: 3

Min Credits: 3

14.705 Supervised Teaching in Civil Engineering

Course ID: 3084

Course Details:

Max Credits: 0

Min Credits: 0

14.733 Masters Project in Civil Engineering

Course ID: 3085

Course Details:

Max Credits: 3

Min Credits: 3

14.736 Masters Project in Civil Engineering

Course ID: 34790

Course Details:

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Max Credits: 6

Min Credits: 6

14.741 Master's Thesis-Civil Engineering

Course ID: 30315

Course Details:

Max Credits: 1

Min Credits: 1

14.743 Master's Thesis - Civil Engineering

Course ID: 3086

Course Details:

Max Credits: 3

Min Credits: 3

14.746 Master's Thesis - Civil Engineering

Course ID: 3087

Course Details:

Max Credits: 6

Min Credits: 6

14.749 Master's Thesis - Civil Engineering

Course ID: 3088

Course Details:

Max Credits: 9

Min Credits: 9

14.752 Independent Study in Civil Engineering

Course ID: 3089

Course Details:

Max Credits: 3

Min Credits: 3

14.753 Doctoral Dissertation

Course ID: 3090

Course Details:

Max Credits: 3

Min Credits: 3

14.756 Doctoral Dissertation/Civil Engineering

Course ID: 3091

Course Details:

Max Credits: 6

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Min Credits: 6

14.757 Doctoral Dissertation

Course ID: 33069

Course Details:

Max Credits: 7

Min Credits: 7

14.759 Doctoral Dissertation

Course ID: 3092

Course Details:

Max Credits: 9

Min Credits: 9

14.763 Continued Graduate Research

Course ID: 3093

Course Details:

Max Credits: 3

Min Credits: 3

14.766 Continued Graduate Research

Course ID: 3094

Course Details:

Max Credits: 6

Min Credits: 6

14.769 Continued Graduate Research

Course ID: 3095

Course Details:

Max Credits: 9

Min Credits: 9

16.502 VLSI Design

Course ID: 1268

Course Details: Introduction to CMOS circuits including transmission gate, inverter, NAND, NOR gates, MUXEs, latches and registers. MOS transistor theory including threshold voltage and design equations. CMOS inverter's DC and AC characteristics along with noise margins. Circuit characterization and performance estimation including resistance, capacitance, routing capacitance, multiple conductor capacitance, distributed RC capacitance, multiple conductor capacitance, distributed RC capacitance, switching characteristics incorporating analytic delay models, transistor sizing and power dissipation. CMOS circuit and logic design including fan-in, fan-out, gate delays, logic gate layout incorporating standard cell design, gate array layout, and single as well as two-phase clocking. CMOS test methodologies including stuck-at-0, stuck-at-1, fault models, fault coverage, ATPG, fault grading and simulation including scan-based and self test techniques with signature analysis. A project of modest complexity would be designed to be fabricated at MOSIS.

Max Credits: 3

Min Credits: 3

16.504 VLSI Fabrication

Course ID: 3260

Course Details: Fabrication of resistors, capacitors, p-n junction and Schottky Barrier diodes, BJT's and MOS devices and Integrated circuits. Topics include: silicon structure, wafer preparation, sequential techniques in micro-electronic processing, testing and packaging, yield and clean room environments. MOS structures, crystal defects, Fick's laws of diffusion; oxidation of silicon, photolithography including photoresist, development and stripping. Metallization for conductors, Ion implantation for depletion mode and CMOS transistors for better yield speed, low power dissipation and reliability. Students will fabricate circuits using the DSIPL Laboratory.

Max Credits: 3

Min Credits: 3

16.505 Microwave Electronics

Course ID: 3261

Course Details: Review of p-n junction theory, depletion layer width and junction capacitance, Schottky barrier diodes, pin diodes and applications in switches and phase shifters, varactors and step recovery diodes, tunnel diodes and circuits, Gunn devices and circuits, avalanche diodes, IMPATT, TRAPATT and BARRITT diodes, microwave bipolar junction transistors (BJT) and field effect transistors (FET), small signal amplifier design, new devices like HEMT and Si-Ge devices, traveling wave tubes and klystrons.

Max Credits: 3

Min Credits: 3

16.506 Antenna Theory and Design

Course ID: 3262

Course Details: An introduction to properties of individual antennas and arrays of antennas. Retarded potentials, dipoles of arbitrary length, radiation pattern, gain, directivity, radiation resistance. The loop antenna. Effects of the earth. Reciprocity, receiving antennas, effective length and area. Moment methods. Arrays: collinear, broadside, endfire. Array synthesis. Mutual coupling. Log-periodic and Yagi arrays. Radiation from apertures: the waveguide horn antenna, parabolic dish. Antenna noise temperature. Numerical software packages. A design project is required in the course.

Max Credits: 3

Min Credits: 3

16.507 Electromagnetic Materials and Waves

Course ID: 3263

Course Details: This is a graduate core course, which serves the needs of students who study electromagnetics as a basis for a number of electromagnetic technologies including photonic technologies. Study of Electromagnetic Wave Interactions with Bounded Simple Media: transmission lines, Green's function, fibers, conducting waveguides and cavity resonators, Plane waves in Complex Electromagnetic Materials: plasmas, dispersive dielectrics, mixing formulas, optical waves in metals, super conductors, chiral media, crystals, magnetized plasma and time-varying media, layered and periodic media.

Max Credits: 3

Min Credits: 3

16.508 Quantum Electronics for Engineers

Course ID: 3264

Course Details: Introduction to the fundamental postulates of quantum theory: Planck's quantization hypothesis; wave-particle duality; time-dependent & time-independent Schrodinger's Equation; simple quantum mechanical systems. Radiation and quanta; quantization of the radiation field and cavity modes; absorption and emission of radiation; coherence functions; coherent states; importance of quantum fluctuations and quantum nature of light; laser amplifiers and amplifier nonlinearity; electromagnetics and quantum theory of laser oscillators; photons in semiconductors; semiconductor photon sources and detectors.

Max Credits: 3

Min Credits: 3

16.509 Linear Systems Analysis

Course ID: 3265

Course Details: Correlation and Circular convolutions. Concepts of orthogonality and Gramm-Schmidt orthogonalization procedure. Fourier series and Fourier transforms (FT): convergence properties; applications to linear systems including modulation, sampling and filtering. Hilbert transforms (HT) and analytic signals. Bilateral Laplace transforms (LT): convergence properties. Contour integration methods applied to FT, HT and LT. Discrete-time Fourier series and Fourier transforms including complex convolution: applications to linear systems. Discrete Fourier transforms and Fast Fourier algorithm. Ztransforms: convergence properties, solution of difference equations, application to linear systems. Correlation.

Max Credits: 3

Min Credits: 3

16.510 Digital Signal Processing

Course ID: 3266

Course Details: Review of Z-Transforms and solutions of linear difference equations. Digital filter structures, parameter quantization effects and design techniques. FFT and Chirp Z-Transform methods. Discrete Hilbert Transforms, minimum-phase sequences and their application to Homomorphic Signal Processing and calculation of Complex Cepstrum.

Max Credits: 3

Min Credits: 3

16.511 Medical Diagnostic Imaging

Course ID: 3267

Course Details: This course covers the physics and electrical engineering aspects of how signals are acquired from which images will be formed, and the principal methods by which the signals are processed to form useful medical diagnostic images. Modalities studied include: x-rays, ultra-sound, computed tomography, and magnetic resonance imaging. The principles of signal processing via Fourier transform will be reviewed. Noise and other artifacts that degrade the medical diagnostic of images are considered. MATLAB is heavily used in simulation and verification.

Max Credits: 3

Min Credits: 3

16.512 Mixed-Signal VLSI Design

Course ID: 36394

Course Details: The course covers a wide spectrum of topics related to challenges in modern VLSI design. Students will learn the skills of overcoming these problems when two opposing signal domains are integrated onto a single chip. Understanding physical layout representation and the effects of alternative layout solutions on circuit and system specifications is critical in modern designs. Students will learn to use the CAD tools widely used by the semiconductor industry for layout, schematic capture, advanced simulation, parasitic extraction, floorplanning and place and route. specifically, the course provides a review of fundamentals of semiconductor components. In the next step, basic building blocks of digital and analog design are described. The course concludes with challenges of large scale integration under varying operation conditions. An individual project involving a layout design from specification to implementation is included.

Max Credits: 3

Min Credits: 3

16.513 Control Systems

Course ID: 3268

Course Details: System representations, state variables, transfer functions, controllability and observability, phase variables, canonical variables, representation of nonlinear systems, Lagrange's equations, generalized co-ordinates, time response of linear systems, state transition matrix, Sylvester's expansion theorem, stability and state function of Liapunov, transient behavior estimation, optimal control, state function of Pontryagin, variational calculus, Hamilton Jacobi method, matrix Riccati equation, linear system synthesis.

Max Credits: 3

Min Credits: 3

16.514 Integrated Power Systems

Course ID: 3227

Course Details: Power System Operations and Electricity Markets provide a comprehensive overview to understand and meet the challenges of the new competitive highly deregulated power industry. The course presents new methods for power systems operations in a unified integrated framework combining the business and technical aspects of the restructured power industry. An outlook on power policy models, regulation, reliability, and economics is attentively reviewed. The course lay the groundwork for the coming era of unbundling, open access,, power marketing, self-generation, and regional transmission operations.

Max Credits: 3

Min Credits: 3

16.515 Power Electronics

Course ID: 1267

Course Details: A one-semester course with emphasis on the engineering design and performance analysis of power electronics converters. Topics include: power electronics devices (power MOSFETs, power transistors, diodes, silicon controlled rectifiers SCRs, TRIACs, DIACs and Power Darlington Transistors), rectifiers, inverters, ac voltage controllers, dc choppers, cycloconverters, and power supplies. The course includes a project, which requires that the student design and build one of the power electronics converters. A demonstrative laboratory to expose the students to all kinds of projects is part of the course.

Max Credits: 3

Min Credits: 3

16.517 MMIC Design and Fabrication

Course ID: 3271

Course Details: The goal of MMIC design and fabrication is to prepare students for designing integrated circuits operating at GHz frequencies. The design is based on scattering parameters of the MESFETs and PHEMTs. The real challenge in this case is to relate S_{11} , S_{12} , S_{21} and S_{22} with the fabrication technology parameters such as channel conductance, transconductance and threshold voltages etc. This course not only covers rf design techniques but also the manufacturability and testability of the circuits at GHz frequencies, including packaging techniques.

Max Credits: 3

Min Credits: 3

16.519 Engineering of Submicron Machines

Course ID: 3273

Course Details: Recently fabrication of Very Large Scale Integrated circuits has spun-off a new technology of micro-machines (MEMS) and sensors on a semiconductor wafer. These new devices are ideally located next to a microprocessor on the same wafer or a separate chip. The data transfer to and from a miniature machine, sensor or transducer is processed and controlled on site. Topics include design of mechanical, electrical and biological transducers; properties of electronic materials; pattern generation on a semiconductor wafer; interface of a micromachine and processor; applications and markets for submicron machines.

Max Credits: 3

Min Credits: 3

16.520 Computer Aided Engineering Analysis

Course ID: 3274

Course Details: An advanced programming course, which considers the digital computer as a tool for solving significant engineering problems. The course is based on a specific area in engineering which will be selected from such topics as digital and image processing, spectral estimation, optimization techniques, etc. Typical algorithms related to the specific topic will be studied. User oriented programs or subroutine packages will be developed in a project.

Max Credits: 3

Min Credits: 3

16.521 Real Time Digital Signal Processing

Course ID: 3275

Course Details: This course provides an introduction to real-time digital signal processing techniques using the TMS320C3x floating point and TMS320C5x fixed point processors. The architecture, instruction set and software development tools for these processors are studied via a series of C and assembly language computer projects where real time adaptive filters, modems, digital control systems and speech recognition systems are implemented.

Max Credits: 3

Min Credits: 3

16.523 Introduction to Solid State Electronics

Course ID: 3277

Course Details: A design of semiconductor device and manufacturing technology is linked to the solid state physics principles in this course. Topics covered: The electronic structure of the atom, wave-particle duality of moving electrons. Schrodinger equation for periodic crystalline structure. Band theory of semiconductors. Brillouin zones. Statistics of electrons and holes. Kinetic effects: electrical conductivity, Hall effect, magnetoresistance. Optical properties: photoconductivity, light absorption and emission. Thermal properties including thermal conductivity, thermo EMF, recombination processes and role of defects. "

Max Credits: 3

Min Credits: 3

16.524 Computational Methods for Power System Analysis

Course ID: 3278

Course Details: The course explores some of the mathematical and simulation tools used for the design, analysis and operation of electric power systems. Computational methods based on linear and nonlinear optimization algorithms are used to solve load flow problems, to analyze and characterize system faults and contingencies, and to complete economic dispatch of electric power systems. Real case studies and theoretical projects are assigned to implement the techniques learned and to propose recommendations. Different software applications will be used concurrently including ATP, PowerWorld Simulator, Aspen, MatLab with Simulink and Power System Toolbox, PSCAD, etc.

Max Credits: 3

Min Credits: 3

16.525 Power Distribution Systems

Course ID: 3279

Course Details: An intermediate course in analysis and operation of electrical power distribution systems using applied calculus and matrix algebra. Topics include electrical loads characteristics, modeling, metering, customer billing, voltage regulation, voltage levels, and power factor correction. The design and operation of the power distribution system components will be introduced: distribution transformers, distribution substation, distribution networks, and distribution equipment.

Max Credits: 3

Min Credits: 3

16.526 Power Systems Stability and Control

Course ID: 3213

Course Details: Stability definition and cases in power systems. System model for machine angle stability. Small signal and transient stability. Voltage stability phenomenon, its characterization. Small and large signal models for voltage stability analysis. Frequency stability and control. Compensation methods for system voltage regulation including classical and modern methods. Stability of multi-machine system.

Max Credits: 3

Min Credits: 3

16.527 Advanced VLSI Design Techniques

Course ID: 33544

Course Details: This course builds on the previous experience with Cadence design tools and covers advanced VLSI design techniques

for low power circuits. Topics covered include aspects of the design of low voltage and low power circuits including process technology, device modeling, CMOS circuit design, memory circuits and subsystem design. This will be a research-oriented course based on team projects.

Max Credits: 3

Min Credits: 3

16.528 Alternate Energy Sources

Course ID: 3280

Course Details: PV conversion, cell efficiency, cell response, systems and applications. Wind Energy conversion systems: Wind and its characteristics; aerodynamic theory of windmills; wind turbines and generators; wind farms; siting of windmills. Other alternative energy sources: Tidal energy, wave energy, ocean thermal energy conversion, geothermal energy, solar thermal power, satellite power, biofuels. Energy storage: Batteries, fuel cells, hydro pump storage, flywheels, compressed air.

Max Credits: 3

Min Credits: 3

16.529 Electric Vehicle Technology

Course ID: 3281

Course Details: Electric vehicle VS internal combustion engine vehicle. Electric vehicle (EV) saves the environment. EV design, EV motors, EV batteries, EV battery chargers and charging algorithms, EV instrumentation and EV wiring diagram. Hybrid electric vehicles. Fuel cells. Fuel cell electric vehicles. The course includes independent work.

Max Credits: 3

Min Credits: 3

16.531 RF Design

Course ID: 3282

Course Details: Two-port network parameters, Smith chart applications for impedance matching, transmission line structures like stripline, microstrip line and coaxial line, filter designs for low-pass, high-pass and band-pass characteristics, amplifier design based on s-parameters, bias network designs, one port and two port oscillator circuits, noise in RF systems.

Max Credits: 3

Min Credits: 3

16.532 Computational Electromagnetics

Course ID: 3283

Course Details: Formulation of electromagnetic problems for computer solution. Variational principles in electromagnetics. Method of moments. Applications in electrostatics, wire antennas, waveguides and cavities. Simple scattering problems. Finite difference methods. Finite element method.

Max Credits: 3

Min Credits: 3

16.533 Microwave Engineering

Course ID: 3284

Course Details: An introductory course in the analysis and design of passive microwave circuits beginning with review of time-varying electromagnetic field concepts and transmission lines. Smith Chart problems; single and double stub matching; impedance transformer design; maximally flat and Chebyshev transformers; microstrip transmission lines, slot lines, coplanar lines; rectangular and circular waveguides; waveguide windows and their use in impedance matching; design of directional couplers; features of weak and strong couplings; microwave filter design; characteristics of low-pass, high-pass, band-pass, band-stop filter designs; two-port network representation of junctions; Z and Y parameters, ABCD parameters, scattering matrix; microwave measurements; measurement of VSWR, complex impedance, dielectric constant, attenuation, and power. A design project constitutes a major part of the course.

Max Credits: 3

Min Credits: 3

16.541 Introduction to Biosensors

Course ID: 33545

Course Details: This course introduces the theory and design of biosensors and their applications for pathology, pharmacogenetics, public health, food safety civil defense, and environmental monitoring. Optical, electrochemical and mechanical sensing techniques will be discussed.

Max Credits: 3

Min Credits: 3

16.543 Theory of Communication

Course ID: 3288

Course Details: Information transmission and deterministic signals in time and frequency domains. Relationship between correlation and power or energy spectra. Statistical properties of noise. Spectral analysis and design of AM, FM and pulse modulation systems, continuous and discrete. AM, FM, and various pulse modulation methods, in the presence of noise. Digital modulation & demodulation technique.

Max Credits: 3

Min Credits: 3

16.546 Communication Networks

Course ID: 3291

Course Details: An in depth survey of the elements of the modern computer based telecommunications system. Discussion of media used to transport voice and data traffic including twisted pair, baseband and broadband coaxial cable, fiber optic systems and wireless systems. Techniques for sending data over the media are presented including modems, baseband encoding, modulation and specific cases such as DSL, cable modems, telephone modems. Architecture and functionality of telephone system that serves as backbone for moving data, including multiplexing, switching, ATM, ISDN, SONET. Layered software architectures are discussed including TCP/IP protocol stack and the ISO/OSI seven layer stacks are examined in depth from data link protocols to transport protocols. LAN and WAN architectures including media access control (MAC) techniques are discussed for Ethernet, token ring and wireless LAN applications. Internetworking protocols and the role of repeaters, routers, and bridges. Voice over IP and state of the art applications.

Max Credits: 3

Min Credits: 3

16.548 Coding and Information Theory

Course ID: 3293

Course Details: Probabilistic measure of information. Introduction to compression algorithms including L-Z, MPEG, JPEG, and Huffman encoding. Determination of the information handling capacity of communication channels and fundamental coding theorems including Shannon's first and second channel coding theorems. Introduction to error correcting codes including block codes and convolutional coding and decoding using the Viterbi algorithm. Applications of information theory and coding to advanced coding modulation such as Trellis code Modulation (TCM) and turbo modulation.

Max Credits: 3

Min Credits: 3

16.550 Advanced Digital System Design

Course ID: 30320

Course Details: Design of logic machines. Finite state machines, gate array designs, ALU and 4 bit CPU unit designs, micro-programmed systems. Hardware design of advanced digital circuits using XILINX. Application of probability and statistics for hardware performance, and upgrading hardware systems. Laboratories incorporate specification, top-down design, modeling, implementation and testing of actual advanced digital design systems hardware. Laboratories also include simulation of circuits using VHDL before actual hardware implementation and PLDs programming. Prerequisites: 16.202, 16.207, 16.265, 92.260, 16.216.

Max Credits: 3

Min Credits: 3

16.551 Advanced Robotics Automation and Machine Intelligence

Course ID: 36395

Course Details: Covers advanced foundations and principles of robotic manipulation; includes the study of advanced robot motion planning, task level programming and architectures for building perception and systems for intelligent robots. Autonomous robot navigation and obstacle avoidance are addressed. Topics include computational models of objects and motion, the mechanics of robotic manipulators, the structure of manipulator control systems, planning and programming of robot actions. Components of mobile robots, perception, mechanism, planning, and architecture; detailed case studies of existing systems. Pre-Req: Permission of Instructor.

Max Credits: 3

Min Credits: 3

16.552 Microprocessor Systems II & Embedded Systems

Course ID: 3295

Course Details: Continuation of 16.317. CPU architecture, memory interfaces and management, coprocessor interfaces, bus concepts, bus arbitration techniques, serial I/O devices, DMA, interrupt control devices. Including Design, construction, and testing of dedicated microprocessor systems (static and real-time). Hardware limitations of the single-chip system. Includes micro-controllers, programming for small systems, interfacing, communications, validating hardware and software, microprogramming of controller chips, design methods and testing of embedded systems.

Max Credits: 3

Min Credits: 3

16.553 Software Engineering

Course ID: 3296

Course Details: Introduces software life cycle models, and engineering methods for software design and development. Design and implementation, testing, and maintenance of large software packages in a dynamic environment, and systematic approach to software design with emphasis on portability and ease of modification. Laboratories include a project where some of the software engineering methods (from modeling to testing) are applied in an engineering example.

Max Credits: 3

Min Credits: 3

16.556 Robotics

Course ID: 3298

Course Details: Introduces the basic aspects of mobile robotics programming, starting at low-level PID control and behavioral robot control. Covers the analysis, design, modeling and application of robotic manipulators. Forward and inverse kinematics & dynamics, motion and trajectory control and planning are also covered. Laboratories include design, analysis and simulation of real life industrial robots.

Max Credits: 3

Min Credits: 3

16.559 Introduction to Nanoelectronics

Course ID: 37745

Course Details: This course introduces the use of nanomaterials for electronic devices such as sensors and transistors. Synthesis methods for nanoparticles, nanotubes, nanowires, and 2-D materials such as graphene will be covered. The challenges in incorporating nanomaterials into devices will also be discussed. These methods will be compared to techniques used in the semiconductor industry and what challenges, technically and financially, exist for their widespread adoption will be addressed. Finally, examples of devices that use nanomaterials will be reviewed. The course will have some hands on demonstrations.

Max Credits: 3

Min Credits: 3

16.560 Biomedical Instrumentation

Course ID: 30817

Course Details: Analysis and design of Biomedical Instrumentation systems that acquire and process biophysical signals. Properties of Biopotential signals and electrodes; Biopotential Amplifiers and Signal Processing; Basic Sensors and Principles; Medical Imaging Systems; Electrical Safety.

Max Credits: 3

Min Credits: 3

16.561 Computer Architecture and Design

Course ID: 3301

Course Details: Structure of computers, past and present: first, second, third and fourth generation. Combinatorial and sequential circuits. Programmable logic arrays. Processor design: information formats, instruction formats, arithmetic operations and parallel processing. Hardwired and microprogrammed control units. Virtual, sequential and cache memories. Input-output systems, communication and bus control. Multiple CPU systems.

Max Credits: 3

Min Credits: 3

16.562 VHDL/Verilog Synthesis & Design

Course ID: 3302

Course Details: Circuit and system representations including behavioral, structural, and physical descriptions using HDL. Modeling of short and narrow MOS transistors for submission applications. Overview of CMOS technology including oxidation, epitaxy, deposition, ion implantation and diffusion essential for multi-layer vias. 2-0 and 4-0 memory structures, I/O structures and PADS. System design including structural, hierarchy, regularity, modularity and programmable gate arrays. RTL synthesis, layout and placement, design capture tools, including schematic, netlist, verification and simulation. Fast adders, sub-tractors, multipliers, dividers, ALUs, CPUs, RAMs, ROMs, row/column decoders, FIFOS, and FSMs with detailed examples. A RISC microcontroller, pipeline architecture including logic blocks, data paths, floor planning, functional verification and testing. Layout and simulation of chips as well as of PCs based on VHDL, verilog, and HILO will be encouraged. A project of industrial vigor for fabrication at MOSIS is required.

Max Credits: 3

Min Credits: 3

16.565 Analog Devices and Techniques

Course ID: 1266

Course Details: A survey of analog devices and techniques, concentrating on operational amplifier design and applications. Operational amplifier design is studied to reveal the limitations of real opamps, and to develop a basis for interpreting their specifications. Representative applications are covered, including: simple amplifiers, differential and instrumentation amplifiers, summers, integrators, active filters, nonlinear circuits, and waveform generation circuits. A design project is required.

Max Credits: 3

Min Credits: 3

16.568 Electro Optic Systems

Course ID: 3305

Course Details: Introduction to optoelectronics and laser safety; geometrical optics; waves and polarization; Fourier optics; coherence of light and holography; properties of optical fibers; acousto-optic and electro-optic modulation; elementary quantum concepts and photon emission processes; optical resonators; Fabry Perot etalon; laser theory and types; review of semiconductor lasers and detectors; nonlinear optics.

Max Credits: 3

Min Credits: 3

16.571 Radar Systems

Course ID: 3307

Course Details: Introduction to both pulsed and C. W. radar systems. Detection of radar echoes in noise. The radar equation and its use

in estimating performance of a radar system. Estimation of range, direction and velocity of targets. Moving target indicators (MTI). Pulse compression and other advanced techniques. Discussion of elements of practical radar systems.

Max Credits: 3

Min Credits: 3

16.572 Embedded Real Time Systems

Course ID: 3308

Course Details: Designing embedded real-time computer systems. Types of real-time systems, including foreground/background, non-preemptive multitasking, and priority-based pre-emptive multitasking systems. Soft vs. hard real time systems. Task scheduling algorithms and deterministic behavior. Ask synchronization: semaphores, mailboxes and message queues. Robust memory management schemes. Application and design of a real-time kernel. A project is required.

Max Credits: 3

Min Credits: 3

16.573 Operating Systems

Course ID: 3309

Course Details: Covers the components, design, implementation, and internal operations of computer operating systems. Topics include basic structure of operating systems, Kernel, user interface, I/O device management, device drivers, process environment, concurrent processes and synchronization, inter-process communication, process scheduling, memory management, deadlock management and resolution, and file system structures. laboratories include examples of components design of a real operating systems.

Max Credits: 3

Min Credits: 3

16.574 Advanced Logic Design

Course ID: 3310

Course Details: Error detection and correction codes. Minimization of switching functions by Quine-McCluskey (tabular) methods. Minimization of multiple-output circuits. Reed-Muller polynomials and exclusive-OR circuits. Transient analysis of hazards. Hazard-free design. Special properties of switching algebra. Programmable logic devices. Analysis and synthesis of fundamental-mode and pulsed-mode sequential circuits. Test sets and design for testability.

Max Credits: 3

Min Credits: 3

16.575 Field Programmable Gate Arrays Logic Design Techniques

Course ID: 3311

Course Details: Advanced logic design techniques using field programmable gate arrays (FPGAs), programmable logic devices, programmable array logic devices, and other forms of reconfigurable logic. Architectural descriptions and design flow will be covered as well as rapid prototyping techniques, ASIC conversions, in-system programmability, high level language design techniques, and case studies highlighting the tradeoffs involved in designing digital systems with programmable devices. This course is generally offered summers only.

Max Credits: 3

Min Credits: 3

16.576 Principles of Solid State Devices

Course ID: 3312

Course Details:

Max Credits: 3

Min Credits: 3

16.577 Verification of Digital Systems

Course ID: 3313

Course Details:

Max Credits: 3

Min Credits: 3

16.580 Robotics, Automation and Machine Intelligence

Course ID: 35618

Course Details: Covers advanced foundations and principles of robotic manipulation; includes the study of advanced robot motion planning, task level programming and architectures for building perception and systems for intelligent robots. Autonomous robot navigation and obstacle avoidance are addressed. Topics include computational models of objects and motion, the mechanics of robotic manipulators, the structure of manipulator control systems, planning and programming of robot actions. Components of mobile robots, perception, mechanism, planning and architecture; detailed case studies of existing systems.

Max Credits: 3

Min Credits: 3

16.581 Computer Vision and Digital Image Processing

Course ID: 3315

Course Details: Introduces the principles and the fundamental techniques for Image Processing and Computer Vision. Topics include programming aspects of vision, image formation and representation, multi-scale analysis, boundary detection, texture analysis, shape from shading, object modeling, stereo-vision, motion and optical flow, shape description and objects recognition (classification), and hardware design of video cards. AI techniques for Computer Vision are also covered. Laboratories include real applications from industry and the latest research areas.

Max Credits: 3

Min Credits: 3

16.582 Wireless Communications

Course ID: 3316

Course Details: Cellular systems and design principles, co-channel and adjacent channel interference, mobile radio propagation and determination of large scale path loss, propagation mechanisms like reflection, diffraction and scattering, outdoor propagation models, Okumura and Hata models, small scale fading and multipath, Doppler shift and effects, statistical models for multipath, digital modulation techniques QPSK, DPSK, GMSK, multiple access techniques, TDMA, FDMA, CDMA, spread spectrum techniques, frequency hopped systems, wireless systems and worldwide standards.

Max Credits: 3

Min Credits: 3

16.583 Network Design: Principles, Protocols and Applications

Course ID: 3317

Course Details: Covers design and implementation of network software that transforms raw hardware into a richly functional communication system. Real networks (such as the Internet, ATM, Ethernet, Token Ring) will be used as examples. Presents the different harmonizing functions needed for the interconnection of many heterogeneous computer networks. Internet protocols, such as UDP, TCP, IP, ARP, BGP and IGMP, are used as examples to demonstrate how internetworking is realized. Applications such as electronic mail and the WWW are studied.

Max Credits: 3

Min Credits: 3

16.584 Probability and Random Processes

Course ID: 3318

Course Details: Sample space, Field and Probability Measure. Axiomatic definition of Probability. Bayes' theorem. Repeated trials. Continuous and discrete random variables and their probability distribution and density functions. Functions of random variables and their distribution and density functions. Expectation, variance and higher order moments. Characteristic and generating functions. Vector formulation of random variables and their parameters. Mean square estimation and orthogonality principle. Criteria for estimators. Introduction to random processes: distribution and density functions; Ensemble and time averages; correlation functions and spectral densities. Classification of random processes. Random processes through linear systems. Weiner filters and Kalman filters.

Max Credits: 3

Min Credits: 3

16.590 Fiber Optic Communication

Course ID: 3322

Course Details: Optical fiber; waveguide modes, multimode vs single mode; bandwidth and data rates; fiber losses; splices, couplers, connectors, taps and gratings; optical transmitters; optical receivers; high speed optoelectronic devices; optical link design; broadband switching; single wavelength systems (FDDI, SONET, ATM); coherent transmission; wavelength division multiplexing and CDMA; fiber amplifiers.

Max Credits: 3

Min Credits: 3

16.593 Industrial Experience

Course ID: 3324

Course Details:

Max Credits: 1

Min Credits: 1

16.595 Solid State Electronics

Course ID: 32955

Course Details: Topics included are physical limits of microminiaturization, metal semiconductor junctions, p-n junction diodes, (rectifiers, varactors, tunnel diodes and photodetectors and solar cells); bipolar junction transistors, field effect transistors (junction FET, MESFET, MOSFET); heterojunction devices and high speed devices; quantum dots, wires and two dimensional quantum well devices; light emitting devices; flat panels, liquid crystals and hot electron eitters. Prerequisite: 16.523 or Permission of Instructor.

Max Credits: 3

Min Credits: 3

16.598 Seminar for Teaching Assistants

Course ID: 37927

Course Details: This course will meet once per week and attendance in mandatory for all TAs. The course will cover an overview of laboratories for the following week.

Max Credits: 0

Min Credits: 0

16.601 Graduate Seminar

Course ID: 3326

Course Details: There will be a series of seminars by distinguished researchers form academia and industry in addition to UML faculty. Moreover, there will be seminars dedicated to instructional sessions in library services, introduction to Department and Faculty research, and information on thesis requirements and professional ethics. Attendance is mandatory for doctoral and MS students with thesis option. The students are required to write short reports summarizing the talk after each seminar. This course is offered in the fall semester.

Max Credits: 0

Min Credits: 0

16.602 Graduate Seminar

Course ID: 3327

Course Details: There will be a series of seminars by distinguished researchers from academia and industry, in addition to UML faculty. Moreover, there will be seminars dedicated to instructional sessions in library services, introduction to Department and Faculty research, and information of thesis requirements and professional ethics. Attendance is mandatory for doctoral and MS students with thesis option. The students are required to write short reports summarizing the talk after each seminar. This course is offered in the spring semester.

Max Credits: 0

Min Credits: 0

16.612 Converged Voice and Data Network

Course ID: 33547

Course Details: Covers the technologies and protocols used to transport voice and data traffic over a common communication network, with emphasis on voice over IP (VoIP). The specific topics covered include voice communication network fundamentals, data networking fundamentals, voice packet processing, voice over packet networking, ITU-T VoIP architecture, IETF VoIP architecture, VoIP over WLAN, access networks for converged services: xDSL and HFC networks, and IP TV service.

Max Credits: 3

Min Credits: 3

16.616 Computational Power Systems Analysis

Course ID: 3339

Course Details: Power system matrices, power flow studies, fault studies, state estimation, optimal power dispatch, and stability studies.

Max Credits: 3

Min Credits: 3

16.617 Modelling Of Communication Networks

Course ID: 3340

Course Details: Overview of general architectures for B-ISDN and Internet, network layering, signaling, performance requirements, traffic management strategies, usage parameter control, connection admission control, congestion control, stochastic processes, Markov chains and processes, stochastic models for voice, video and data traffic, Poisson processes, Markov-modulated processes, traffic analysis, queuing systems, M/M/1, M/M/m, M/G/1 queues, fluid buffer models, effective band-width approaches, simulation modeling, discrete event simulation of transport and multiplexing protocols using OPNET software, statistical techniques for validation and sensitivity analysis.

Max Credits: 3

Min Credits: 3

16.650 Advanced Computing Systems Hardware Architecture

Course ID: 33546

Course Details: Covers the latest advanced techniques in CPU design, floating point unit design, vector processors, branch prediction, shared memory versus networks, scalable shared memory systems, Asynchronous shared memory algorithms, systems performance issues, advanced prototype hardware structures, and future trends including TeraDash systems.

Max Credits: 3

Min Credits: 3

16.652 Parallel & Mp Architect

Course ID: 3346

Course Details:

Max Credits: 3

Min Credits: 3

16.653 AI and Machine Learning

Course ID: 3347

Course Details:

Max Credits: 3

Min Credits: 3

16.656 Fault Tolerant System Design

Course ID: 3349

Course Details:

Max Credits: 3

Min Credits: 3

16.658 Computer Network Security

Course ID: 3351

Course Details: This course will cover two categories of topics: One part is the fundamental principles of cryptography and its applications to network and communication security in general. This part focuses on cryptography algorithms and the fundamental network security enabling mechanisms. Topics include attack analysis and classifications, public key cryptography (RSA, Diffie-Hellman), Secret key cryptography (DES, IDEA), Hash (MD5, SHA-1) algorithms; Key distribution and management; Security handshake pitfalls and authentications; and well known network security protocols such as Kerberos, IPSec, SSL/SET, PGP & PKI, WEP. The second part covers the advanced topics on the security issues of MANET (including VANET), WSN, Smart Grid, Cognitive Radio Network, and Cloud Computing. This part involves diverse literature review on the unique security challenges and open issues faced by these emerging network technologies, and the state-of-the-art security solutions in literature. Pre-Req: Permission of Instructor.

Max Credits: 3

Min Credits: 3

16.659 Distributed Systems

Course ID: 3352

Course Details:

Max Credits: 3

Min Credits: 3

16.660 Mobile Communication Networks

Course ID: 3353

Course Details:

Max Credits: 3

Min Credits: 3

16.666 Storage Area Networks

Course ID: 3359

Course Details:

Max Credits: 3

Min Credits: 3

16.669 Opto Electronic Devices

Course ID: 30326

Course Details:

Max Credits: 3

Min Credits: 3

16.688 Theoretical Acoustics

Course ID: 3369

Course Details:

Max Credits: 3

Min Credits: 3

16.692 Directed Studies/Electrical Engineering

Course ID: 3371

Course Details: Provides opportunity for students to get a specialized or customized course in consultation with a faculty member.

Max Credits: 3

Min Credits: 3

16.710 Selected Topics

Course ID: 3376

Course Details: Topics of current interest in electrical Engineering. Subject matter to be announced in advance.

Max Credits: 3

Min Credits: 3

16.711 Special Topics

Course ID: 3377

Course Details: Topics of current interest in Electrical Engineering. Subject matter to be announced in advance.

Max Credits: 3

Min Credits: 3

16.712 Special Topics in Electrical Engineering

Course ID: 3378

Course Details:

Max Credits: 3

Min Credits: 3

16.715 Special Topics

Course ID: 3381

Course Details:

Max Credits: 3

Min Credits: 3

16.729 Selected Topics in Electrical Engineering

Course ID: 3394

Course Details: Advanced topics in various areas of Electrical Engineering and related fields. Prerequisite: specified at the time of offering.

Max Credits: 3

Min Credits: 3

16.730 Thesis - Electrical Engineering

Course ID: 3395

Course Details:

Max Credits: 6

Min Credits: 6

16.732 Systems Engineering Thesis

Course ID: 30819

Course Details:

Max Credits: 3

Min Credits: 3

16.733 Advance Graduate Project

Course ID: 3396

Course Details: The Advanced Project is a substantial investigation of a research topic under the supervision of a faculty member. A written proposal must be on file in the Electrical & Engineering Graduate Office before enrollment. A written report is required upon completion of the project. This course can be taken only once, and may evolve into a master's thesis. However, credit for this course will not be given if thesis credit is received.

Max Credits: 3

Min Credits: 3

16.736 Graduate Project - Electrical Engineering

Course ID: 3397

Course Details:

Max Credits: 6

Min Credits: 6

16.739 Graduate Project - Electrical Engineering

Course ID: 3398

Course Details:

Max Credits: 9

Min Credits: 9

16.740 Advanced Project In Electrical Engineering

Course ID: 3399

Course Details:

Max Credits: 3

Min Credits: 3

16.743 Master's Thesis in Electrical Engineering

Course ID: 3400

Course Details: Master's Thesis Research

Max Credits: 3

Min Credits: 3

16.746 Master's Thesis in Electrical Engineering

Course ID: 3401

Course Details: Co-requisites: Minimum of 6 credit-hours of graduate courses at an acceptable level when registering for first three credits and 12 credit hours when registering for subsequent credits; matriculated status in the M.S. Eng. Program in Electrical, Computer or Systems Engineering; approval of a written proposal outlining the extent and nature of proposed research work. The report on the research work, performed under the supervision of a faculty member, must be published in appropriate form and presented to a committee of three faculty members appointed at the time of acceptance of the thesis proposal. The student is required to give an oral defense of the thesis before the committee and other faculty members.

Max Credits: 6

Min Credits: 6

16.749 Master's Thesis - Electrical Engineering

Course ID: 3402

Course Details:

Max Credits: 9

Min Credits: 9

16.751 Doctoral Thesis

Course ID: 30327

Course Details:

Max Credits: 1

Min Credits: 1

16.752 PhD Thesis

Course ID: 30328

Course Details:

Max Credits: 2

Min Credits: 2

16.753 Doctoral Dissertation/EE

Course ID: 3403

Course Details: Doctoral Dissertation Research

Max Credits: 3

Min Credits: 3

16.754 Doctoral Thesis - Electrical Engineering

Course ID: 30329

Course Details:

Max Credits: 4

Min Credits: 4

16.755 Doctoral Dissertation

Course ID: 29831

Course Details:

Max Credits: 5

Min Credits: 5

16.756 Doctoral Dissertation/Electrical Engineering

Course ID: 3404

Course Details: Doctoral Dissertation Research

Max Credits: 6

Min Credits: 6

16.757 Doctoral Dissertation

Course ID: 29830

Course Details:

Max Credits: 7

Min Credits: 7

16.759 Doctoral Dissertation/Electrical Engineering

Course ID: 3405

Course Details: No more than 9 credits of doctoral dissertation research may be taken before passing the doctoral qualifying examination. No more than 15 credits of doctoral dissertation research may be taken before passing the defense of the thesis proposal examination.

Max Credits: 9

Min Credits: 9

16.766 Continued Grad Research

Course ID: 3407

Course Details:

Max Credits: 6

Min Credits: 6

16.771 Eng Sys Analysis I

Course ID: 3409

Course Details: Study of the key areas in multiple engineering disciplines including Mechanical, Electrical, Software, Systems and Optical. Students are introduced to weekly topics and then work in multidiscipline teams to solve technical assignments. Topics covered include: Concept of Operations and Requirements development, integration, test and verification, vibration/shock analysis, thermal analysis, power supply design, digital electronics & FPGA, intro to optical engineering, SCRUM planning, continuous integration and UML/SW design. Content may vary year to year. This course is part of the Engineering Leadership Development Program (ELDP) and team taught by industry experts at BAE Systems.

Max Credits: 3

Min Credits: 3

16.772 Eng Sys Analysis II

Course ID: 3410

Course Details: Introduction and analysis of complex systems aligned with the key product lines of BAE Systems. Students are introduced to multiple types of systems and then work in multidiscipline teams to solve technical assignments. The systems covered include but are limited to: Electronic Warfare (EW), Communications Electronic Attack (Comms EA), Wide Area Airborne Surveillance (WAAS), Signal Intelligence (SIGINT), RADAR Navigation, Radio Communications, and Infrared Countermeasures (IRCM). Content may vary year to year. This course is part of the Engineering Leadership Development Program (ELDP) and team taught by industry experts at BAE Systems.

Max Credits: 3

Min Credits: 3

16.773 Eng Sys Analysis III

Course ID: 3411

Course Details: Study of project management concepts, product development methods, transition to operations and new business capture. Topics covered include but are not limited to risks and opportunities management, earned value management, lean product development, business strategy, design for manufacturability/maintainability (DFM²), and request for information (RFI) response. Content may vary year to year. This course is part of the Engineering Leadership Development Program (ELDP) and team taught by industry experts at BAE Systems.

Max Credits: 3

Min Credits: 3

18.501 Wetlands Ecology

Course ID: 3489

Course Details: Types, characteristics and definitions, functions and values, regulation and management of wetlands; with due regard given to geology, soils and hydrology, and biological/ecosystem interactions.

Max Credits: 3

Min Credits: 3

18.502 Limnology

Course ID: 3490

Course Details: Limnology is a lecture course which covers the basic elements of limnology, which has been described as the study of the functional relationships and productivity of non - marine (i.e., freshwater and estuarine) communities as they are affected by the physical, chemical, and biological components of the environment. Starting with the origins of lake basins in the landscape, the course presents key concepts for understanding how lakes work and are affected by man. These concepts (e.g., heat budgets, lake circulation patterns, nutrient budgets) are incorporated with the lake biota (e.g., phytoplankton, zooplankton, fish) and synthesized to provide perspective on ecosystem structure and function. While the emphasis is on lakes and ponds, the course also examines the stream environment and its function. Finally, the course considers man - made stresses for lake and stream systems and provides the tools to diagnosis and restore aquatic resources.

Max Credits: 3

Min Credits: 3

18.510 Water Resource System Assessment

Course ID: 3495

Course Details: The course is designed to build understanding of the technologies and methods of analysis of water resource management issues and of the interdependence they have to each other when real problems must be evaluated. It presumes no prior background in any water related technology. The emphasis is upon building understanding of fundamental concepts in order to apply them to the management of water resources. Management in this case implies resolution of conflicts in technology utilization of a resource because of scarcity or incompatibility of competing possible uses. Hypothetical cases are resolved to aid in converting concepts into reasonable applications to problems. Prerequisites: Students must only meet the general one year of calculus and of

chemistry requirements for matriculation into the Environmental Studies M.S. program. Students whose first language is not English are urged to gain facility in understanding spoken technical English and in having easy facility with formal written English prior to enrolling. 92.131 Calculus I and 92.132 Calculus II.

Max Credits: 3

Min Credits: 3

18.527 Environmental Law

Course ID: 1265

Course Details: The large body of law, which has developed since the early 1960's, is examined in considerable detail. Federal laws relating to the environment, particularly with the Environmental Protection Agency and the Occupational Safety and Health Acts. State and local laws and ordinances are discussed where pertinent.

Max Credits: 3

Min Credits: 3

18.531 Sustainable Water Infrastructure

Course ID: 36536

Course Details: Drinking water and wastewater managers across the country are facing the same challenges of rising costs, aging infrastructure, and increased rates of population growth. In order to address these concerns effectively, utility leaders must look beyond the limited operational and financial goals that are usually considered, and take into account other aspects of effective utility management, including: long-term planning and resiliency; community sustainability; employee leadership and development; and stakeholder engagement, understand and support. This course will explore a full variety of considerations in maintaining sustainable water infrastructure using real-world examples and tools of the trade to engage students and prepare them for future careers in the water sector.

Max Credits: 3

Min Credits: 3

18.572 Energy and Environment

Course ID: 3514

Course Details: Laws that govern the conversion of energy from one form to another. Flow of energy in our present industrial society from extraction through transport and conversion to end use. Electricity: generation from fossil fuel, nuclear, hydro, solar and other sources; its distribution and end use. Air, water and soil pollution from all sources of energy on a local, regional and global scale. Amelioration of environmental effects by emission control, fuel switching, renewable energy and conservation.

Max Credits: 3

Min Credits: 3

18.581 Understanding Massachusetts Contingency Plan

Course ID: 3523

Course Details: The Massachusetts Contingency Plan (MCP) is a body of regulations designed to streamline and accelerate the assessment and cleanup of releases of oil and hazardous materials to the environment. This course serves as an introduction to the MCP and will explore the intent and use of key aspects of this working document. Though primarily a regulatory course, some topics to be covered are technical by nature. Prerequisites: None. Though not required, some familiarity with relevant environmental science and/or engineering principles is desirable.

Max Credits: 3

Min Credits: 3

18.626 Advanced Graduate HP Internship

Course ID: 3526

Course Details:

Max Credits: 3

Min Credits: 3

18.693 Master's Project in Environment

Course ID: 3528

Course Details:

Max Credits: 3

Min Credits: 3

18.733 Graduate Project - Environmental Studies

Course ID: 3531

Course Details:

Max Credits: 3

Min Credits: 3

18.743 Master's Thesis - Environmental Studies

Course ID: 3534

Course Details:

Max Credits: 3

Min Credits: 3

18.749 Master's Thesis - Environmental Studies

Course ID: 3536

Course Details:

Max Credits: 9

Min Credits: 9

19.500 Analytical Context of the Work Environment

Course ID: 3542

Course Details: An overview course to be taken in the first semester in the Master's program. Case studies are used to introduce students first to the hazard analysis methods, and second, to the prevention methods of each of the department's sub-disciplines. Interconnections between exposures and illness/accident development are reviewed at three levels: individual, work organization and society.

Max Credits: 3

Min Credits: 3

19.503 Toxicology and Health

Course ID: 3545

Course Details: Examines the effects of the major and chemical physical hazards in the modern work environment. Presents principles of toxicology as well as the toxicology of heavy metals, organic solvents, pesticides, harmful dusts, asphyxiants. Mechanisms of the effects on human physiologic systems are described along with the physiologic effects of ionizing radiation, heat stress, noise and repetitive trauma.

Max Credits: 3

Min Credits: 3

19.505 Qualitative Research Methods

Course ID: 3547

Course Details: This course explores and examines non-quantitative methodologies in the social sciences and political economy. The course will discuss hypothesis generation, survey design, research problem design, case studies, ethnographic methods, participatory research methods, content analysis, interviewing techniques and key informant interviews. Doctoral students in work environment policy are particularly urged to take this course. The course will be offered in collaboration with the Department of Regional Economic and Social Development as course 57.592.

Max Credits: 3

Min Credits: 3

19.506 Introduction to Environmental Health

Course ID: 30821

Course Details: This course will survey the rapidly growing field of environmental health through an introduction to the links between environmental stressors and impacts on public health. The course will explore human and industrial activities that impact on environmental health such as population, food production, air and water pollution, waste, the built environment, toxic substances, pests, and global climate change. The course will also examine the types of diseases and illnesses that result from environmental impacts. Students will be encouraged to examine in greater detail a specific topic in environmental health of personal interest.

Max Credits: 3

Min Credits: 3

19.507 Environmental Health in Practice

Course ID: 32049

Course Details: Through a combination of class lectures, field trips, and a service learning project, this course is designed to introduce students to the daily responsibilities of an environmental health professional. The class will provide indepth knowledge and hands-on understanding of topics such as food safety, indoor air quality, water quality, waste water disinfection, and chemicals management. Through lectures and guest speakers students will understand the challenges facing environmental health professionals and the resources available to them. Students will undertake a final group project for a health board or other organization.

Max Credits: 3

Min Credits: 3

19.508 Principles and Practices of Biological Safety

Course ID: 35700

Course Details: This course is designed to provide an overview of hazard recognition, evaluation and control of potentially hazardous biological materials. This introduction to the field will cover the potential risks of working with biological materials, the use of engineering, work practices and administrative measures for hazard control and regulations governing the area of biosafety. Requires working knowledge of Microbiology, and permission of Instructor.

Max Credits: 3

Min Credits: 3

19.514 Aerosol Science

Course ID: 3553

Course Details: Basic properties of airborne particles, with particular regard to properties important to health. Includes basic properties of gas-borne particles, uniform particle motion, particle collection mechanisms, filtration, particle sampling, respiratory deposition, particle statistics, electrical properties, and optical properties. Course includes lectures and laboratory.

Max Credits: 3

Min Credits: 3

19.516 Laboratory Environmental Health and Safety

Course ID: 35347

Course Details: This course is designed to provide an overview of hazard recognition, evaluation and control in laboratory environments. This introduction to the field will cover the potential risks of working with chemicals, radioactive materials, animals and biological

materials. It will also introduce the use of engineering, workpractices and administrative measures for hazard control and regulations governing the area of laboratory safety.

Max Credits: 3

Min Credits: 3

19.520 Climate Change: Science, Communication, and Solutions

Course ID: 36712

Course Details: Climate change offers one of the greatest challenges yet faced by society and scientists. The scientific consensus is clear that climate change is occurring, its pace is accelerating, its impacts on human society will be largely negative, and it is largely caused by anthropogenic greenhouse gas emissions. Yet, despite strong scientific evidence for the enormous challenges that society may face, scientists' attempts to disseminate that evidence beyond their peers have not yet been successful. Indeed in today's media world of blogs, YouTube video clips, and sound-bites, confusion over the scientific reality of climate change frequently dominates the discourse in classrooms and communities. This course will provide students with the tools and knowledge that they need to develop their own well-informed view of climate change. Because climate change is both impacted by humans and will increasingly impact society, this course takes a cross-disciplinary approach, integrating science, policy solutions, and media literacy as they relate to climate change.

Max Credits: 4

Min Credits: 4

19.521 Introduction to Industrial Hygiene

Course ID: 3558

Course Details:

Max Credits: 2

Min Credits: 2

19.523 Introduction To Ergonomics

Course ID: 3559

Course Details:

Max Credits: 2

Min Credits: 2

19.525 Industrial Hygiene and Ergonomics

Course ID: 3560

Course Details: A survey course covering introductory topics in ergonomics and industrial hygiene. Ergonomics topics include work measurement, anthropometry, biomechanics, psychosocial stress and work reorganization, special emphasis is placed on the recognition and control of work-related musculoskeletal disorders. Industrial hygiene topics will cover the identification, measurement, and control of chemical and physical hazards in the work environment including principles of air sampling and analysis, ventilation and other control technologies, and the use of personal protective equipment with special attention to respiratory and hearing protection.

Max Credits: 3

Min Credits: 3

19.531 Occupation Biomechanics

Course ID: 3562

Course Details: The anatomical and physiological basis of human motor capabilities. Quantitative models are developed to explain muscle strength performance, motion control, physical fatigue, and acute and chronic musculoskeletal trauma, particularly static link models of lifting and other manual activities. Application to the evaluation and design of various tasks and occupations.

Max Credits: 3

Min Credits: 3

19.532 Occupational Biomechanics Laboratory

Course ID: 3563

Course Details: A laboratory presentation of the biomechanical basis for understanding and predicting human motor capabilities using bioinstrumentation. Computerized data acquisition, electromyography and load cells for strength measurement are examples of the equipment used in this lab. Particular emphasis is placed on the evaluation of occupational activities.

Max Credits: 3

Min Credits: 3

19.533 Intervention Research

Course ID: 37513

Course Details: This course will address the design and conduct of intervention studies to reduce occupational and environmental risk factors for injury, illness or disability. Intervention studies may examine any of a range of dependent variables, at the individual or organizational level, such as change in exposure, health endpoint (s), cost of workers' compensation claims, etc. Each student will select an occupational or environmental health problem and identify and justify an appropriate intervention approach. Selected scientific articles will be evaluated with respect to study design and methodologic issues. We will also consider how to evaluate scientific findings in terms of their implications for policy-setting.

Max Credits: 3

Min Credits: 3

19.540 Occupational Safety Engineering

Course ID: 3565

Course Details: The purpose of this course is to introduce students to the principles of safety hazards in the work environment. This course is primarily designed to emphasize the safety aspects of the hazards at work. It begins with the historical development of occupational safety and health and progressively examines the fundamentals of recognition, measurement, evaluation, and control of occupational safety hazards.

Max Credits: 3

Min Credits: 3

19.542 Human Factors

Course ID: 3567

Course Details: The functional processes of human systems in the workplace that affect psychosocial health and productivity. Review of associations between work design principles and effects on human well-being, learning, and performance. Human perceptible, cognitive, metabolic, and social-psychologic limitations. Human-machine interactions affecting "stress" and learning at the level of individuals and of groups. Introduction to "healthy" job redesign, "conductive production", and measurement strategies. Principles applied through practical design problems.

Max Credits: 3

Min Credits: 3

19.545 Chemicals and Health

Course ID: 36702

Course Details: Provides a broad overview of how the design, manufacture, use and disposal of chemicals and chemical products affect health and ecosystems. Provides an in-depth overview of how chemicals are monitored in the environment (including biomonitoring), how their risks are characterized, and the prevention of chemical risks through safer chemical design.

Max Credits: 3

Min Credits: 3

19.550 Environmental Law

Course ID: 1265

Course Details: The large body of law, which has developed since the early 1960's, is examined in considerable detail. Federal laws relating to the environment, particularly with the Environmental Protection Agency and the Occupational Safety and Health Acts. State and local laws and ordinances are discussed where pertinent.

Max Credits: 3

Min Credits: 3

19.555 Comparative Environmental

Course ID: 3574

Course Details: Human social and productive activities often harm the natural environment. Environmentally related health problems will become more prominent and put additional stress on industrial, as well as transitional and developing nations. A sustainable world is one that provides not only for environmental viability but also economic health, social justice and political participation. This course is designed to explore the dynamics and interactions of social, economic and political factors that aid or impede a community's ability to contribute to global environmental sustainability. The course will be offered in collaboration with the Department of Regional Economic and Social Development as course 57.518.

Max Credits: 3

Min Credits: 3

19.556 Analyzing Peace Violence and War

Course ID: 30331

Course Details: This course examines the political, and social factors that cause violence and war, together with the possibilities for peaceful citizen action and constructive solutions to violence and conflicts. Different arenas of conflict are discussed, ranging from workplaces, families and communities, to nations, to the world.

Max Credits: 3

Min Credits: 3

19.557 Toxic Use Reduction

Course ID: 3575

Course Details: Toxic Use Reduction (TUR) is a new approach to hazardous waste management and environmental protection. Rather than addressing chemical contamination as waste (after its generation), to be managed through permits and emission regulations, TUR focuses on chemicals while still in production. In Massachusetts, firms are required to prepare plans demonstrating how they will reduce or eliminate the use of toxic chemicals. The course is organized as a set of discussions and case studies from the real-life program.

Max Credits: 3

Min Credits: 3

19.559 Conflict Resolution

Course ID: 3577

Course Details: This course gives students an understanding of the main issues and solutions involved in community level conflict resolution; e.g., in neighborhoods, workplaces, and other institutions. It develops students' skills in practicing conflict resolution and/or evaluating programs in the field of dispute resolution. It is important to understand why conflict happens and how to resolve conflict.

Max Credits: 3

Min Credits: 3

19.575 Introduction Biostatistics and Epidemiology

Course ID: 3584

Course Details: Provides an introduction to the principal quantitative methods for assessments of the work environment. Topics include: probability theory, the normal distribution, Gaussian statistics, linear regression, epidemiologic study designs, causal inference in epidemiology, bias, and confounding.

Max Credits: 3

Min Credits: 3

19.577 Biostatistics for Health Data

Course ID: 3586

Course Details: This is a practical course in biostatistical methods for health research. Emphasis is placed on developing an understanding of the use and interpretation of standard biostatistical methods. Topics include probability and sampling distributions, regression and ANOVA, methods for analyzing rates and proportions, power and sample size calculations. Students will gain experience in using a statistical software package to apply and expand their data analysis skills.

Max Credits: 3

Min Credits: 3

19.579 Disability Outcomes and Interventions

Course ID: 3587

Course Details: This course will address the epidemiology of disability outcomes through a mix of didactic presentation and critical discussion of the literature, covering both observational and intervention studies. Qualitative research methods will also be highlighted in terms of how they can enrich the study hypotheses, construct measures, etc. The first half of the course will cover observational studies of individual and environmental risk factors for disability outcomes, including features of both the workplace and the community. Then we will describe the key design features of clinical trials to evaluate interventions, again at both the individual and the organizational levels. Interspersed with lecture material, selected observational and intervention studies from the peer-reviewed scientific literature will be evaluated with respect to study design, methodologic rigor, and adequacy of statistical analysis.

Max Credits: 3

Min Credits: 3

19.591 Co-Op Internship CPT

Course ID: 38407

Course Details: Practical training course for students to perform CPT.

Max Credits: 1

Min Credits: 0

19.598 Thesis Review

Course ID: 35547

Course Details:

Max Credits: 1

Min Credits: 1

19.600 Work Environment Capstone

Course ID: 3590

Course Details: This course is designed to provide students with the opportunity to examine an interdisciplinary problem in depth and propose a solution to the problem. The product will be a term paper and a public presentation of the proposed approach. Students will work with a faculty member (usually the academic advisor) to serve as a consultant to the process of developing a solution, although the faculty member's role will be to provide guidance and general advice, not detailed directions. A Capstone Report may be designed as an extension of the Research Project.

Max Credits: 0

Min Credits: 0

19.601 Work Environment Capstone

Course ID: 3591

Course Details: This 3.0 credit course (19.600 and 19.601) is designed to provide students with the opportunity to examine an interdisciplinary problem in depth and propose a solution to the problem. The product will be a term paper and a public presentation of the proposed approach. Students will work with a faculty member (usually the academic advisor) to serve as a consultant to the process

of developing a solution, although the faculty member's role will be to provide guidance and general advice, not detailed directions. A Capstone Report may be designed as an extension of the Research Project.

Max Credits: 3

Min Credits: 3

19.610 Exposure Assessment

Course ID: 3592

Course Details: Concepts of quantification of occupational exposures (chemical and physical hazards) for purpose of correlating health effects with exposures. Topics discussed include reasons for conducting exposure assessment, sampling methods, sampling strategies (for epidemiology, compliance, control), and statistical considerations. Principles are illustrated through a series of case studies.

Max Credits: 3

Min Credits: 3

19.611 Physical Properties of Aerosols

Course ID: 3593

Course Details: A seminar covering aspects of aerosol science not discussed in 19.514 but necessary for the completion of research projects involving aerosols. Topics covered include the electrical, thermal, and optical properties of aerosols, particle agglomeration, evaporation and condensation, and the generation and measurement of test aerosols. Course will consist of lectures and laboratory sessions.

Max Credits: 3

Min Credits: 3

19.612 Exposure Data Analysis

Course ID: 3594

Course Details: An advanced seminar covering statistical considerations for exposure sampling and data analysis. Topics include sampling data distributions; the effects of averaging time, autocorrelation, multiple task jobs and limit of detection samples on the sampling distribution; the use of linear models to examine between and within worker variability in exposure; the determination of homogeneous exposure groups; the development of multiple regression models to predict exposure levels and evaluate exposure determinants; and methods of model development, interpretation and validation.

Max Credits: 3

Min Credits: 3

19.613 Design and Evaluation Of Ventilation Systems

Course ID: 3595

Course Details: A seminar intended for students pursuing research involving industrial ventilation system design and evaluation. It covers material not included in 19.518, such as recent theoretical models which describe system performance, design of systems for high-temperature operation, trouble-shooting techniques, and advanced instrumentation techniques. Course consists of lectures and laboratory sessions.

Max Credits: 3

Min Credits: 3

19.614 Evaluation of Work Environment Hazards

Course ID: 3596

Course Details: This course provides the work environment professional with a systematic method of evaluating chemical, ergonomics and work organizational hazards in the field. Formal walk around inspections are conducted and formal reports are prepared. Sampling strategies and statistical considerations in the quantification of occupational exposures are covered. The health risks and control of physical hazards (noise and vibration) in the work environment are a major focus of this course.

Max Credits: 3

Min Credits: 3

19.615 Solutions for Work Environment Hazards

Course ID: 3597

Course Details: Techniques for controlling exposure to airborne contaminants. Basic controls include substitution, ventilation, isolation, administrative controls, and personal protective equipment. Special focus is placed on Toxic Use Reduction (TUR) and Pollution Prevention strategies.

Max Credits: 3

Min Credits: 3

19.616 Exposure and Risk Assessment

Course ID: 34949

Course Details: This course covers quantitative and qualitative approaches to the development of sampling strategies. Statistical considerations in the quantification of occupational exposures are covered. Assessment of dermal exposures and the use of biomarkers for exposure assessment are also a focus of this class. An introduction to the methods of risk assessment will also be covered.

Max Credits: 3

Min Credits: 3

19.618 Risk Management and Training

Course ID: 34950

Course Details: This course will introduce models of health and safety management with a focus on communication with management and employees. Development of effective worker training programs will be covered. The methods and policy implications of quantitative risk analysis and assessment will be introduced and cases discussed.

Max Credits: 3

Min Credits: 3

19.619 Measurement of Chemical Exposure

Course ID: 3599

Course Details: Basic properties of airborne particles, with particular regard to properties important to health. Sampling and analysis methods used in the evaluation of occupational exposures to aerosols, gases, vapors. Direct reading instrumentation, calibration and data processing. Integrated sampling methods and chemical analysis of organic and inorganic compounds will be covered in class and lab.

Max Credits: 3

Min Credits: 3

19.620 Advanced Exposure Assessment

Course ID: 3600

Course Details: An advanced seminar covering exposure assessment for studies of acute and chronic respiratory disease, pharmacologic modeling for exposure assessment and the design of models to evaluate the role of production process factors in determining workplace airborne exposures. The course assumes a prior background in epidemiology and biostatistics as well as industrial hygiene and toxicology.

Max Credits: 3

Min Credits: 3

19.621 Nanomaterials: Exposure, Health and Safety

Course ID: 34722

Course Details: This course presents a comprehensive overview of environmental health and safety issues of nanotechnology, with focus on biologically based exposure assessment and control. Methods based on biology, toxicology, and knowledge of disease mechanisms are presented for identifying and quantifying nanoscale materials exposures found in occupational/environmental setting and consumer products and for designing exposure assessments for the study of health effects. This course is needed to fill a gap in the

current curriculum offerings and to assist the various researchers in understanding possible risks associated with diverse nanotechnologies. The course will include introductory lectures, paper critiques, and laboratory sessions.

Max Credits: 3

Min Credits: 3

19.622 Biomarkers in Occupations and Environment

Course ID: 30332

Course Details:

Max Credits: 3

Min Credits: 3

19.623 Skin Exposure to Chemicals

Course ID: 34723

Course Details: This new course, the only of its kind in the occupational & environmental hygiene program in the country, will discuss the significance of occupational environmental and household skin exposure to chemicals, skin exposure assessment and regulatory aspects. The course will address important topics, such as physiology and metabolism of normal skin, skin absorption of a variety of chemicals, including solids and nanomaterials, factors affecting skin permeation, permeability of compromised skin barrier integrity, skin sampling methods, skin-lung interactions and prevention of skin exposure, through a mix of didactic presentations and critical discussion of the scientific peer-reviewed literature. Each session will start with a presentation on the topic, followed by guided discussions of realistic, but provocative, scenarios. As laboratory space and instrumentation becomes available in the near future, a laboratory component will be added to the course to emphasize major sampling techniques and illustrate/visualize skin permeation of chemicals.

Max Credits: 3

Min Credits: 3

19.630 Research Design for Ergonomics

Course ID: 3602

Course Details: Procedures for conducting research on ergonomics (human factors, biomechanics, etc.). Experimental design alternatives, field research, survey research, considerations of data collection and reduction, sequential design procedures, and ethical use of human subjects.

Max Credits: 3

Min Credits: 3

19.632 Advanced Biomechanics

Course ID: 3603

Course Details: A course in advanced biomechanical modeling methods, covering three dimensional static models, optimization methods and dynamic models. Special emphasis will be placed on biomechanical models of the hand. Time will also be dedicated to reviewing current developments in the scientific literature.

Max Credits: 3

Min Credits: 3

19.638 Methods In Work Analysis

Course ID: 3606

Course Details: Criteria for selection of an approach to ergonomic job analysis depend on the combination of exposures (micro- and macro-level ergonomic stressors) observed to be present as well as the analytical goal. Many ergonomic analysis techniques are based on traditional industrial engineering approaches (time-motion study and work sampling), applied to the identification and evaluation of potential risks to workers' health. A variety of methods, both observational and instrumental, will be discussed; laboratory sessions will permit hands-on application of several of these for critical evaluation.

Max Credits: 3

Min Credits: 3

19.640 Macroergonomics: A comprehensive approach to Job and Organizational Design

Course ID: 35457

Course Details: The purpose of this course is to introduce students to the Macroergonomics field. Macroergonomics, also known as the third generation of ergonomics, is a top-down sociotechnical systems approach to the design of organizations, work systems, and jobs. The goal of macroergonomics is a fully harmonized work system at both the macro- and micro-ergonomic level which results in improved productivity, job satisfaction, health and safety, and employee commitment.

Max Credits: 3

Min Credits: 3

19.643 Health Work Organization Design

Course ID: 3608

Course Details: Rationales for prevention; determinant of job change feasibility, classic and alternative work organization theories, alternative productivity conceptions, health and growth assessment strategies, conducive work processes, work-group based re-design processes, communicative and network-oriented processes, organization-level change process, product redesign, occupational and political strategic issues.

Max Credits: 3

Min Credits: 3

19.651 Work Environment Policy

Course ID: 3612

Course Details: This course provides an overview of occupational safety and health policy in the U.S. It focuses on the legal context, especially on OSHA, but also provides an analytical framework for examining the role of social, economic and political factors in the recognition and control of occupational hazards.

Max Credits: 3

Min Credits: 3

19.654 Work, Technology and Training

Course ID: 3614

Course Details: This course examines the broader issues of the impact of technology on the work environment and on workers. Topics include technology and craft work, Taylorism and the development of mass production methods, labor in the "factory of the future", skill-based automation, shop floor programming, and other issues in technology policy. The course is offered in collaboration with the Department of Regional Economic and Social Development as 57.503.

Max Credits: 3

Min Credits: 3

19.655 Introduction to Environmental and Natural Resource Economics

Course ID: 3615

Course Details: This course introduces students to the economic and policy aspects of environmental quality and natural resource issues. The course also incorporates relevant work-environment related issues. Simple and complex models are used to blend economic theory with environmental facts. Students will learn to derive policy insights from theoretical constructs. The primary objective is to show how the basic principles in economics can play a valuable role in analyzing and evaluating critical environmental issues and help in determining policy guidelines. Standard benefit cost of efficiency criteria will be applied to a wide variety of environmental, work-environment and natural resource problems. In attempting to do so we shall also emphasize how difficult it is to model actual environmental problems in the real world. We shall draw upon the basic tools of environmental and health economics to discuss current policy issues and questions that policy makers confront in practice. Graduate students in work environment will be required to do an economic analysis of an occupational health and safety intervention.

Max Credits: 3

Min Credits: 3

19.658 Clean Product Design

Course ID: 3618

Course Details: This advanced seminar will provide an introduction to clean product design and management which includes the use of lifecycle thinking, eco-design concepts, materials analysis, inherent product safety, recycling and reuse, produce take back, and design for the environment. As background, the seminar will cover renewable resources, bio-based materials and green chemistry solutions and conclude with a consideration of new forms of sustainable consumption.

Max Credits: 3

Min Credits: 3

19.659 Cleaner Production

Course ID: 3619

Course Details: This course will explore the rapidly expanding developments in cleaner production methods and policies. The course will focus on new directions in environmentally conscious manufacturing and product design in Europe. The subject will cover topics ranging from European demonstration projects, environmental auditing, cleaner technology assessment, eco-efficiency models, water and energy conservation, sustainable product design, eco-design and life cycle assessment, product take-back and extended product life, full cost accounting, industrial ecology, environmental management systems and ISO 14000. Special emphasis will be given to new information data sources and an introduction to new cleaner production methods software.

Max Credits: 3

Min Credits: 3

19.675 Introduction to Manuscript Writing

Course ID: 35633

Course Details: This seminar will cover the basics of how to structure and write an article for a peer-reviewed journal. Participants will bring at least one article from their own field that can serve as a model, as well as a sample of their own writing (can be a course paper or other draft manuscript). Both peer and instructor feedback will help to inform revisions of the draft.

Max Credits: 1.5

Min Credits: 1.5

19.676 Introduction to Proposal Writing

Course ID: 35634

Course Details: This seminar will cover the basics of how to write a thesis proposal or grant application. Participants will bring an idea for a project and, if possible, an outline or draft of a proposal to be developed further with peer and instructor feedback.

Max Credits: 1.5

Min Credits: 1.5

19.678 Occupational Respiratory Disease Epidemiology

Course ID: 3625

Course Details: Advanced course on the methods and content of research on occupational respiratory disease with focus on the appropriate use of spirometry, symptom questionnaires, and chest radiography in cross sectional and longitudinal studies. Reviews pathophysiology, prevalence, latency considerations and diagnosis of both acute and chronic respiratory disease caused or exacerbated by work. Special attention is devoted to the impact of the healthy worker selection effect in respiratory epidemiology studies.

Max Credits: 3

Min Credits: 3

19.679 Psychiatric Diseases and Work

Course ID: 34724

Course Details: This course will explore the relationships between mental health and psychiatric diseases and working life. Both the impacts of mental illness on work, as well as the effects of work and the work environment on mental health will be covered. By the end of the semester, students will understand: basic psychiatric terminology, and the different psychiatric syndromes in relation to their clinical symptomatology and long term prognoses; how to assess those syndromes using epidemiologic screening tools; and the current state of the art on the impact of working conditions on mental diseases and mental health, and the impact of these on working life.

Max Credits: 1.5

Min Credits: 1.5

19.680 Introduction To SAS

Course ID: 3626

Course Details: This course is designed for researchers who will be doing data analysis using SAS. No prior programming experience is necessary, though familiarity with and general experience in use of a PC (DOS and Windows) is required. The course covers topics including: basics of SAS, reading raw data and existing SAS data sets, modifying data, combining data sets, basic statistical procedures, sorting, summarizing, and printing data. .

Max Credits: 1

Min Credits: 0

19.682 Applied Epidemiology Methods

Course ID: 3628

Course Details: A second level course in modern epidemiologic methods. This course is designed for those planning to work in public health or healthcare. Emphasis is placed on the design and conduct of field studies. Students read the current literature, and learn the particular methods and difficulties of conducting epidemiologic studies in the work environment. Major topics covered include: casual inference in epidemiology, point and interval estimation for cohort and case control studies, exposure assessment for epidemiology, control of confounding, cross-sectional and longitudinal study designs.

Max Credits: 3

Min Credits: 3

19.683 Risk Assessment

Course ID: 3629

Course Details: This course will review both the methods and policy implications of risk assessment in the development of occupational and environmental standards. Students will conduct risk assessments on real problems, and study important cases in which these methods have been used in setting public policy.

Max Credits: 3

Min Credits: 3

19.684 Musculoskeletal Epidemiology

Course ID: 3630

Course Details: An advanced course on methods and content of research on work-related musculoskeletal disorders. Reviews pathophysiology, diagnosis, prevalence, latency and surveillance issues. The key literature is examined with attention to study design, quality of exposure assessment, control of bias and adequacy of statistical analysis. .

Max Credits: 3

Min Credits: 3

19.687 Quantitative Models Environmental Health

Course ID: 3633

Course Details: In this seminar readings, discussion, group work and computer exercises are used to gain an understanding of how certain kinds of quantitative models work. Emphasis is placed on the underlying assumptions of these models, and on gaining an intuitive understanding of the most common modeling procedures. The types of models covered will be those most important to current research and policy in environmental health, including ordinary least squares, the method of maximum likelihood, Monte Carlo simulation, and systems of ordinary difference equations. There will be a diverse set of readings, frequent computer exercises to be worked either individually or in groups, and a final project. Facility with Excel or an analogous spreadsheet program will be assumed. .

Max Credits: 3

Min Credits: 3

19.688 Research Synthesis Environmental Health Policy

Course ID: 3634

Course Details: Introduces students to methods used to synthesize, evaluate, and present environmental, epidemiologic, and other scientific data for environmental health policy. Through presentation of a variety of existing methods, case studies, guest lectures, and group projects, students will develop an understanding of the complexities and issues involved in evaluating and synthesizing scientific information for public policy. The course will examine methods for using both quantitative and qualitative research findings.

Max Credits: 3

Min Credits: 3

19.689 Advanced Regression Modeling

Course ID: 30857

Course Details: This course will cover introductions to several different regression methods used in environmental and occupational epidemiology to model exposure-response relationships. Topics include Poisson regression, Cox proportional hazards models, and nonparametric regression based on smoothed functions of exposure. Students should have working familiarity with STATA or SAS. Prerequisite: 19.674 or equivalent.

Max Credits: 3

Min Credits: 3

19.690 Critical Review Health Regulations

Course ID: 3635

Course Details: Course designed to explore the practical applications of epidemiologic methods to the setting of actual standards. Students gain experience in distinguishing minor from major design and analysis flaws. Course is presented as a seminar with four case studies and problem analysis.

Max Credits: 3

Min Credits: 3

19.695 Chemical Process/Sustainability

Course ID: 3637

Course Details: This course surveys the basis of chemical engineering process design and fundamentals of unit operations. The student will be able to understand the basics of chemical engineering design methods for the purpose of enhancing sustainability of chemical production processes.

Max Credits: 3

Min Credits: 3

19.701 Independent Study: Industrial Hygiene

Course ID: 3638

Course Details: Advanced topics in industrial hygiene, exposure assessment or exposure control not offered in the regular curriculum. Topics may vary from year to year.

Max Credits: 3

Min Credits: 3

19.702 Independent Study: Industrial Hygiene

Course ID: 3639

Course Details: Advanced topics in industrial hygiene, exposure assessment or exposure control not offered in the regular curriculum.

Topics may vary from year to year.

Max Credits: 1

Min Credits: 1

19.703 Independent Study: Ergonomics

Course ID: 3640

Course Details: Advanced topics in biomechanics, work physiology, occupational safety or human factors not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 3

Min Credits: 3

19.704 Independent Study: Ergonomics

Course ID: 3641

Course Details: Advanced topics in biomechanics, work physiology, occupational safety or human factors not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 1

Min Credits: 1

19.708 Independent Study: Epidemiology

Course ID: 3644

Course Details: Advanced topics in occupational epidemiology, design and confounding, exposure-response modeling, or surveillance not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 1

Min Credits: 1

19.709 Independent Studies: Occupational Epidemiology

Course ID: 3645

Course Details: Advanced topics in occupational epidemiology, design and confounding, exposure-response modeling, or surveillance not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 1.5

Min Credits: 1.5

19.711 Independent Study: Industrial Hygiene

Course ID: 3647

Course Details: Advanced topics in industrial hygiene, exposure assessment or exposure control not offered in the regular curriculum. Topics may vary from year to year.

Max Credits: 3

Min Credits: 3

19.712 Independent Study: Industrial Hygiene

Course ID: 3648

Course Details: Advanced topics in industrial hygiene, exposure assessment or exposure control not offered in the regular curriculum. Topics may vary from year to year.

Max Credits: 2

Min Credits: 2

19.713 Independent Study: Ergonomics

Course ID: 3649

Course Details: Advanced topics in biomechanics, work physiology, occupational safety or human factors not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 3

Min Credits: 3

19.715 Independent Study: Work Environment Policy

Course ID: 3651

Course Details: Advanced topics in work environment policy, risk perception, risk communication and management, regulatory affairs or labor-management programs not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 3

Min Credits: 3

19.717 Independent Study: Epidemiology

Course ID: 3653

Course Details: Advanced topics in occupational epidemiology, design and confounding, exposure-response modeling, or surveillance not covered in the regular curriculum. Content may vary from year to year.

Max Credits: 3

Min Credits: 3

19.719 Independent Study: Clean Production

Course ID: 3655

Course Details: Advanced topics in clean production, pollution prevention, and environmental protection efforts. Not offered in the regular curriculum. Topics may vary from year to year.

Max Credits: 3

Min Credits: 3

19.721 Selected Topics : Industrial Hygiene

Course ID: 3657

Course Details:

Max Credits: 3

Min Credits: 3

19.723 Selected Topics: Ergonomics

Course ID: 3658

Course Details:

Max Credits: 3

Min Credits: 3

19.725 Epidemiologic Theory

Course ID: 3659

Course Details: An advanced seminar in epidemiologic theory. The goal of the course is to develop each student's own theoretical perspective on the field to ground practical problems of study design and analysis. Students read a major text in modern chronic

disease epidemiology as well as relevant papers, and discuss and evaluate the perspectives of different authors. Topics include: causality, study designs, measures of disease frequency, measures of association, statistical inference, biases, and confounding.

Max Credits: 3

Min Credits: 1.5

19.727 Sel Top: Epidemiology

Course ID: 3660

Course Details:

Max Credits: 3

Min Credits: 3

19.728 Sel Top: Work Env Policy

Course ID: 3661

Course Details:

Max Credits: 3

Min Credits: 3

19.729 Selected Topics : Clean Production

Course ID: 3662

Course Details:

Max Credits: 3

Min Credits: 3

19.733 Graduate Project

Course ID: 3665

Course Details: Advanced research project required of all master's degree candidates in the ergonomics, industrial hygiene, occupational epidemiology and work environment policy concentrations.

Max Credits: 3

Min Credits: 3

19.735 Independent Study: Policy

Course ID: 3666

Course Details:

Max Credits: 3

Min Credits: 3

19.736 Graduate Project - Work Environment

Course ID: 3667

Course Details:

Max Credits: 6

Min Credits: 6

19.737 Independent Study: Epidemiology

Course ID: 3668

Course Details:

Max Credits: 3

Min Credits: 3

19.739 Graduate Project - Work Environment

Course ID: 3669

Course Details: Advanced research project required of all master's degree candidates in the ergonomics, industrial hygiene, occupational epidemiology and work environment policy concentrations.

Max Credits: 9

Min Credits: 9

19.743 Master's Thesis Research

Course ID: 3670

Course Details:

Max Credits: 3

Min Credits: 3

19.759 Doctoral Dissertation/Work Environment

Course ID: 3675

Course Details: Minimum of 18 semester hours of graduate courses at an acceptable level; approval of a written proposal outlining the extent and nature of proposed research work.

Max Credits: 9

Min Credits: 1

19.761 1 - Credit Continued Graduate Research

Course ID: 38148

Course Details: 1-Credit Continued Graduate Research course is for students with less than one year to defend or complete program. Part of reduce course load program for international students.

Max Credits: 1

Min Credits: 1

19.763 Continued Graduate Research

Course ID: 3676

Course Details:

Max Credits: 3

Min Credits: 3

19.770 Directed Readings: Epidemiology Biostatistics

Course ID: 3679

Course Details:

Max Credits: 3

Min Credits: 3

19.999 Intercampus Graduate Research

Course ID: 33695

Course Details: This course will allow doctorate students to remain active while they are taking courses/research at the other UMASS campuses.

Max Credits: 0

Min Credits: 0

20.535 Microprocessor Application

Course ID: 3761

Course Details:

Max Credits: 3

Min Credits: 3

22.504 Energy Engineering Workshop

Course ID: 3869

Course Details: A group design of an innovative energy system. Integration of many aspects of the student's engineering background, including design concepts, technical analyses, economic and safety considerations. Ideally the whole design cycle of design, build, test. A formal report and oral presentation.

Max Credits: 3

Min Credits: 3

22.505 Directed Studies - ME

Course ID: 31917

Course Details:

Max Credits: 3

Min Credits: 3

22.512 Applied Finite Elements

Course ID: 3871

Course Details: An introduction to finite element methods using popular commercial packages. The features common to different programs as well as special features of particular programs are presented. Primary focus is on hands-on familiarity with the software with a limited discussion of the underlying finite element theory. ALGOR, ADINA, ABAQUS, LS-DYNA, HyperMesh, and FEMAP are among the pre/post-processing and analysis packages used in the class. This is a WWW based course and access to a PC, the Internet, and a frames-capable browser is required.

Max Credits: 3

Min Credits: 3

22.513 Finite Element Analysis I

Course ID: 3872

Course Details: Matrix algebra and the Rayleigh-Ritz technique are applied to the development of the finite element method. The minimum potential energy theorem, calculus of variations, Galerkin's and the direct-stiffness method are used. Restraint and constraint conditions are covered. C0 and C1 continuous shape functions are developed for bar, beam, and two and three dimensional solid elements. Recovery methods, convergence and modeling techniques are studied. Applications to problems in static stress analysis and heat conduction.

Max Credits: 3

Min Credits: 3

22.514 Finite Element Analysis of Composites

Course ID: 3873

Course Details:

Max Credits: 3

Min Credits: 3

22.515 Modal Analysis

Course ID: 3874

Course Details: Review of single and multiple degree of freedom system using classical and Laplace formulations. Finite element methods for dynamic systems. Model reduction/expansion formulations. Modal participation and mode activation concepts. Linear algebra review, matrix formulations, matrix eigenanalysis, generalized inverses, spectral and singular valued decomposition techniques. Models developed using MATLAB.

Max Credits: 3

Min Credits: 3

22.516 Experimental Modal Analysis

Course ID: 3875

Course Details: Prerequisite: 22.4xx/5xx Experimental Modal Analysis I (or permission of instructor) Review of system transfer and FRF matrices for development of a modal model. Review of DSP techniques for experimental modal analysis. Excitation techniques for the development of the system FRF matrix; SISO and MIMO techniques. Modal parameter estimation using time and frequency domain techniques. Advanced data manipulation for dynamic analysis. Introduction to structural dynamic modification and system modeling concepts. Models developed using MATLAB and commercially available software.

Max Credits: 3

Min Credits: 3

22.518 Signal Proc Techniques

Course ID: 3877

Course Details:

Max Credits: 3

Min Credits: 3

22.520 Numerical Methods for Partial Differential Equations

Course ID: 36063

Course Details: Mathematical approaches for numerically solving partial differential equations. The focus will be (a) iterative solution methods for linear and non-linear equations, (b) spatial discretization and meshing (c) finite difference methods (FDM), (d) finite volume methods (FVM), (e) finite element methods (FEM) and (f) boundary element methods (BEM). The theory behind of each of these methods will be developed and discussed. Computer programming applications involving the solution of linear and non-linear PDEs in multiple dimensions will play a key role in this course. Unique computer programming assignments will be selected from different engineering/science fields (possibilities include: fluid flow, heat transfer, electrostatics, electromagnetism, structural analysis, medical, ocean engineering etc.) to illustrate the broad applicability of numerical methods. Students will be expected to complete programming assignments -- while most class examples will deal with pseudo code and/or matlab, a working knowledge of one of the following programming languages is recommended: Matlab, Octave, C, C++, fortran, Java, BASIC, or Python.

Max Credits: 3

Min Credits: 3

22.521 Solar Fundamentals

Course ID: 3879

Course Details: Utilization Terrestrial irradiation on tilted surfaces; radiation, conduction, convection in collectors; absorptance,

emittance, reflection, transmittance of solar irradiation; energy flow in flat plate and concentrator collectors; storage; design tools; small project; web-based.

Max Credits: 3

Min Credits: 3

22.524 Fund of Acoustics

Course ID: 31881

Course Details:

Max Credits: 3

Min Credits: 3

22.525 Grid-Connected Solar Electric Systems

Course ID: 38510

Course Details: Students will study the concepts and design considerations of grid-connected, solar-powered, electrical generation systems, from residential through utility scale. Emphasis will be on practical applications that help make the student "work ready" at graduation. Grading consists of two tests during semester; one individual project (residential scale PV system); and one group project (commercial-scale system). This course fulfills an elective requirement for renewable energy students.

Max Credits: 3

Min Credits: 3

22.526 Transport Processes in Energy Systems

Course ID: 38509

Course Details: Course focuses on the development of a fundamental understanding of transport processes from a multi-scale and multi-physics perspective, and the application of such understanding to the analysis of energy engineering systems. Derivations of the equations describing the mechanisms for mass, momentum, and energy transport are presented, together with approaches for the evaluation of material properties and constitutive relations. Emphasis is placed on a holistic view of transport processes as combinations of transient, advective, diffusive, and reactive phenomena.

Max Credits: 3

Min Credits: 3

22.527 Solar Energy Engineering

Course ID: 3881

Course Details: Systems engineering, stochastic modeling, design, and life-cycle cost analysis of several solar systems: photovoltaics, passive heating, solar cooling, and daylighting; Web Based.

Max Credits: 3

Min Credits: 3

22.528 Photovoltaics Manufacturing

Course ID: 34725

Course Details: Overview of the manufacturing processes used to make a typical crystalline solar cell. Detailed study of selected processes and manufacturing problems, such as solar cell testing, characterization, reliability issues, factors affecting yields, automated material handling, affect of impurities in crystal growth.

Max Credits: 3

Min Credits: 3

22.531 Math Methods In Mechanical Engineering

Course ID: 3883

Course Details:

Max Credits: 3

Min Credits: 3

22.545 Advanced Industrial Heat and Mass Transfer

Course ID: 32792

Course Details: This course specializes in obtaining practical solutions for applied and industrial heat transfer problems related to device development and production processes. Topics include review of heat transfer modes (i.e. conduction, convection and radiation), transport phenomena in material processing and manufacturing, analytical models and numerical simulations. Representative problems include curing of polymers, thermal conditioning of human body, food packaging and long-term food preservation, thermal management of electrical and electronic equipment, control of water vapor and pollutant transfer, material processing, and heat and mass exchangers.

Max Credits: 3

Min Credits: 3

22.549 Cooling of Electronic Equipment

Course ID: 3894

Course Details: This course focuses on teaching the primary techniques for cooling electronics, and methods for modeling their performance. Heat-transfer fundamentals: conduction, convection, radiation, phase change, and heat transfer across solid interfaces. Heat-generating electronic equipment: ICs, power converters, circuit cards and electrical connectors. Thermal management equipment: heat sinks, interface materials, heat spreaders including liquid loops, and air movers. System design: system packaging architectures, facilities, system analysis. Advanced Topics: spray cooling, refrigeration

Max Credits: 3

Min Credits: 3

22.550 Vibrations

Course ID: 3895

Course Details:

Max Credits: 3

Min Credits: 3

22.553 MEMS & Microsystems

Course ID: 32791

Course Details: The purpose of this course is to give a broad introduction to Micro-electro-mechanical Systems (MEMS) technology, and will provide graduate students in mechanical, electrical, manufacturing and related engineering disciplines with necessary fundamental knowledge and experience in the design, manufacture, and packaging of microsystems. The topics include basic sensing and actuating principles, modeling of electromechanical components, material properties, fabrication technologies, process integration, system design, and packaging of MEMS and microsystems. The course will also cover current literature, MEMS markets and applications. The course will be a combination of lectures, case studies and homework assignments. The students are expected to possess prerequisite knowledge in college mathematics, physics, and chemistry, as well as in engineering subjects such as fundamental materials science, electronics, thermal-fluid, and machine design.

Max Credits: 3

Min Credits: 3

22.554 Dynamic Systems and Controls

Course ID: 3898

Course Details: Matrix-based classical and modern techniques are applied to the dynamics of control systems. Design of controllers, and full and reduced-order observers. Introduction to optimal control and Kalman filters.

Max Credits: 3

Min Credits: 3

22.557 Microsystem Design

Course ID: 34605

Course Details: Design aspects of Microsystems (MEMS). Topics covered include working principles of various microsystems, analytical and numerical modelling, and case studies. Course incorporates lectures, computer laboratories and term project presentations.

Max Credits: 3

Min Credits: 3

22.558 Aero/Wind Eng

Course ID: 30334

Course Details: This course will introduce and examine classical and modern theoretical and computational two and three dimensional aerodynamics and aeroelastic modeling with applications in wind and subsonic aero/hydrodynamics applications. In addition, wind and meteorological science as well as simple FEM structural modeling and coupling concepts will be examined. The class will comprise scheduled lectures and discussions. Students will be expected to perform presentations and directed projects which involve computer programming.

Max Credits: 3

Min Credits: 3

22.559 Multi-Scale Computational Fluid Dynamics I

Course ID: 37600

Course Details: Derivation of governing equations; Scale analysis; Role of relative dimensionless parameters; Discretization of the governing equations; Finite-Difference, Finite-Volume, and/or Finite Element Techniques; Solutions of several problems in micro/meso/macro scale applications.

Max Credits: 3

Min Credits: 3

22.560 Multi-Scale Computational Fluid Dynamics II

Course ID: 37601

Course Details: Applications of CFD methods to the solution of multi-phase problems such as: heat pipes, fuel cells, nanofluidics, material processing and manufacturing, etc.

Max Credits: 3

Min Credits: 3

22.562 Solid Mechanics I

Course ID: 3901

Course Details: Topics covered include the theory of stress, kinematics of strain, Hooke's Law, work and energy, equations of stress equilibrium, Navier's equations, strain compatibility, and the Beltrami-Michell equations. Problems for uniformly varying 3-D states of stress, torsion, and plane deformation are studied. Axisymmetric deformation is considered. Green's function solutions for plane and axisymmetric problems are studied.

Max Credits: 3

Min Credits: 3

22.570 Polymer Nanocomposites

Course ID: 34581

Course Details: This course deals with the preparation, characterization, behavior and properties of polymer nanocomposites, with an emphasis on the most commercially relevant systems to date, as well as new developments in the field. The major preparation routes to these materials are discussed, with an emphasis on the importance not only of dispersion but of true thermodynamic compatibility in these systems. From there, the focus shifts to describe the consequences of nanocomposite structure in terms of both molecular

behavior and macroscopic properties, as informed by the most up-to-date research literature available. Case studies of specific systems will serve as opportunities to gain deeper understanding, and the safety issues surrounding nanoparticle handling will also be presented. Finally, current research by invited lecturers working in the field will be presented as time permits.

Max Credits: 3

Min Credits: 3

22.571 Collaborative Engineering

Course ID: 3907

Course Details: Focuses on methodologies used by world class companies to guide the design and development of high quality, low cost products in the most timely manner through the use of analytical tools in case studies: Topics include: new product creation strategy and process, organizational aspects of multi-disciplinary design teams, concurrent project management, and structural methodologies for identifying customer requirements and manufacturing process design, control and selection. In particular, focus is on the interrelationship of CE, manufacturing and Quality tools and methodologies and how they contribute in determining the appropriate level of product/process quality and design efficiency.

Max Credits: 3

Min Credits: 3

22.574 Design For Reliability Engineering

Course ID: 3910

Course Details: (3-0)3 Design for Reliability Engineering provides a systematic approach to the design process that is focused on reliability and the physics of failure. It provides the requirements on how, why, and when to use the wide variety of reliability engineering tools available in order to achieve the reliability goals of the total design cycle. Topics include the product design cycle and customer requirements, analytical physics, reliability statistics, accelerated testing, accelerated reliability growth, industry standard predictive models, design reliability assessment, reliability FMEA, product risk evaluation and thermodynamic reliability.

Max Credits: 3

Min Credits: 3

22.575 Industrial Design of Experiment

Course ID: 3911

Course Details: Concepts of Robust Design and statistical Design Of Experiments (DOE) as applied to the design and manufacturing of new high technology products. Classical and current methodologies of DOE including Full Factorial, Fractional Factorial, Taguchi, Central Composite and Yates Algorithms. The course will also provide for different methods for experimental design and analysis, including average and variability analysis. Commercial software packages and case studies using industrial experiments will be used to illustrate the material.

Max Credits: 3

Min Credits: 3

22.576 Engineering Project Management

Course ID: 3912

Course Details: Skills are developed enabling engineers to be effective decision makers and technical leaders in an environment where technology management, business operations and strategies for contract compliance are critical to achieving competitive advantage. Elements of the Project Planning and Control System are presented along with analytical methods important for maintaining Projects on schedule and within budget.

Max Credits: 3

Min Credits: 3

22.579 Robotics

Course ID: 3914

Course Details: Common robotics joints and robotics classification. Planes of motion and fold lines. Robotics capability. Forward and inverse kinematics and the RobSim software package. Trajectory planning and elementary obstacle avoidance. Robotics dynamics and feasible trajectory evaluation. Design of the control system for the non-linear robotics problem. Classroom studies are followed by

hands-on applications in the Automated Manufacturing Assembly and Robotics Laboratory.

Max Credits: 3

Min Credits: 3

22.580 Adv Grad Res Dev Proj

Course ID: 3915

Course Details:

Max Credits: 3

Min Credits: 3

22.581 Advanced Fluid Mechanics

Course ID: 3916

Course Details: Fundamental equations of fluid motion, kinematics, vorticity, circulation, Crocco's theorem, Kelvin's theorem, Helmholtz's velocity laws, secondary flows. Stream function, velocity potential, potential flows. Unsteady Bernoulli equation, gravity water waves.

Max Credits: 3

Min Credits: 3

22.583 Advanced Aerodynamics

Course ID: 3918

Course Details: 3-0)3 Fundamentals of subsonic and supersonic aerodynamics. Atmosphere models, air-speed measurement, and aerodynamic heating. Circulation, downwash, and three-dimensional wing theory. Airfoil data, and lift and drag of aircraft components. Compressibility effects on drag, and airfoils and wings in supersonic and hypersonic flow. Aircraft performance calculations. Fundamentals of orbital mechanics. Special project required in supersonic wind tunnel testing or orbital mechanics.

Max Credits: 3

Min Credits: 3

22.584 Ocean Engineering

Course ID: 3919

Course Details: Physical Properties of the Ocean Environment, ocean wave mechanics, computer solutions of wave interactions, physical modeling of marine vehicles and coastal environments (modeling and scaling laws), resistance and propulsion of surface ships and submarines, and forces on floating and submerged objects such as buoys, pipelines, piers, and breakwaters. Research report required summarizing some aspect of ocean engineering.

Max Credits: 3

Min Credits: 3

22.589 Finite Element in Thermofluids

Course ID: 3923

Course Details: The Galerkin finite element technique is first applied to a simple one-dimensional steady state convection/conduction equation. The element equations are derived and the assembly process is described. These concepts are then extended to two-dimensional transient problems. A finite element package is used to solve a variety of fluid flow problems. All course materials are available on the WWW.

Max Credits: 3

Min Credits: 3

22.591 Mechanical Behavior of Materials

Course ID: 3925

Course Details: Quantification of structure-property relationships requires application of solid mechanics concepts to materials

microstructure. Using micromechanics approach, the course focuses on the deformation and fracture behavior of metals, ceramics, composites and polymeric. Topics include: elastic behavior, dislocations, crystal plasticity, strengthening mechanisms, composite materials, glassy materials, creep and creep fracture, tensile fracture, and fatigue.

Max Credits: 3

Min Credits: 3

22.593 Graduate Co-op Education

Course ID: 3927

Course Details: The prediction, analysis, and prevention of failure in mechanical design is covered. Failure mechanisms such as creep, plastic deformation, crack propagation, cyclic fatigue, thermal fatigue, fretting and galling are considered. Theories of failure such as Colomb-Mohr, Beltrami, and Huber-Von Mises are used to predict failure. Cumulative damage theories such as those of Gatts, Corten and Dolan, Marin, and Manson will be studied. Statistical methods of analysis and test data interpretation are studied. Materials such as steels, aluminum alloys, solders, plastics, and composites will be considered.

Max Credits: 0

Min Credits: 0

22.595 Graduate Co-op II

Course ID: 3929

Course Details:

Max Credits: 0

Min Credits: 0

22.596 Composite Materials

Course ID: 3930

Course Details: Analysis of anisotropic lamina and laminated composites. Methods of fabrication and testing of composites. Other topics include environmental effects, joining and machining.

Max Credits: 3

Min Credits: 3

22.597 Processing of Composites

Course ID: 3931

Course Details: Methods of fabrication. Analysis of forming, fiber orientation, permeability, polymer rheology, flow through porous media, consolidation, cure kinetics, combined flow and cure models. Effect of manufacturing defects

Max Credits: 3

Min Credits: 3

22.602 Special Topic: Thermo-Fluids

Course ID: 3934

Course Details: Study of advanced topics in thermo-fluid energy systems and processes not covered in the regular curriculum. Contents may vary from year to year.

Max Credits: 3

Min Credits: 3

22.603 Special Topic: Vibration Dynamics

Course ID: 3935

Course Details: Study of advanced topics in vibrations/dynamics not covered in the regular curriculum. Contents may vary from year to year.

Max Credits: 3

Min Credits: 3

22.611 Matrix Methods

Course ID: 3940

Course Details: 3-0)3 Prerequisite: 22.515 Matrix linear algebra. Solution of algebraic equations using Gaussian elimination and decomposition variants. Eigenanalysis using various direct similarity techniques and simultaneous vector iteration methods. Algorithm development of solution techniques. Solution techniques for structural mechanics, dynamic systems and stability. Models developed using MATLAB.

Max Credits: 3

Min Credits: 3

22.614 Finite Element Analysis II

Course ID: 3942

Course Details: Nonlinear finite element methods as applied to large deformation and nonlinear material behavior and contact problems are the focus of this course. Various classical and contemporary constitutive models and their implementation in the finite element method are considered. Procedures for determining material parameters from a matrix of material test results are investigated.

Max Credits: 3

Min Credits: 3

22.622 Family Violence

Course ID: 3944

Course Details:

Max Credits: 3

Min Credits: 3

22.741 Master's Thesis - Mechanical Engineering

Course ID: 3959

Course Details:

Max Credits: 1

Min Credits: 1

22.742 Master's Thesis - Mechanical Engineering

Course ID: 3960

Course Details:

Max Credits: 2

Min Credits: 2

22.743 Master's Thesis - ME

Course ID: 3961

Course Details: MS Thesis Research

Max Credits: 3

Min Credits: 3

22.746 Master's Thesis - ME

Course ID: 3962

Course Details: MS Thesis Research

Max Credits: 6

Min Credits: 6

22.749 Master's Thesis - Mechanical Engineering

Course ID: 3963

Course Details: MS Thesis Research

Max Credits: 9

Min Credits: 9

22.751 Adv Projects In Mechanical Engineering

Course ID: 3964

Course Details:

Max Credits: 3

Min Credits: 3

22.753 Doctoral Dissertation/Mechanical Engineering

Course ID: 3965

Course Details: Doctoral Dissertation Research

Max Credits: 3

Min Credits: 3

22.756 Doctoral Dissertation/Mechanical Engineering

Course ID: 3966

Course Details: Doctoral Dissertation Research

Max Credits: 6

Min Credits: 6

22.759 Doctoral Dissertation/Mechanical Engineering

Course ID: 3967

Course Details: Masters and doctoral students who have attained the required number of thesis credits may enroll in:

Max Credits: 9

Min Credits: 9

22.761 Continued Grad Research

Course ID: 38491

Course Details: Continued Grad Research

Max Credits: 1

Min Credits: 1

22.763 Continued Graduate Research

Course ID: 3968

Course Details: Continuing Graduate Research

Max Credits: 3

Min Credits: 3

22.766 Continued Graduate Research

Course ID: 3969

Course Details: Continuing Graduate Research

Max Credits: 6

Min Credits: 6

22.769 Continued Graduate Research

Course ID: 3970

Course Details: Continuing Graduate Research

Max Credits: 9

Min Credits: 9

22.771 Systems Analysis I

Course ID: 3971

Course Details: Study of the key areas in multiple engineering disciplines including Mechanical, Electrical, Software, Systems and Optical. Students are introduced to weekly topics and then work in multidiscipline teams to solve technical assignments. Topics covered include: Concept of Operations and Requirements development, integration, test and verification, vibration/shock analysis, thermal analysis, power supply design, digital electronics & FPGA, intro to optical engineering, SCRUM planning, continuous integration and UML/SW design. Content may vary year to year. This course is part of the Engineering Leadership Development Program (ELDP) and team taught by industry experts at BAE Systems.

Max Credits: 3

Min Credits: 3

22.772 Systems Analysis II

Course ID: 3972

Course Details: Introduction and analysis of complex systems aligned with the key product lines of BAE Systems. Students are introduced to multiple types of systems and then work in multidiscipline teams to solve technical assignments. The systems covered include but are limited to: Electronic Warfare (EW), Communications Electronic Attack (Comms EA), Wide Area Airborne Surveillance (WAAS), Signal Intelligence (SIGINT), RADAR Navigation, Radio Communications, and Infrared Countermeasures (IRCM). Content may vary year to year. This course is part of the Engineering Leadership Development Program (ELDP) and team taught by industry experts at BAE Systems.

Max Credits: 3

Min Credits: 3

22.773 Systems Analysis III

Course ID: 3973

Course Details: Study of project management concepts, product development methods, transition to operations and new business capture. Topics covered include but are not limited to risks and opportunities management, earned value management, lean product development, business strategy, design for manufacturability/maintainability (DFM²), and request for information (RFI) response. Content may vary year to year. This course is part of the Engineering Leadership Development Program (ELDP) and team taught by industry experts at BAE Systems.

Max Credits: 3

Min Credits: 3

24.504 Energy Engineering Workshop

Course ID: 4057

Course Details: A group/individual design project. The design effort will integrate many aspects of the student's engineering background, including design concepts, technical analyses, economic and safety considerations, etc. A formal report and oral presentation are required.

Max Credits: 3

Min Credits: 3

24.505 Reactor Physics

Course ID: 4058

Course Details: Advanced treatment of several topics in reactor physics, including cross sections and processing methods, development of transport theory, reduction to diffusion theory, and analyses of analytical and numerical solutions of the resultant balance equations.

Max Credits: 3

Min Credits: 3

24.507 Reactor Engineering and Safety

Course ID: 4060

Course Details: Modeling and analysis of reactor thermal-hydraulics and safety systems. Topics include nuclear heat generation and transport, single and two-phase flow, boiling crisis, and safety analysis.

Max Credits: 3

Min Credits: 3

24.509 Dynamic Systems Analysis

Course ID: 4062

Course Details: Mathematical foundation using the state-variable approach. Topics include matrix methods, Laplace and Fourier transforms, transfer functions, frequency response and stability analyses, and distributed/lumped parameter systems. Applications to mechanical and thermo-fluid systems. Modeling and simulation of systems using Matlab are emphasized. A comprehensive project, including formal written and oral reports, is required.

Max Credits: 3

Min Credits: 3

24.510 Nuclear Fuel Cycle

Course ID: 4063

Course Details: This course will explore the various stages of the nuclear fuel cycle. The nuclear fuel cycle is broadly classified into three stages; front end, service stage, and back end. The course will introduce students to the various sub stages within the three broad stages of the nuclear fuel cycle. The course will explore the technology that is currently being used in these stages, then compare difference in approaches. Further modifications to the fuel cycle management will be discussed to make nuclear energy more sustainable. The course will provide an overview of front end fuel cycle including: mining, milling, enriching, fabrication; back end of the fuel cycle including: waste and recycling (or not); and in core fuel management, burnup calculations; and approaches to balance the cost of electricity production using nuclear reactors. The students will be introduced to nuclear burnup code such as ORIGEN. At the conclusion of the course students will be tasked to design and evaluate an aspect of the nuclear cycle that has been discussed in the class including but not limited to: enrichment plant, in-core fuel management, spent fuel management.

Max Credits: 3

Min Credits: 3

24.514 Chemical and Nuclear Waste

Course ID: 4066

Course Details: History of nuclear waste disposal; engineering design of disposal systems. Present status of waste and the character and quantities of future wastes. Review of disposal concepts on a generic basis. The national plan for waste disposal.

Max Credits: 3

Min Credits: 3

24.516 Radiation Shielding and Protection

Course ID: 38017

Course Details: This course will explore the fundamental principles of the interaction of nuclear and atomic radiation with matter and the transport of radiation through materials. The students will learn characterization of radiation fields and sources, and transport radiation through material. The course will discuss radiation exposure, dose, dose equivalent in context of radiation shielding and protection. Consequently, the students will compile each of these topics to learn how to design and analyze radiation shielding and protection. The students will learn how to use both the SOURCES and ORIGEN (or equivalent) code systems for calculating radiation sources and the MCNP (or equivalent) code system for the transport of radiation. At the conclusion of the course the students are expected to develop a shielding design for a given constraints typically encountered in the nuclear field.

Max Credits: 3

Min Credits: 3

24.519 Reactor Operator Training

Course ID: 4067

Course Details: Training, including in-reactor experience and topical lectures, as given to Reactor Operator Trainees who will undergo Federal testing for a Reactor Operator License.

Max Credits: 3

Min Credits: 3

24.520 Reactor Operator Training

Course ID: 4068

Course Details: Continuation of 24.519. Upon completion of this course, the student will be given a simulated Reactor Operator examination, including a written test, an oral test about reactor systems, and a controls manipulation test.

Max Credits: 3

Min Credits: 3

24.531 Selected Topics in Engineering

Course ID: 4077

Course Details: Special problems in nuclear science and engineering assigned to the individual student, with emphasis on modern research methods and preparation of results for publication.

Max Credits: 3

Min Credits: 3

24.532 Selected Topics: Energy Science

Course ID: 4078

Course Details: Special problems in nuclear science and engineering assigned to the individual student, with emphasis on modern research methods and preparation of results for publication.

Max Credits: 3

Min Credits: 3

24.536 Reactor Experiments

Course ID: 38016

Course Details: A laboratory-based course using the U Mass Lowell Research Reactor (UMLRR) to illustrate, validate, and expand upon a mix of topics from reactor core physics, reactor operations, and balance-of-plant/energy removal considerations in nuclear systems. Typical experiments may include an approach to critical demo, reactivity measurements, generation of blade worth curves, analysis of various reactor kinetics and dynamic scenarios (including temperature and xenon effects), measurement of axial flux profiles and temperature/void coefficients, analysis of loss of flow and other pump transients, etc. Matlab will be used for data analysis and for reactor simulation. Other analysis tools such as VENTURE, MCNP, or PARET using existing models of the UMLRR may also be used. Comprehensive analysis reports that compare/contrast experimental and simulation data will be required. Oral presentations summarizing the results from the experiments will also be required.

Max Credits: 3

Min Credits: 3

24.539 Mathematical Methods for Engineers

Course ID: 1261

Course Details: Ordinary and partial differential equations, linear algebra, matrix/vector calculus, numerical methods, introduction to optimization methods, and other topics as time permits. Both analytical and numerical techniques are integrated to give good analytical skills coupled with practical problem solving tools. Extensive computer work with the MATLAB package is required. (Same as 24.539).

Max Credits: 3

Min Credits: 3

24.601 Graduate Research Seminar

Course ID: 4086

Course Details:

Max Credits: 0

Min Credits: 0

24.651 Selected Topics in Energy Engineering

Course ID: 4088

Course Details:

Max Credits: 3

Min Credits: 3

24.705 Supervised Tchg - Nuclear Engineering

Course ID: 4092

Course Details:

Max Credits: 0

Min Credits: 0

24.733 Graduate Project - Energy Engineering

Course ID: 4094

Course Details:

Max Credits: 3

Min Credits: 3

24.739 Graduate Project - Energy Engineering

Course ID: 4096

Course Details:

Max Credits: 9

Min Credits: 9

24.741 Thesis Review

Course ID: 35265

Course Details:

Max Credits: 1

Min Credits: 1

24.743 Master's Thesis - Nuclear Engineering

Course ID: 4098

Course Details:

Max Credits: 3

Min Credits: 3

24.746 Master's Thesis - Energy Engineering

Course ID: 4099

Course Details:

Max Credits: 6

Min Credits: 6

24.749 Master's Thesis - Energy Engineering

Course ID: 4100

Course Details:

Max Credits: 9

Min Credits: 9

24.753 Doctoral Dissertation/Energy Engineering

Course ID: 4102

Course Details: Advanced research work required of students performed under the supervision of a senior faculty member in the Nuclear Engineering Program. The dissertation topic must be approved by the doctoral committee.

Max Credits: 3

Min Credits: 3

24.756 Doctoral Dissertation/Energy Engineering

Course ID: 4103

Course Details:

Max Credits: 6

Min Credits: 6

24.759 Doctoral Dissertation/Energy Engineering

Course ID: 4104

Course Details: Advanced research work required of students performed under the supervision of a senior faculty member in the Energy

Engineering Program. The dissertation topic must be approved by the doctoral committee.

Max Credits: 9

Min Credits: 9

24.766 Continued Graduate Research

Course ID: 4106

Course Details:

Max Credits: 6

Min Credits: 6

24.769 Continued Graduate Research

Course ID: 4107

Course Details:

Max Credits: 9

Min Credits: 9

25.550 Introduction to Nanotechnology

Course ID: 30852

Course Details: This course is designed to provide you with a broad overview to the multi-disciplinary field of nanotechnology. The course is team-taught by researchers from science, engineering, health and environment, management, and humanities disciplines. The topics include an introduction to nanoscale phenomena; fundamental theoretical concepts and experimental techniques in nanotechnology; nanoscale manufacturing and processing; innovative nanomaterials for various applications; applications of the technology; and environmental and health impacts of nanotechnology.

Max Credits: 3

Min Credits: 3

25.570 Selected Issues in Nanomanufacturing

Course ID: 30850

Course Details: A seminar course that examines the issues associated with high rate template-based nanomanufacturing, including: technologies for nanoscale templates, high rate assembly of nanoelements and polymer systems, registration at the nanoscale, interfacing with biological systems, measurement of nanoelements, and molecular modeling. Environmental, regulatory, and ethical issues associated with new technologies are also addressed. The course is co-taught by faculty from Northeastern University, the University of Massachusetts Lowell, and the University of New Hampshire. Meeting dates: January 27, February 10, February 24, March 10, March 24, and April 7. Time: 12:00 to 3:30, including lunch.

Max Credits: 0

Min Credits: 0

25.580 Thesis Review

Course ID: 35537

Course Details:

Max Credits: 1

Min Credits: 1

25.581 Project Review

Course ID: 35538

Course Details:

Max Credits: 1

Min Credits: 1

25.590 Graduate Industrial Cooperative Educational Experience I

Course ID: 35539

Course Details: Industrial experience credit for co-op and internships with industry. Students must register with department co-op coordinator.

Max Credits: 1

Min Credits: 1

25.591 Graduate Industrial Cooperative Educational Experience II

Course ID: 35540

Course Details: Industrial experience credit for co-op and internships with industry. Students must register with department co-op coordinator.

Max Credits: 1

Min Credits: 1

25.592 Graduate Industrial Cooperative Educational Experience III

Course ID: 35541

Course Details: Industrial experience credit for co-op and internships with industry. Students must register with department co-op coordinator.

Max Credits: 1

Min Credits: 1

25.593 Graduate Industrial Cooperative Educational Experience

Course ID: 35542

Course Details: Industrial experience credit for co-op and internships with industry. Students must register with department co-op coordinator.

Max Credits: 3

Min Credits: 3

26.500 Advanced Project In Plastics I

Course ID: 4205

Course Details: A laboratory course for advanced projects in the areas of plastics materials, design, processing, elastomers, coatings, adhesives, or medical plastics.

Max Credits: 1

Min Credits: 1

26.501 Advanced Project In Plastics II

Course ID: 4206

Course Details: Continuation of 26.500.

Max Credits: 3

Min Credits: 3

26.503 Mechanical Behavior of Polymers

Course ID: 1260

Course Details: Topics covered in this course include linear viscoelasticity, creep, stress relaxation, dynamic behavior, hysteresis, stress-strain response phenomena, principles of time-temperature superposition, rubber elasticity, failure and fracture mechanisms for polymers, and the effect of additives on mechanical behavior. Real life design examples are used to demonstrate the topics and concepts as much as possible.

Max Credits: 3

Min Credits: 3

26.506 Polymer Structure Properties & Applications

Course ID: 4210

Course Details: Relationships between polymer structure (chemical composition, molecular weight and flexibility, intermolecular order and bonding, supermolecular structure) and practical properties (processability, mechanical, acoustic, thermal, electrical, optical, and chemical) and applications.

Max Credits: 3

Min Credits: 3

26.509 Plastics Processing Theory I

Course ID: 4213

Course Details: Principles of Rheology and continuum mechanics involved in the processing of plastics, and their applications in plastics process engineering including flows in standard geometries and extrusion applications.

Max Credits: 3

Min Credits: 3

26.510 Plastics Processing Theory II

Course ID: 4214

Course Details: A continuation of Theory I using the transport phenomena approach to analyze and describe plastics conversion processes, including roll processing blown film extrusion, injection molding, and mixing.

Max Credits: 3

Min Credits: 3

26.511 Polymer Blends

Course ID: 4215

Course Details: Physical, mechanical, and thermal properties, preparation, and testing of polymer blends, alloys, and multiphase systems. Thermodynamic theories and experimental determination of miscibility of polymer blends. Structure property relationships for multiphase systems and interpenetrating networks.

Max Credits: 3

Min Credits: 3

26.512 Porous Polymers

Course ID: 4216

Course Details: Preparation, structure, and properties of porous polymers. Includes both practical systems in development and production and novel techniques of more fundamental interest and/or aimed at more specialized applications. Existing and potential applications for these materials will also be discussed, and related back to their structure and properties.

Max Credits: 3

Min Credits: 3

26.513 New Plastics Materials

Course ID: 4217

Course Details: Critical examination of the new plastics appearing in the research literature and being field-tested for commercialization in the plastics industry.

Max Credits: 3

Min Credits: 3

26.514 Statistics for Six Sigma

Course ID: 4218

Course Details: A review of statistical techniques for Six Sigma with Applications specifically designed for the plastics processing industry. Those completing the course should be at the Six Sigma green belt level or better.

Max Credits: 3

Min Credits: 3

26.515 Lean Plastics Manufacturing

Course ID: 30849

Course Details: Methods of analysis and operation of plastics manufacturing facilities. Topics include: performance measurement, inventory control, forecasting, production planning, scheduling, resource management, supply chains, various technologies for improved productivity.

Max Credits: 3

Min Credits: 3

26.518 Plastics Product Design

Course ID: 4221

Course Details: This course reviews the theoretical principles and the engineering practice associated with the development of new plastic products. The course focuses on design practices for products that will be produced by conventional and advanced injection molding processes. Topics include design methodology, plastic materials selection, design for manufacturing, computer aided engineering, mechanical behavior of plastics, structural design of plastic parts, prototyping techniques, experimental stress analysis, and assembly techniques for plastic parts.

Max Credits: 3

Min Credits: 3

26.522 Advanced Project in Plastics IV

Course ID: 4225

Course Details:

Max Credits: 3

Min Credits: 3

26.524 Process Analysis Instrument and Control

Course ID: 4227

Course Details: Industrial instruments for measurement and control of plastics processes. Design of experiments. Analysis of plastics forming operations. Dynamic testing techniques. Automatic plastics process control. Data acquisition systems, SPC/SQC and Taguchi methods.

Max Credits: 3

Min Credits: 3

26.528 Plastics Informaton Data Bases

Course ID: 4230

Course Details: Review of procedures for literature searching, databases, etc.

Max Credits: 1

Min Credits: 1

26.530 Selected Topics

Course ID: 4232

Course Details: Topics in various fields of Plastics Engineering. Content may vary from year to year so that students may, by repeated enrollment, acquire a broad knowledge of contemporary Plastics Engineering.

Max Credits: 3

Min Credits: 3

26.532 Adhesives and Adhesion

Course ID: 4234

Course Details: Adhesive joining of engineering materials. Surface chemistry, theories of adhesion and cohesion, joint design, surface preparation, commercial adhesives, Rheology, equipment, testing, service life, and reliability.

Max Credits: 3

Min Credits: 3

26.533 Coatings Science and Technology I

Course ID: 4235

Course Details: This course reviews the basic principles of design and formulation of waterborne, high-solids, powder resins used for the development of solvent-less "green" coatings and the use of bio-derived resins, mostly based on soybean oil and other renewable raw materials. The mechanisms and methods of curing and of polymerization for polymers used as coatings will also be covered.

Max Credits: 3

Min Credits: 3

26.534 Coatings Science and Technology II

Course ID: 4236

Course Details: A continuation of 26.533. This graduate course reviews the basic principles of design and formulation of waterborne, high-solids, powder resins that meet current manufacturing regulations. Rheology of polymer and pigment dispersion, and their application to coatings, inks and adhesives will be included here..

Max Credits: 3

Min Credits: 3

26.535 Rubber Technology

Course ID: 4237

Course Details: Polymerization and compounding of the commercial elastomers. Properties and test methods. Leading applications and methods of processing.

Max Credits: 3

Min Credits: 3

26.537 Business Law for Engineers

Course ID: 30847

Course Details: Business legal issues engineers encounter in practice, including contractual, products liability, and intellectual property issues. Business torts relating to product design, manufacturing and inadequate warning defects. Unreasonably dangerous products

and strict liability.

Max Credits: 3

Min Credits: 3

26.540 Commercial Development of Plastics

Course ID: 4241

Course Details: The concepts of industrial marketing will be reviewed for research, pricing strategies, and product planning for market segmentation, place (distribution)-promotional activities. Topics will include creating a demand, selling, and servicing base resins and additives.

Max Credits: 3

Min Credits: 3

26.541 Computer Applications in Plastics

Course ID: 4242

Course Details: Problem solving in plastics engineering has been dramatically influenced by the computer and innovative software packages. This graduate course will focus on the application and development of software packages for engineering analyses of plastics processes. Specially, the course will cover the basic CAD programs, Pro/ENGINEER, SOLIDWORKS, followed by basic Pre- and-Post processor software, FEMAP, meshing program HYPERMESH, FEMLAB multiphysics, and MATHEMATICA.

Max Credits: 3

Min Credits: 3

26.542 Colloidal Nanoscience and Nanoscale Engineering

Course ID: 1259

Course Details: This course will cover the fundamentals of nanoscale colloidal processes, intermolecular forces and electrostatic phenomena at interfaces, boundary tensions and films at interfaces, electrostatic and London forces in disperse systems, interactions and self-assembly of polymer colloids, nanoparticles, surfactants and biomolecules. Applications include microfluidics; lab-on-a-chip; nano-biocolloids, vesicles, colloidosomes, polymersomes and polymer hydrogel microcapsules for drug delivery and nanostructured materials and devices.

Max Credits: 3

Min Credits: 3

26.544 Advanced Plastics Materials

Course ID: 4243

Course Details: This course reviews the historical developments of polymeric material systems, commodity, engineering, biodegradable, and high performance thermoplastics. Topics include their synthesis, structure, properties, and applications and there is also an overview of typical additives that are used to modify the properties of plastics. Knowledge of general and/or organic chemistry is recommended as a prerequisite for this course. .

Max Credits: 3

Min Credits: 3

26.545 Additives for Polymer Materials

Course ID: 4244

Course Details: Additives incorporated into polymers to modify processing and end-use properties: reinforcements, plasticizers, stabilizers, flame retardants, colorants, biostats, blowing agents, anti-stats, impact modifiers, and processing aids.

Max Credits: 3

Min Credits: 3

26.547 Materials for Renewable Energy and Sustainability

Course ID: 4246

Course Details: This course reviews the selection and design of materials for use in energy generation and conservation applications. Both traditional and renewable technologies for energy generation are reviewed, and the differences in materials needs for generation, storage and transmission highlighted. Particular emphasis is placed on organic and polymeric materials technological challenges in solar, wind and hydro/geothermal energy and future transportation fuel production. The concept of life cycle assessment is introduced for the optimization of systems from a materials science perspective. The impacts of global economics, ethics and efficiency are also addressed. The course approaches sustainability as an open-ended, complex engineering problem and introduces students to the broad range of career opportunities for materials engineers in renewable energy.

Max Credits: 3

Min Credits: 3

26.548 Analytical and Numerical Methods in Plastics Processing

Course ID: 4247

Course Details: This course covers the use of analytical and numerical methods related to engineering. Topics include ordinary differential equations, linear second order differential equations, matrices, vectors, linear systems of equations, partial differential equations. Use of numerical methods to differential equations, linear algebra, regression, interpolation, data analysis, and partial differential equations.

Max Credits: 3

Min Credits: 3

26.549 Product Design for Elastomers

Course ID: 4248

Course Details: This course covers the basics of thermoset and thermoplastic elastomer product design. Topics include mechanical behavior, large deformation structural analysis, design for manufacturability, performance limitations, and end use applications for elastomers and assembly considerations.

Max Credits: 3

Min Credits: 3

26.550 Processing with Elastomers

Course ID: 4249

Course Details: This course covers the basics of elastomer processing. Topics include mixing, Rheology, extrusion, injection molding, compressing molding, and curing as it applies to elastomers.

Max Credits: 3

Min Credits: 3

26.551 Extrusion Die Design

Course ID: 4250

Course Details: This is a project-oriented course which utilizes current CAE programs to design extruder dies. This course will study the basic principles of extrusion die design and apply these principles in designing extrusion dies. A review of the extrusion process and the flow behavior of various polymers will be studied.

Max Credits: 3

Min Credits: 3

26.553 Medical Device Design I

Course ID: 4252

Course Details: A systematic approach to inventing new medical devices. The class details the process of validating medical needs including market assessment and the evaluation of existing technologies; basics of regulatory (FDA) and reimbursement planning; brainstorming and early prototyping for concept creation. Course format includes expert guest lecturers and interactive practical discussions with faculty. Students will prepare a medical device proposal and presentation.

Max Credits: 3

Min Credits: 3

26.554 Medical Device Design II

Course ID: 4253

Course Details: This course focuses on how to take a medical device invention forward from early concept to technology translation and implementation planning. Topics include technology research & development; patent strategies; techniques for analyzing intellectual property; advanced planning for reimbursement and FDA approval; choosing translation strategies (licensing vs. start-up); ethical issues including conflict of interest; fundraising approaches and cash requirements; essentials of writing a business or research plan; strategies for assembling a development team. Students will prepare a final medical device proposal and presentation.

Max Credits: 3

Min Credits: 3

26.563 Current Topics in Plastics Materials I

Course ID: 4262

Course Details: Individual research and presentation in the field of plastics materials.

Max Credits: 1

Min Credits: 1

26.564 Current Topics in Plastics Materials II

Course ID: 4263

Course Details: Individual research and presentation in the field of plastics materials.

Max Credits: 1

Min Credits: 1

26.565 Thermosets

Course ID: 31944

Course Details: Provides an in-depth review of the major families of engineering thermosetting resins: phenolics, amines, polyesters, epoxies, silicones, and various polyurethanes systems. Emphasis is on the basic chemistry, inherent physical properties and processability, and the effect of polymer modifiers (additives) on the functional properties of molding compounds. Typical market sectors served and related processing/fabrication technologies used in reinforced plastics/composites are reviewed.

Max Credits: 3

Min Credits: 3

26.566 Polymer Materials Systems Solution

Course ID: 4264

Course Details: This course investigates the selection processes to be followed in screening material candidates, and specifying a material of record. Emphasis is placed on prioritizing performance requirements, contrasting potential candidates, reviewing processing demands, and post-fabrication schemes. The course will be based on actual case studies.

Max Credits: 3

Min Credits: 3

26.568 Dynamic Mechanical Properties II

Course ID: 4266

Course Details: Practical review of theoretical concepts of rheological measurements with practical applications of experimental techniques. Emphasis will be on the viscoelastic properties of polymer solutions, melts, and solids with correlation with theoretical dynamic mechanical behavior.

Max Credits: 3

Min Credits: 3

26.569 Current Topics in Plastics Design I

Course ID: 4267

Course Details: Individual research and presentation in the field of plastics design.

Max Credits: 1

Min Credits: 1

26.570 Current Topics in Plastics Processing I

Course ID: 4268

Course Details: Individual research and presentation in the field of plastics processing.

Max Credits: 1

Min Credits: 1

26.572 Advanced Plastics Processing Engineering Laboratory

Course ID: 4270

Course Details:

Max Credits: 1

Min Credits: 1

26.574 Advance Physical Properties Lab

Course ID: 4272

Course Details: Measurement of mechanical properties in tension, compression, shear, and flexure; dielectric constant and dissipation factor; thermal behavior under stress; melt rheology.

Max Credits: 1

Min Credits: 1

26.575 Biomaterials I

Course ID: 4273

Course Details: A comprehensive study of the history, current and future trends within biomedical devices and their applications. Students will be introduced to research techniques used to analyze the different classes of biomaterials. An overview of typical host reactions such as inflammatory response and their evaluation will be touched upon.

Max Credits: 3

Min Credits: 3

26.576 Advanced Mold Design

Course ID: 4274

Course Details: This course provides an integrated approach to mold engineering which includes the interrelationships of polymeric materials, engineering principles, processing, and plastics product design. Major topics include cost estimation, mold layout and feed system design, cooling systems, structural design considerations, and ejector system design. Analytical treatment of the subject matter is given based on the relevant rheology, thermodynamics, heat transfer, fluid flow and strength of materials.

Max Credits: 3

Min Credits: 3

26.577 Plastics Process Engineering I

Course ID: 1256

Course Details: The first course in a two semester sequence to study the fundamental principles of polymer processing, i.e., the conversion of the polymeric materials into useful articles. The course will first study the properties of polymers (bulk and rheological and thermal properties) and why they are important to understanding polymer processing. This course will emphasize the fundamental principles of the extrusion process and examine the correlation between elements of the extruder, polymer properties, and processing variables and why they all must be considered when studying and understanding a plastics processing technique.

Max Credits: 3

Min Credits: 3

26.578 Advanced Plastics Processing

Course ID: 4275

Course Details: This course reviews the common plastics manufacturing processes, including extrusion, injection molding, blow molding, thermoforming, and rotational molding. After the review, the course focus shifts to the impacts of screw design and processing parameters on the conveyance, melting, devolatilization, and mixing with single screws and compounding with twin screw extruders. This course also includes an overview of die designs, multi-shot and gas assist injection molding, film stretching and methods for heating and cooling in plastics processing.

Max Credits: 3

Min Credits: 3

26.579 Problems In Biomaterials/Directed Study

Course ID: 4276

Course Details: Selection of a current biomaterial problem of interest by the individual student, examination of pertinent literature to determine present knowledge in the area, formulation of an approach to resolve or clarify the issues involved, and (time permitting) work towards the solution of the selected problem.

Max Credits: 3

Min Credits: 3

26.582 Current Topics in Plastics Design II

Course ID: 4279

Course Details: Individual research and presentation in the field of plastics product or tooling design.

Max Credits: 1

Min Credits: 1

26.583 Advanced Research Methodology

Course ID: 4280

Course Details: A systematic evaluation of the techniques used in efficient research and development. Experimental data are analyzed and plotted using a mathematical approach. Creative thinking, problem solving, and student presentation of data are stressed. Extensive reading of research papers, analysis of such, and defense of the analysis required.

Max Credits: 3

Min Credits: 3

26.585 Computer Aided Engineering I

Course ID: 4282

Course Details: This course provides a fundamental approach to computer-aided engineering for plastics processing. Emphasis is upon the theory and techniques of computer aided engineering as applied to plastics processing problems, allowing students to understand the various assumptions and methods used to create the programs.

Max Credits: 3

Min Credits: 3

26.589 Polymer Nanocomposites

Course ID: 34581

Course Details: This course deals with the preparation, characterization, behavior and properties of polymer nanocomposites, with an emphasis on the most commercially relevant systems to date, as well as new developments in the field. The major preparation routes to these materials are discussed, with an emphasis on the importance not only of dispersion but of true thermodynamic compatibility in these systems. From there, the focus shifts to describe the consequences of nanocomposite structure in terms of both molecular behavior and macroscopic properties, as informed by the most up-to-date research literature available. Case studies of specific systems will serve as opportunities to gain deeper understanding, and the safety issues surrounding nanoparticle handling will also be presented. Finally, current research by invited lecturers working in the field will be presented as time permits.

Max Credits: 3

Min Credits: 3

26.590 Survey of Intellectual Property

Course ID: 4285

Course Details: A review of patents, trademarks, copyrights and their application for protection of technology in the plastics industry. Other topics to be considered will be employee rights/non-competition agreements, foreign protection, and technology licensing. (in the Plastics Industry)

Max Credits: 3

Min Credits: 3

26.591 Industrial Thesis Development I

Course ID: 4286

Course Details: Enables graduate students to work part-time to compliment academic studies with practical industrial experience and acquire/enhance expertise in their research as well as thesis investigation.

Max Credits: 0

Min Credits: 0

26.593 Cooperative Education

Course ID: 4288

Course Details: Enables graduate students to work full time to gain practical industrial experience for one semester while on reduced course load.

Max Credits: 1

Min Credits: 1

26.595 Thermoplastic Elastomers

Course ID: 4290

Course Details: A comprehensive review of thermoplastic elastomer (TPE) technology. Physical and chemical nature of the various classes of TPE's will be considered with emphasis on mechanical and rheological properties relevant to engineering applications.

Max Credits: 3

Min Credits: 3

26.596 Plastics, Elastomers and Additives from Renewable Resources

Course ID: 33604

Course Details: This course will provide an introduction to plastics, elastomers and additives obtained from renewable resources. Processes that involve conversion (chemically/enzymatically) of naturally occurring precursors (monomers) obtained from renewable

resources to plastics and elastomers will be reviewed. Brief discussion of processing, degradation and recycling of these materials will also be included.

Max Credits: 3

Min Credits: 3

26.601 Graduate Industrial Coop Education I

Course ID: 4295

Course Details: Graduate students interested in developing a practical industrial experience component to complement their academic training may register for this course with advisor's approval. This credit is not applicable to the mandated degree credit hours.

Max Credits: 3

Min Credits: 1

26.606 Plastics Manufacturing Systems Engineering

Course ID: 35172

Course Details: The course provides guidance about plastics manufacturing as an integrated system with broadly applicable analysis in three areas: 1) machinery, 2) controls, and 3) operations. The machinery topics include heating/cooling, hydraulics/pneumatics, electric drives, and sensors. The controls topics include signal conditioning, data acquisition, machine controllers, and related control laws. The operations topics include process characterization, process optimization, quality control, and automation. The course is developed to support plastics processing engineers and others involved with plastics manufacturing who are performing process development, research, and machine design.

Max Credits: 3

Min Credits: 3

26.607 Supply Chain Management for Engineers

Course ID: 37379

Course Details: This course focuses on design, development, and planning supply chain networks while examining the product's life cycle with an emphasis of the manufacturing processes. Throughout the course, global supply chain management, supply chain drivers, distribution networks, network design under uncertainty, supply-demand cycle, demand forecasting, inventory management, supply chain performance, end-of-life, cradle-grave and cradle-cradle products, along with supply chain decision-making topics will be covered. These topics will be demonstrated with the implementation of examples, and case studies.

Max Credits: 3

Min Credits: 3

26.610 Plastics Industry Development

Course ID: 35816

Course Details: The goals of this course are numerous. In the large sense, the primary focus of this course will be to review many of the major technological developments and discoveries that have helped make the plastics industry what it is today. Having a thorough understanding of how these developments were implemented commercially can help us implement modern day technologies in a more efficient and productive manner.

Max Credits: 3

Min Credits: 3

26.618 Structural Product Design

Course ID: 37683

Course Details: Design of plastic and composite products to meet structural requirements including strength, stiffness, impact, fatigue, and creep while remaining low weight, low cost, and easy to manufacture. The course will include an overview of structural properties of polymeric materials as well as application of finite element analysis to homework and project assignments.

Max Credits: 3

Min Credits: 3

26.650 Nanoscale Transport Phenomena for Manufacturing Nanodevices

Course ID: 4300

Course Details: An interdisciplinary course taught by faculty from the Chemical, Mechanical and Plastics Engineering Department, who have special knowledge in nanoscale fluid mechanics and heat transfer. The course on nanoscale transport phenomena constitutes a bridge between existing fluid and heat transfer courses in multiple disciplines and emerging nanoscale science and engineering concepts to reflect the forefront of nanomanufacturing. The course is designed to incorporate recent advances in manufacturing polymer based nanodevices. Key issues of the implementation and maintenance cost for fabrication will be addressed. Hands-on laboratory experiments will be performed to complement the lectures with the ultimate goal of designing and building a complete nanodevice at the end of the course. The course will prepare graduates for employment focused on designing and manufacturing nano/microfluidic systems, lab on ship devices, electronic devices, medical devices and other emerging technologies.

Max Credits: 3

Min Credits: 3

26.675 Biomaterials II

Course ID: 34943

Course Details: The degradation of biomaterials in the biological environment for applications such as sutures, orthopedic implants, dental implants, etc. will be reviewed. Students will analyze issues unique to the field of implants, devices and biomaterials. While reviewing new products and standards, the prospective and possibilities of biomaterials will be studied.

Max Credits: 3

Min Credits: 3

26.741 Master's Thesis - Plastics Engineering

Course ID: 4333

Course Details:

Max Credits: 1

Min Credits: 1

26.743 Masters Thesis Plastics Engineering

Course ID: 4334

Course Details: Individual research projects in plastics.

Max Credits: 3

Min Credits: 3

26.746 Master's Thesis - Plastics Engineering

Course ID: 4336

Course Details: Individual research projects in plastics.

Max Credits: 6

Min Credits: 6

26.749 M S Grad Res Plastics

Course ID: 4337

Course Details: Individual research projects in plastics.

Max Credits: 9

Min Credits: 9

26.753 Doctoral Dissertation/Plastics Engineering

Course ID: 4340

Course Details: Individual research projects in plastics.

Max Credits: 3

Min Credits: 3

26.756 Doctoral Dissertation/Plastics Engineering

Course ID: 4342

Course Details: Individual research projects in plastics.

Max Credits: 6

Min Credits: 6

26.759 Doctoral Dissertation/Plastics Engineering

Course ID: 4345

Course Details: Individual research projects in plastics.

Max Credits: 9

Min Credits: 9

26.763 Continued Graduate Research

Course ID: 4346

Course Details: Individual research projects in plastics.

Max Credits: 3

Min Credits: 3

26.766 Continued Graduate Research

Course ID: 4347

Course Details: Individual research projects in plastics.

Max Credits: 6

Min Credits: 6

26.769 Continued Graduate Research

Course ID: 4349

Course Details: Individual research projects in plastics.

Max Credits: 9

Min Credits: 9

29.759 Doctoral Research - Plastics Engineering

Course ID: 4438

Course Details:

Max Credits: 3

Min Credits: 3

30.550 Human Development and Pathophysiology

Course ID: 4469

Course Details: The physiological steady state of the human body and disruptions that result over the life span will be examined as well as the pathophysiological mechanism manifested in disease states. The course addresses defense, compensating, and adaptive responses to the pathophysiological processes as they apply to the various systems rather than being a survey course of diseases.

Max Credits: 3

Min Credits: 3

30.577 Health Disparities in a Global Economy

Course ID: 36775

Course Details: This course examines the impact of a global economy on health disparities and the impact of health on global economic sustainability. The interconnectedness of health across nations and regions in a global economy presents new challenges. The growing health disparities between wealthy and poor countries will be analyzed. Students will be encouraged to anticipate future health challenges in an expanding global economy and propose solutions to the growth of global health disparities. Cross cultural understanding of the environmental and economic impact on health disparities of the world's populations will be analyzed, including access to quality, affordable health care.

Max Credits: 3

Min Credits: 3

30.614 Health Care Management

Course ID: 4473

Course Details:

Max Credits: 3

Min Credits: 3

31.514 Program Management in Health

Course ID: 1253

Course Details: The concepts of program planning, development, budgeting and evaluation, which are essential functions for individuals working in health care agencies, are presented. Starting with the mission of the organization, the steps of conceptualizing, designing, implementing, budgeting and evaluating health programs are covered. Students will be expected to develop a grant proposal for an agency. This course is a capstone experience and resources from all other relevant coursework will be called upon. Seniors only.

Max Credits: 3

Min Credits: 3

32.502 Organizational Behavior in Health Care

Course ID: 33039

Course Details: An overview is provided of the organizational structure & behavior of individuals in health care institutions and an examination of the role of managers, clinicians and other leaders is provided.

Max Credits: 3

Min Credits: 3

32.504 Health Data Analysis

Course ID: 33128

Course Details: This course focuses on the application of both descriptive and inferential statistical techniques to the analysis of health care data. Students will learn how to a) formulate research questions and hypotheses answerable through quantitative data analysis, b) use computer software (Statistical Package for The social Sciences, SPSS) and an online Probability Calculator to analyze data, and c) interpret the meaning of statistical findings. Areas covered include graphs, measurement, normal distribution, hypothesis testing, t tests, ANOVA, correlation and regression, and chi-square. Emphasis is on using weekly SPSS assignments to analyze research questions using a sample data base from the Framingham Heart Study. Prerequisite: an elementary statistics course.

Max Credits: 3

Min Credits: 3

32.506 Quantitative Methods in Health Management

Course ID: 34589

Course Details: This course focuses on the application of statistical techniques to management of health care information, including descriptive data and statistical inference. SPSS, Statistical Package for the Social Sciences is used for data analysis. Pre-requisite: An elementary statistics course.

Max Credits: 3

Min Credits: 3

32.511 Health Care Finance

Course ID: 33042

Course Details: This course provides students with a practical understanding of basic health care financial issues, financial reporting and analysis, and provider payment structures. The course enables students to read, analyze and use health care financial information in today's healthcare environment.

Max Credits: 3

Min Credits: 3

32.512 Operations Analysis for Quality Improvement

Course ID: 33483

Course Details: This course presents an interdisciplinary approach to quality management in health care, including disciplines such as operations management, organizational behavior, and health services research. We focus on improving performance and patient safety in a variety of health-related organizations, including hospitals, public health departments and pharmaceutical companies.

Max Credits: 3

Min Credits: 3

32.514 Health Care Management

Course ID: 33130

Course Details: This course provides a framework for addressing management problems in health care organizations. It provides students with an overview of the manner in which health care institutions are organized and governed, the role of management, physicians, nurses and other clinical and support staff in these organizations, and the management systems designed for their efficient and effective operation.

Max Credits: 3

Min Credits: 3

32.515 Applied Health Economics

Course ID: 33127

Course Details: This course introduces graduate students to the theory, practice and application of health economics to contemporary health policy issues in the United States. No prior coursework in economics is assumed.

Max Credits: 3

Min Credits: 3

32.527 Healthcare Planning and Marketing

Course ID: 33041

Course Details: Students learn the fundamentals of planning and marketing and how they are applied to the different aspects of the health care system.

Max Credits: 3

Min Credits: 3

32.531 Health Informatics

Course ID: 33129

Course Details: Introduces the student to how health science (theory and practice), computer science (hardware) and information science (software) are integrated in the management of health care data into information and knowledge. Overview of current and future technologies for the management of health care information will be presented. Comparisons of how different health care facilities manage information will be discussed. Prerequisite Ability to use a computer and application software.

Max Credits: 3

Min Credits: 3

32.593 Independent Study

Course ID: 34586

Course Details:

Max Credits: 9

Min Credits: 1

32.606 Quantitative Methods Health Services

Course ID: 4506

Course Details:

Max Credits: 3

Min Credits: 3

32.607 Healthcare Information Systems

Course ID: 4507

Course Details: This course provides health care professionals with a practical understanding of health care information systems sufficient to work effectively with and support information systems design, development and implementation within a variety of health care settings. The course includes analysis and discussion of actual case examples.

Max Credits: 3

Min Credits: 3

32.616 Law and Ethics in Healthcare

Course ID: 4513

Course Details: The course considers ethics and law in the management of health care institutions and public health. Ethics is considered with a focus on the ethical and legal issues facing health care managers and public health personnel. Law is approached as an important element in defining public health and as an instrument to achieve goals in public health and health care delivery. Topics include; an introduction to ethics, and the legal basis of health care management and public health practices. Topics range from HIPPA, fair employment practices, to the allocation of scarce resources in communities and organizations. The course provides an opportunity to apply these concepts to particular students interests in public health and health care management.

Max Credits: 3

Min Credits: 3

32.625 Health Policy

Course ID: 4520

Course Details: Provides students with a framework for policy analysis and examines major strands of U.S. health policy. Detailed consideration and discussion of the relationship of national policy to the planning, implementation and funding of health care services.

Max Credits: 3

Min Credits: 3

32.626 Leadership and Change

Course ID: 4521

Course Details: The strategic planning and management of health care organizations is covered. Development and implementation of strategic plans is covered. Alternative theories of organizations and change are explored. The capstone experience for the major.

Max Credits: 3

Min Credits: 3

32.627 Socioeconomic Inequalities in Health

Course ID: 4522

Course Details: The course explores the relationship between social and economic justice and public health. Focusing primarily on the U.S., the forces that either establish and exacerbate or prevent socioeconomic inequities will be analyzed to understand the intricate links between social, behavioral, physical, and biological determinants of health. Several theoretical orientations will be reviewed in order to better understand how each frames research and public health strategies that have been used to address health inequalities. Students will be able to competently articulate the relationships between social and health inequalities. They will be able to explain the strengths and limitations of different theoretical orientations to these issues and frame the policy needs to positively reduce health disparities.

Max Credits: 3

Min Credits: 3

32.632 Health Information System Planning

Course ID: 4527

Course Details: A study of existing health care system requirements and the design and implementation of modifications or new systems. Actual or hypothetical health care system related projects will be used to support the theoretical framework. Prerequisite 32.607.

Max Credits: 3

Min Credits: 3

32.633 Healthcare Database Design

Course ID: 4528

Course Details: Theoretical understanding of major DBMS models and associated systems, query languages and design of DBMS systems will be covered. MS Access will be used to enhance understanding of the theoretical concepts presented.

Max Credits: 3

Min Credits: 3

32.634 Healthcare Database Development

Course ID: 34791

Course Details: The course is designed to introduce the student to as Relational Database Management System (RDBMS) used to create and manage a Database. Students will use the database designed in 32.633 Healthcare Database Design to develop a working database system that can be used to manage data. No prior knowledge of a particular RDBMS application is required.

Max Credits: 3

Min Credits: 3

32.635 Healthcare Project Management

Course ID: 35735

Course Details: This is a graduate level course providing a comprehensive foundation to Project Management as it applies to healthcare. Students will be introduced to the theory and concepts of project management as it is applied to healthcare projects

specifically, and the tools used to manage projects with a specific focus on healthcare information.

Max Credits: 3

Min Credits: 3

32.638 Strategic Planning in Healthcare and HIT (Health Information Technology)

Course ID: 36675

Course Details: A graduate-level course introducing healthcare professionals to strategic planning for the information systems organization. The concepts are taught in a manner that allows the skills learned to be applied to any discipline with the organization.

Max Credits: 3

Min Credits: 3

32.639 Electronic Health Record Systems

Course ID: 37456

Course Details: The course addresses Electronic Health Records (EHR) integration with patient care flow, clinical decision making and patient engagement, as well as clinical quality reporting. The students also learn core EHR functions. The course uses industry-leading EHR software as a learning tool to demonstrate how electronic health record technologies are used in a clinical setting.

Max Credits: 3

Min Credits: 3

32.671 Comparative Health Systems

Course ID: 33719

Course Details: The course explores and compares national health systems (public health and healthcare). Each will be examined to understand its orientation and capacity to promote health, prevent morbidity and premature mortality, and provide primary healthcare for all. Analysis will address the political, economic, and social contexts within which the system functions, as well as their underlying principles. Systems will include the U.S., European nations, and developing nations from Latin America, Asia, and Africa. Criteria put forward in health promotion charters and declarations developed through World Health Organization sponsored meetings will be used to assess each system's strengths and limitations. Students will be able to competently articulate the principles, criteria for effectiveness, and policies and practices that can establish successful achievement of strong international public health indicators as a foundation for sustainable social development.

Max Credits: 3

Min Credits: 3

32.672 Socioeconomic Inequalities and Health

Course ID: 33720

Course Details: The course explores the relationship between social and economic justice and public health. Focusing primarily on the U.S., the forces that either establish and exacerbate or prevent social inequities will be analyzed to understand the intricate links between social, behavioral, physical, and biological determinants of health. Several theoretical orientations will be reviewed in order to better understand how each frames research and public health strategies that have been used to address health inequalities. Students will be able to competently articulate the relationships between social and health inequalities. They will be able to explain the strengths and limitations of different theoretical orientations to these issues and frame the policy needs to positively reduce health disparities. Permission of instructor.

Max Credits: 3

Min Credits: 3

32.705 Supervised Teaching Health Services Administration

Course ID: 4532

Course Details:

Max Credits: 0

Min Credits: 0

32.733 Capstone Project

Course ID: 4533

Course Details: Each student is required to complete a thesis or project under the supervision of a faculty member. The project is intended to integrate the concepts and skills learned in previous courses, should be original, and make a contribution to the field. Thesis must meet the requirements of the Graduate School and receive permission of the coordinator.

Max Credits: 3

Min Credits: 3

32.743 Master's Thesis

Course ID: 4536

Course Details: Each student is required to complete a thesis or project under the supervision of a faculty member. The project is intended to integrate the concepts and skills learned in previous courses, should be original, and make a contribution to the field. Thesis must meet the requirements of the Graduate School and receive permission of the coordinator.

Max Credits: 3

Min Credits: 3

32.763 Continued Graduate Research

Course ID: 4537

Course Details:

Max Credits: 3

Min Credits: 3

32.775 Capstone/Thesis Review

Course ID: 35254

Course Details:

Max Credits: 1

Min Credits: 1

32.776 CPT Co-op

Course ID: 35276

Course Details:

Max Credits: 1

Min Credits: 0

33.522 Independent Study Health Promotion

Course ID: 4574

Course Details: Health Promotion gerontological clinical practicum is designed to be taken as a co-requisite to 33:611 Gerontological Nursing II didactic, in which the student focuses on comprehensive assessment and diagnosis of health problems in older adults with complex, multi-system health issues. Students utilize evidence-based research to design, implement and evaluate intervention strategies to promote optimum functioning and wellness. Pharmacological and complementary therapies are applied. Client teaching is included.

Max Credits: 3

Min Credits: 1

33.552 Social, Cultural and Policy Issues in Health Care

Course ID: 4575

Course Details: This course links health and illness to other central domains of life: gender, kinship, and culture within the context of the family, community and the current health care system. It draws on concepts from the social, health, and policy sciences to critically examine factors relating to health and health-seeking behaviors across the life course. Ethical dimensions of health policy formation and implementation are analyzed.

Max Credits: 3

Min Credits: 3

33.554 Palliative and End of Life Nursing Care

Course ID: 33172

Course Details: Through didactic, discussion and field experiences, participants in this course explore research and theory related to death, dying, grief, bereavement, and end-of-life-care throughout the lifespan. Personal, professional, cultural, and ethical barriers and facilitators to the provision of palliative care will be examined using a holistic approach. Comfort and restorative care will be considered within the context of the family and the community in a variety of settings where palliative care is provided.

Max Credits: 3

Min Credits: 3

33.558 Geropsychiatric and Mental Health Nursing

Course ID: 30343

Course Details: The focus of this course is on the nursing care of older adults with psychiatric and mental health problems. This course promotes a holistic approach to mental health care of older adults within the community and long-term care setting. Nursing implications of psychopharmacology, behavioral, and complementary interventions will be discussed. Community resources for older adults with psychiatric and mental health problems will be explored.

Max Credits: 3

Min Credits: 3

33.559 Advanced Pharmacology

Course ID: 4577

Course Details: This nursing course focuses on clinical pharmacology and the mechanisms of drug action which determine therapeutic efficacy in clinical practice. Content includes basic pathophysiology, clinical pharmacology and monitoring parameters and standards of practice. Emphasis is given to implications of patient safety, patient diversity and patient teaching.

Max Credits: 3

Min Credits: 3

33.600 Theoretical Foundations for Advanced Nursing Practice

Course ID: 4578

Course Details: Course focuses on the analysis, critique, and application of theory as a basis for advanced practice nursing. Relationships among theories, research, and nursing practice are emphasized.

Max Credits: 3

Min Credits: 3

33.601 Research for Evidence-Based Practice

Course ID: 4579

Course Details: Course focuses on the critique of research studies for the purpose of determining implications for evidence-based practice. The research process will be applied to researchable nursing problems. The role of frameworks, ethics, research designs, sampling theory, and measurement strategies are emphasized.

Max Credits: 3

Min Credits: 3

33.602 Clinical Psychopharmacology

Course ID: 32567

Course Details: This survey course aims to educate advanced practice nurses for safe and effective prescribing practices in the treatment of psychiatric illnesses. The course utilizes a symptom management framework that integrates concepts from normative psychobiology with pathophysiology of the psychiatric diseases. From this perspective, emphasis is placed on gaining a fundamental understanding of the hypothesized complement between the pathophysiologic basis of the disease state and mechanism of action of the drug treatment as a basis for rational selection of pharmacologic treatment. Current standards of practice and treatment algorithms are emphasized in helping the student to develop a working knowledge of psychopharmacology for the practice arena.

Max Credits: 3

Min Credits: 3

33.603 Psychopharmacology and Related Psychobiology

Course ID: 33009

Course Details: This course aims to familiarize the student with current theory and practice related to adult psychopharmacology. Particular attention is paid to current standards of practice, practice guidelines and evidence-based approaches to the use of the range of psychtherapeutic agents that are used in the treatment of psychiatric disorders. The course will orient the student to current psychobiological theory related to the hypothesized effects of psychopharmacologic drugs used in the treatment of psychiatric disease.

Max Credits: 3

Min Credits: 3

33.610 Adult Gerontological Nursing I

Course ID: 4580

Course Details: Focus is on health promotion and biopsychosocial wellbeing of older adults from diverse cultures. Utilizing current scientific research, physical/natural sciences, social sciences, and the humanities, implications for advanced nursing interventions and health policy are identified. Principles of pharmacology and pharmacological therapies related to the older adult are addressed.

Max Credits: 4

Min Credits: 4

33.611 Adult/Gerontological Nursing II

Course ID: 4581

Course Details: The focus of this course is on the advanced practice nursing role in the holistic assessment and management of health problems of the adult with a special focus on older adults within a family and community context. Evidence-based strategies to prevent and treat common health problems and to maintain and promote health through the application of advanced knowledge, theory, relevant research and critical decision making are emphasized. Community resources, pharmacological therapies, and complementary strategies are addressed.

Max Credits: 4

Min Credits: 4

33.612 Adult/Gerontological Nursing III

Course ID: 4582

Course Details: This capstone course builds on the adult/gerontological nursing curriculum of the previous three semesters. Issues related to health care policy and legislation relative to their impact on the role of the nurse practitioner within primary care are analyzed. Advanced knowledge of the management of complex health issues is integrated in nursing practice. Transition to the role of the advanced practice nurse is examined and actualized through an intensive, precepted, clinical experience.

Max Credits: 4

Min Credits: 4

33.613 Adult Gerontological Nursing Practicum I

Course ID: 4583

Course Details: This course focuses on promotion of biopsychosocial well-being of older adults through comprehensive assessment of health, the diagnosis of age-related changes and health problems, and the design, implementation and evaluation of pharmacologic and complementary intervention strategies. The application of scientific knowledge, theory and research finding to clinical practice is emphasized. The utilization of current clinical technologies is introduced.

Max Credits: 3

Min Credits: 3

33.614 Gerontological Nursing Practicum II

Course ID: 4584

Course Details: The focus of this course is on the comprehensive assessment and diagnosis of health problems in adults and in older adults with complex, multisystem health issues. Students utilize evidence-based research to design, implement, and evaluate intervention strategies to promote optimum functioning and wellness. Pharmacological and complementary therapies are applied.

Max Credits: 3

Min Credits: 3

33.620 Adult Psychiatric-Mental Health Nursing I

Course ID: 4587

Course Details: The focus of this course is on health promotion, diagnosis and management of the common psychiatric/mental health issues pertaining to adults from diverse backgrounds. Utilizing current scientific research, students develop skills in analyzing data, differential diagnosis, and developing holistic plans of care that address health promotion, illness prevention and mental health promotion of a wide variety of client populations. Principles of psychopharmacology and psychopharmacological therapies as well as psychotherapy skills are addressed.

Max Credits: 4

Min Credits: 4

33.621 Adult Psychiatric-Mental Health Nursing II

Course ID: 4588

Course Details: This course focuses on the role of the advanced practice psychiatric mental health nurse in assessment and diagnosis of complex psychiatric/mental health problems and the challenges these problems pose to effective health promotion and illness management. The course aims to develop skills in the area of advanced diagnostic reasoning, critical thinking, ethical decision-making and appropriate selection of both pharmacologic and non-pharmacologic therapies appropriate to complex presentations of psychiatric disorders. The course focuses on the needs of adults presenting with acute and chronic psychiatric/mental health problems and explores the interrelationship between physical, psychosocial, spiritual and cultural dimensions of health and illness.

Max Credits: 4

Min Credits: 4

33.622 Adult Psychiatric-Mental Health Nursing III

Course ID: 4589

Course Details: This capstone course builds on Adult Psychiatric/Mental Health Nursing curriculum of the previous three semesters. Issues related to health care policy and legislation relative to their impact on the role of the nurse practitioner/clinical nurse specialist within psychiatric care are analyzed. Advanced knowledge of the management of complex mental health issues is integrated in nursing practice. Transition of the role of the advanced practice nurse is examined, and actualized through an intensive, precepted, clinical experience.

Max Credits: 4

Min Credits: 4

33.623 Adult Psychiatric-Mental Health Nursing Practicum I

Course ID: 4590

Course Details: This course focuses on the health promotion, illness prevention, assessment and treatment of psychiatric/mental health issues. Students engage in comprehensive mental health assessment, clinical decision-making, and intervention strategies to facilitate

health promotion and illness prevention in the care of adults from diverse backgrounds with acute and episodic psychosocial issues and mental health problems. The utilization of current clinical technologies is introduced.

Max Credits: 3

Min Credits: 3

33.624 Adult Psychiatric-Mental Health Practicum II

Course ID: 4591

Course Details: This course focuses on advanced psychiatric-mental health nurses as direct providers of selected services for adults with acute, episodic or chronic psychiatric/mental health problems in a variety of settings. Application and evaluation of concepts, theories, psychotherapeutic and pharmacologic strategies and evidence-based research findings are required. Development of critical decision making skills and interdisciplinary collaboration is emphasized.

Max Credits: 3

Min Credits: 3

33.651 Advanced Health Assessment and Diagnostic Reasoning

Course ID: 4592

Course Details: This course focuses on the development of advanced critical thinking and clinical judgment skills through comprehensive health assessment. Health promotion and health maintenance content, including relevant research findings are utilized to evaluate health status and to evaluate health risk among individuals and groups. Age, gender, and cultural variations in health and implications for advanced practice are included. Advanced practice health assessment skills are developed and refined.

Max Credits: 3

Min Credits: 3

33.660 Family Health Nursing I

Course ID: 4593

Course Details: The focus of this course is on health promotion and management of common health issues pertaining to women and to infants, children and adolescents. Based on current scientific research, students develop skills in analyzing data, differential diagnosis, and developing holistic plans of care that address the health promotion, illness prevention, and primary care needs of a wide-variety of client populations.

Max Credits: 4

Min Credits: 4

33.661 Family Health Nursing II

Course ID: 4594

Course Details: Focus is on the advanced practice nursing role in the holistic assessment and management of health problems of the adult and older adult within a family and community context. Evidence-based strategies to prevent and treat common health problems, and to maintain and promote health through the application of advanced knowledge, theory, relevant research, and critical decision making are emphasized. Community resources, pharmacological therapies, and complementary nursing strategies are addressed.

Max Credits: 4

Min Credits: 4

33.662 Family Health Nursing III

Course ID: 4595

Course Details: This capstone course builds on the family nursing curriculum of the previous three semesters. Issues related to health care policy and legislation relative to their impact on the role of the nurse practitioner within primary care are analyzed. Advanced knowledge of the management of complex health issues is integrated into nursing practice. Transition to the role of the advanced practice nurse is examined and actualized through an intensive, precepted, clinical experience.

Max Credits: 4

Min Credits: 4

33.663 Family Health Nursing Practicum I

Course ID: 4596

Course Details: This course focuses on health promotion, illness prevention and treatment through the comprehensive assessment and management of common health issues of infants, children, adolescents and women in the context of family and social environments. Application of theory, knowledge, and research findings to clinical practice is emphasized. The utilization of current clinical technologies is introduced.

Max Credits: 3

Min Credits: 3

33.664 Family Health Nursing Practicum II

Course ID: 4597

Course Details: This course focuses on the comprehensive assessment and diagnosis of health problems in adults and in older adults with complex, multi-system health issues. Students utilize evidence-based strategies to design, implement, and evaluate interventions to promote optimum functioning and wellness. Pharmacological and complementary therapies are applied.

Max Credits: 3

Min Credits: 3

33.677 Thesis Review

Course ID: 35266

Course Details:

Max Credits: 1

Min Credits: 1

33.681 Nursing Administration I

Course ID: 4604

Course Details:

Max Credits: 3

Min Credits: 3

33.686 Introduction to Clinical Dimensions of Sleep & Chronobiology

Course ID: 35738

Course Details: Through lecture-accompanied slide presentations, readings and web-based assignments, participants in this course will learn about normal sleep and its variations. The human circadian timing system will be explored to understand the physiologic dimensions of sleep and relationship of sleep and wakefulness to environmental cues.

Max Credits: 3

Min Credits: 3

33.687 Diagnosis & Differential Diagnosis across Sleep Disorders

Course ID: 35739

Course Details: Building on knowledge of normative sleep and chronobiology, this course addresses sleep-related pathology. In addition to formal sleep disorder diagnoses covered in the International Classification of sleep Disorders, this course specifically focuses on medical and psychiatric comorbidity related to insomnia and sleep dysregulation: hypertension and cardiovascular disease, obesity, endocrine dysregulation, inflammatory disease, cancer and a large number of psychiatric diseases.

Max Credits: 3

Min Credits: 3

33.688 Clinical Assessment & Intervention in Sleep Dysregulation

Course ID: 35740

Course Details: This course requires the application and synthesis of content from previous courses to apply clinical assessment strategies to normative and pathologic sleep. Discussion of intervention strategies bifurcates between behavioral and pharmacologic strategies used in clinical practice. Evidence based approaches endorsed by practice guidelines from the American Academy of Sleep Medicine form the foundation for the intervention strategies discussed.

Max Credits: 3

Min Credits: 3

33.689 Scholarly Project/Capstone

Course ID: 35746

Course Details: This capstone project affords the student the opportunity for further knowledge development in an area of interest and learning need. The faculty-guided experience involves the development of a scholarly project which may involve a number of options: a scholarly review of the literature in a specific area; development of clinical teaching materials related to some dimension of sleep and/or sleep disorders; or a translational research project whereby a body of current research is interpreted for application to practice. The project will be negotiated with the faculty of record to meet the objectives of the course.

Max Credits: 3

Min Credits: 3

33.690 Orthopedic and Rehabilitation Nursing

Course ID: 35748

Course Details: This course will provide the post-baccalaureate nurse the opportunity to expand knowledge about issues related to musculoskeletal injuries and conditions. The course focuses on topics pertinent to the nursing care and treatment of acute and chronic musculoskeletal conditions across the lifespan. Content will include scope of nursing practice in orthopedics and rehabilitation, musculoskeletal assessment, perioperative care, diagnostic studies, pain, immobility and complication prevention. Pediatric and geriatric considerations, physical, nutritional and psychosocial aspects of injury and rehabilitation, as well as metabolic and degenerative conditions will be discussed.

Max Credits: 3

Min Credits: 3

33.691 Advanced Musculoskeletal Conditions I Practicum

Course ID: 35762

Course Details: 168 contact hours (32 hours of class on-campus lab, 36 hours on-line seminar, & 100 hours of clinical practicum Through lab, seminar, and clinical experiences this course will focus on assessment in orthopedic advanced practice nursing. Issues in advanced practice are discussed. The practicum will focus on the complete musculoskeletal exam. orientation to operating room and RN first assist procedures, interpreting diagnostic studies, musculoskeletal deformities, use of prosthetics and orthotics, non-surgical interventions, and selected radiologic interpretation. Selected clinical experiences will be directed toward assessing chronic conditions in spinal, joint replacement and reconstructive surgery, physiatry and rehabilitation settings. Clinical experiences will consist of inpatient, outpatient, or operating room settings with surgeons, physiatrists and/or advanced practice clinicians.

Max Credits: 3

Min Credits: 3

33.692 Advanced Orthopedic and Rehabilitation Nursing

Course ID: 35763

Course Details: This course focuses on topics pertinent to the nursing care and treatment of acute and chronic musculoskeletal conditions across the lifespan. Content will include pharmacology for orthopedics & rehabilitation, soft tissue, bone, joint, neuromuscular and metabolic conditions, as well as developmental, preventive, therapeutic and restorative interventions. The advanced practice nursing role in holistic care, pain management, leadership, research, publication, and utilization of community resources will be explored.

Max Credits: 3

Min Credits: 3

33.693 Advanced Musculoskeletal II Practicum

Course ID: 35764

Course Details: This course will focus on management of musculoskeletal conditions and builds on previous course work in orthopedic and rehabilitation nursing. Issues in advanced practice are discussed. Clinical experiences, demonstrations and learning experiences will focus on joint injections and aspirations, casting and splinting, internal and external fixation, treatment of fractures and other musculoskeletal conditions. Selected acute care clinical experiences will occur in trauma, pediatric, hand, spinal injury, and/or sports settings. Practicum experiences may have inpatient, outpatient, and/or operating room components, with surgeons and/or advanced practice clinicians.

Max Credits: 3

Min Credits: 3

33.701 Philosophy of Science

Course ID: 4609

Course Details: This course provides doctoral students in nursing with philosophical perspectives in science, the nature of knowledge and its development, nursing knowledge development and philosophical underpinning to theory development, methods in scientific inquiry.

Max Credits: 3

Min Credits: 3

33.702 Theoretical Foundations of Health Promotion

Course ID: 4610

Course Details: Study of the multidisciplinary theories, which direct or have the potential to direct inquiry in health promotion. Course content is derived from nursing, anthropology, psychology, sociology, economics, medicine and management

Max Credits: 3

Min Credits: 3

33.703 Research In Nursing and Health Promotion

Course ID: 4611

Course Details: Study of the most recent research which examines the antecedents and correlates of health risk and health promotion behavior. Emphasis is placed on the critical analysis of research methodologies used in current research.

Max Credits: 3

Min Credits: 3

33.706 Measurement in Health & Behavioral Research

Course ID: 4614

Course Details: This course provides students with theoretical principles of measurement and design in health and behavioral research. The strategies, techniques, and issues in the development and administration of survey instruments will be critically examined. Psychometric properties using standardized approaches to measurement will be analyzed.

Max Credits: 3

Min Credits: 3

33.707 Epidemiology of Health Promotion

Course ID: 4615

Course Details: This course provides an in-depth exploration of the concepts and methods of epidemiological research. Students will critique the principles of epidemiology with an emphasis on health promotion research. Students will analyze and develop epidemiological approaches, which seek to promote health and prevent disease.

Max Credits: 3

Min Credits: 3

33.709 Intervention Development in Health Promotion

Course ID: 4617

Course Details: Study of current health promotion intervention research at the individual family and community levels. Emphasis is on the critical analysis of research methodology and the design of the intervention protocols.

Max Credits: 3

Min Credits: 3

33.713 Curriculum and Teaching In Nursing

Course ID: 4621

Course Details: The focus of this course is on development, implementation, and evaluation of nursing curricula and academic courses. Contemporary theories of learning are applied to analysis of student learning needs, teaching strategies and educational methodologies. This course is intended for those nursing students post-MS or enrolled in doctoral study who wish to teach in the academic and/or practice environment. However, students in a MS program who are interested may register for the course with permission.

Max Credits: 3

Min Credits: 3

33.715 Independent Study

Course ID: 4623

Course Details: The study of highly specific content area related to the student's dissertation topic. Course objectives and projects are jointly designed by student and faculty member. No more than 1 independent study is acceptable as cognate credit.

Max Credits: 3

Min Credits: 3

33.716 Qualitative Methods

Course ID: 4624

Course Details: The study of predominating qualitative methodology in the health sciences literature. Emphasis is on phenomenology, ethnography, life history/narrative, critical incidents, grounded theory, case study, and associated methodologies

Max Credits: 3

Min Credits: 3

33.717 Evaluation Research

Course ID: 4625

Course Details: This course focus is on the basic concepts of evaluation research and their application to education, health and social programs. Specific design and analytic approaches that effect quality evaluation research will be reviewed. Students will design a mock evaluation study. Prerequisites: Completion of a graduate level research methods course

Max Credits: 3

Min Credits: 3

33.718 Independent Study

Course ID: 36594

Course Details:

Max Credits: 1

Min Credits: 1

33.730 Quantitative Research Methods and Grantsmanship

Course ID: 37483

Course Details: This course introduces students to strategies and methods in research including an analysis of theoretical and empirical links, operationalization of concepts, research design, and ethics in behavioral research. Students will identify appropriate funding sources and complete a research grant application.

Max Credits: 3

Min Credits: 3

33.731 Health Promotion Research

Course ID: 37484

Course Details: This course focuses on interdisciplinary health promotion research that targets diverse individuals, families, groups, and communities/society. Students will identify and analyze ethical issues, philosophical and conceptual underpinnings, measurement principles and major gaps in current knowledge in nursing and health promotion. Students will critique research approaches to health promotion studies and propose a research study in a topic relevant to health promotion.

Max Credits: 3

Min Credits: 3

33.733 Graduate Project - Nursing

Course ID: 4637

Course Details: Course focus is on application of the nursing research process. The student actively engages in at least two aspects of research under the guidance of a faculty mentor. The course product has practical implications for nursing practice.

Max Credits: 3

Min Credits: 3

33.737 Advanced Qualitative Methods

Course ID: 37486

Course Details: This course will focus on the in-depth historical and philosophical underpinnings of qualitative research. The student will examine and critique various analytic qualitative methods. The student will complete a project incorporating qualitative analysis using a qualitative software program.

Max Credits: 3

Min Credits: 3

33.738 Mentored Research Experience

Course ID: 37485

Course Details: In this course students participate in a mentored research experience. Opportunities are provided for the application of research skills using an interdisciplinary approach. Students conduct health promotion research and undertake a leadership role in the dissemination of culturally competent scholarship to improve nursing and health promotion practice.

Max Credits: 3

Min Credits: 3

33.743 Master's Thesis - Nursing

Course ID: 4642

Course Details: Course focus is on the application of the full research process to a topic relevant to nursing practice and/or health outcomes. The student is expected to propose, conduct and defend the study under the guidance of a designated faculty thesis committee.

Max Credits: 3

Min Credits: 3

33.753 Doctoral Dissertation

Course ID: 4645

Course Details: A structured series of sequenced seminars which guides students through dissertation proposal development, defense, collection and analysis of data. The first seminar concludes with the development of Chapters I and II of the dissertation; the second seminar concludes with defense of the proposal; and the the third seminar culminates in the development of discussion and conclusions of the dissertation effort.

Max Credits: 3

Min Credits: 3

33.756 Doctoral Dissertation

Course ID: 4646

Course Details: A structured series of sequenced seminars which guides students through dissertation proposal development, defense, collection and analysis of data. The first seminar concludes with the development of Chapters I and II of the dissertation; the second seminar concludes with defense of the proposal; and the third seminar culminates in the development of discussion and conclusions of the dissertation effort.

Max Credits: 6

Min Credits: 6

33.759 Doctoral Dissertation

Course ID: 33003

Course Details: A structured series of sequenced seminars which guides students through dissertation proposal development, defense, collection and analysis of data. The first seminar concludes with the development of Chapters I and II of the dissertation; the second seminar concludes with defense of the proposal; and the the third seminar culminates in the development of discussion and conclusions of the dissertation effort.

Max Credits: 9

Min Credits: 9

33.763 Continued Graduate Research

Course ID: 4647

Course Details:

Max Credits: 3

Min Credits: 3

33.769 Continued Graduate Research

Course ID: 4650

Course Details:

Max Credits: 9

Min Credits: 9

33.770 Evidence Appraisal

Course ID: 35090

Course Details: In this course the student will explore the role of the DNP in evaluating evidence to inform practice. The student will also identify a critical issue or influential trend within the health care system that impacts health care delivery. Methods relevant to reviewing, analyzing, synthesizing, and applying evidence from the scientific literature will be discussed. Models of systematic reviews of the literature will be explored and implemented. Decisions will be made relative to the student's topical area of interest and identification of the Scholarly Project Chair.

Max Credits: 3

Min Credits: 3

33.771 Advanced Nursing Leadership and Management

Course ID: 35091

Course Details: This course consists of a seminar and leadership experience. The seminar will explore the major concepts in leadership and management and their application in the health care setting. The role of DNP will also be discussed in terms of leadership in the health policy, education, and clinical settings. A leadership project will be completed by the end of the semester.

Max Credits: 3

Min Credits: 3

33.772 Scholarly Project Implementation

Course ID: 35092

Course Details: In this course, the student will implement the Scholarly Project according to DNP Scholarly Project guidelines. Building on the previous semesters; course work and proposal design, students will meet in seminar every other week on campus to share progress on the project and to discuss issues related to implementation. Seminars will serve to guide students through the phases of the scholarly project implementation and evaluation.

Max Credits: 3

Min Credits: 3

33.773 Evidence Dissemination, Advocacy & Policy

Course ID: 4651

Course Details: this course will include a weekly seminar. The students will complete the scholarly project by undertaking dissemination activities. The student will analyze policies influencing DNP practice and quality, cost, and access to health care and participate in the policy making process.

Max Credits: 3

Min Credits: 3

33.774 Scholarly Project Design

Course ID: 37475

Course Details: In this course, the student will design and present the Scholarly Project proposal. Students will meet biweekly with the scholarly project chair to develop the DNP scholarly project using knowledge acquired in previous course work. Students will complete a University of Massachusetts Lowell Institutional Review Board application that considers ethical and cultural issues related to the scholarly project.

Max Credits: 3

Min Credits: 3

33.775 DNP Practicum

Course ID: 37476

Course Details: In this course the student will be involved in individualized practical experiences to assist in meeting doctoral competencies. The foci may include direct clinical care practicum, or non-clinical practicum experiences with populations, systems, organizations, and/or policy.

Max Credits: 3

Min Credits: 3

33.777 Independent Study: Practicum in Nursing Education

Course ID: 33361

Course Details: In this independent study practicum students will apply knowledge of curriculum and teaching in nursing in an educational setting under the mentorship of a nursing faculty member. Students will actively engage in curriculum development,

evaluation and refinement, course preparation, classroom and clinical teaching, and student evaluation. The nurse educator role will be explored.

Max Credits: 3

Min Credits: 3

33.793 Cooperative Education

Course ID: 37139

Course Details:

Max Credits: 1

Min Credits: 1

34.501 Pharmacology

Course ID: 33819

Course Details: An introduction to the chemistry, biochemistry and physiological actions of various pharmaceuticals. Fundamental concepts will be stressed and will include a discussion of drug receptors, drug receptor interactions, pharmacokinetics, enzyme induction, drug metabolism, drug safety and effectiveness and idiosyncratic reactions. Several major groups of drugs will be studied including: central nervous system stimulants, hypnotics, narcotic analgesics, anti-inflammatory drugs, cholinergics, adrenergics, adrenergic blocking drugs, antihypertensives, antihistamines, diuretics, adrenal steroids, anti-anemic drugs and antibiotics. Articles from the current literature will be discussed.

Max Credits: 2

Min Credits: 2

34.510 Models and Measurement in Disability

Course ID: 33437

Course Details: This course will introduce students to the World Health organization's International Classification of Function and discuss its implications for models and measurement of disability. Discussion will focus on defining and measuring disability based on the enabling-disabling process with both temporal and spatial dynamics. Temporal dynamics will include both short cycle dynamics (days to weeks) as well as longer range cycles (i.e. the life cycle). Spatial dynamics will include multi level - bidirectional interactions that emerge through cell, organ, system, organism, and environmental scales. The multi level structure will be emphasized as mechanism to link disciplines and the need for diverse strategies required for examining, evaluating and intervening for reducing disability. There will be an emphasis on the important recurrent feedback loops between human and environment in long-term health trajectories and transitions from health to disability and from acute disturbances to chronic conditions. These discussions will occur in two primary areas: musculoskeletal and cardiovascular system dynamics. Open to: Undergraduate Seniors and Graduate Students It is recommended that students have completed at least a year of upper division exercise physiology, biological science, engineering or psychology coursework. In addition, a year of general physics and a semester of statistics or research methods is recommended but not required.

Max Credits: 3

Min Credits: 3

34.601 Clinical Anatomy

Course ID: 4684

Course Details: Clinical Anatomy is a study of the structures of the human body, utilizing lectures, demonstrations and A.V. materials. It is a foundation course for physical therapy procedures courses. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.602 Neuroscience: Anatomy

Course ID: 4685

Course Details: Neuroscience anatomy presents the structural features of the central nervous system as they relate to problems encountered in clinical neurology. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.603 Anatomy Laboratory

Course ID: 4686

Course Details: Clinical Anatomy Laboratory is a visualization of the structures of the human body utilizing laboratory dissection of prosected parts and human cadavers. The laboratory also incorporates the recognition of underlying structures using surface anatomy and palpation of body and soft tissues. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.604 Neuroscience:Physiology/Neurology

Course ID: 4687

Course Details: Neuroscience presents the principles of neurophysiology, neurology, and motor control as related to the practice of physical therapy. Topics in neurophysiology include: conduction and transmission of the nerve impulse, neuromuscular synaptic transmission and skeletal muscle contraction, muscle tone and spinal reflexes, the neurophysiology of sensation and movement, and the transmission of pain. Neurological conditions will be integrated with these various neurophysiological topics through the use of case studies and will include: peripheral nerve injuries, neuromuscular conditions, and diseases/conditions of the central nervous system. An introduction to the major theories of motor control and their applications to physical therapy examination and intervention will be discussed through problem solving and case studies. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.605 Physical Therapy Interventions I Lecture

Course ID: 4688

Course Details: This course introduces the student to the principles of patient evaluation and treatment utilizing case studies to integrate didactic information into practical clinical situations. The appropriate use of evaluation procedures and the rationale for safe and effective use of treatment procedures are emphasized. Topics include: principles of biomechanical analysis, body mechanics, principles of goniometry and muscle testing, patient positioning and transfers, gait training and activities of daily living with assistive devices, wheelchair prescription and mobility, isolation/sterile technique, wound care, monitoring vital signs, heat and cold modalities, aquatic therapy, and evaluation of normal gait. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.606 Neuroscience Laboratory

Course ID: 4689

Course Details: This course introduces the student to the principles of patient evaluation and treatment utilizing case studies to integrate didactic information into practical clinical situations. The appropriate use of evaluation procedures and the rationale for safe and effective use of treatment procedures are emphasized. Topics include: principles of biomechanical analysis, body mechanics, principles of goniometry and muscle testing, patient positioning and transfers, gait training and activities of daily living with assistive devices, wheelchair prescription and mobility, isolation/sterile technique, wound care, monitoring vital signs, heat and cold modalities, aquatic therapy, and evaluation of normal gait. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.607 Physical Therapy Interventions I Laboratory

Course ID: 4690

Course Details: This laboratory course develops the psychomotor skills necessary to apply the didactic knowledge presented in the Physical Therapy Interventions I Lecture to clinical situations. The safe and effective performance of various evaluation and treatment techniques is emphasized. Topics include: patient interviewing; isolation/sterile techniques; wound care and bandaging; monitoring vital signs; patient positioning and bed mobility; transfers; gait training and activities of daily living with assistive devices; wheelchair mobility;

massage/soft tissue mobilization/lymph edema management; heat and cold modalities; gait analysis; goniometry and strength testing; postural analysis and anthropometry. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.608 Musculoskeletal Physical Therapy I

Course ID: 4691

Course Details: This course is the first of a three-course series which explores physical therapy management of musculoskeletal dysfunction. In this first course, general models for physical therapy intervention will be presented. The evaluation, treatment and prevention of pathological conditions affecting the musculoskeletal system of the lower extremity will be emphasized. Normal function will be included as a basis for recognizing and therapeutically resolving dysfunction of skeletal and joint structures, muscles and soft tissues. A problem-solving approach to resolve impairments, contributing to functional limitations and disabilities, will be stressed. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.609 Medical/Surgical Pathology

Course ID: 4692

Course Details: This course presents an introduction to the study of diseases commonly seen in people with conditions treated by physical therapists. Mechanisms of cell growth, response to injury, and cell death are reviewed. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.610 Musculoskeletal Physical Therapy I Laboratory

Course ID: 4693

Course Details: This laboratory course develops the psychomotor skills to allow clinical application of didactic knowledge gained in Musculoskeletal Physical Therapy I Lecture. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.611 Professional Issues/Clinical Practice

Course ID: 4694

Course Details: This course will be divided into two sections. The first course section will provide an overview of physical therapy as a profession. Student Generic Abilities will be introduced as they apply to classroom instruction and clinical practice. The APTA (American Physical Therapy Association) Standards of Practice, Code of Ethics, disciplinary Process, The Scope of Physical Therapy Practice and The Massachusetts Practice Act will be discussed. The second course section will emphasize the development of effective teaching and learning strategies as it applies to physical therapy in the clinical setting. Discussions and exercises will center on the concepts of motivation and compliance in learning, learning/teaching styles, documentation, designing measurable goals, clinical teaching methods/techniques and tools, the art of effective communication, reinforcement strategies, principles of evaluation and giving effective feedback. Emphasis is placed on creating a climate that encourages learning. A teaching experience will be planned, implemented and evaluated by each student group. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.612 Cardiopulmonary Physical Therapy I

Course ID: 4695

Course Details: Cardiopulmonary Physical Therapy provides instruction in a variety of pathological cardiopulmonary conditions encountered by physical therapists. The course emphasizes examination, evaluation and interventions employed by the physical therapist in dealing with these conditions. Students will be expected to integrate and synthesize information from related courses in a variety of cardiopulmonary problem solving experiences. All physical therapy graduate courses (number 34.) are restricted to PT majors

only.

Max Credits: 3

Min Credits: 3

34.614 Cardiopulmonary Physical Therapy I Laboratory

Course ID: 4697

Course Details: Cardiopulmonary Physical Therapy Laboratory is taken concurrently with Cardiopulmonary Physical Therapy 34.612. The Laboratory experiences are designed to provide an opportunity to practice examination, evaluation, and interventions as discussed in lecture and demonstrate psychomotor proficiency in each procedure. The course emphasizes procedures employed by the physical therapist in dealing with cardiopulmonary conditions. In addition, students will be expected to integrate and synthesize information from related courses in a variety of cardiopulmonary problem solving experiences. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.615 Clinical Education I Seminar

Course ID: 4698

Course Details: This course is the first in a series of two one-credit weekly seminars. The class will continue to explore the professional issues and clinical practice begun in 34.611 in various settings. Requirements include successful completion of the one week Clinical Education Fieldwork Experience I in Spring, Year 1. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.616 Research Methods

Course ID: 4699

Course Details: This course presents the role of research in the development and critical analysis of physical therapy clinical practice. Students are guided through the process of clinical scientific research including the following content areas: problem and hypothesis identification, review and analysis of scientific literature, methods of hypothesis testing, data collection and analysis, and interpretation and presentation of research results. Students work in small groups to develop and present a full research proposal. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.617 Neurological Physical Therapy Lecture I

Course ID: 4700

Course Details: This course is the first of two courses dealing with the physical therapy management of adult patients/clients with neurological dysfunction. Concepts, practical applications, and strategies based on theories of motor skill development, motor control, and motor learning will be discussed. A variety of neurological conditions with different levels of impairments, functional limitations and disabilities will be examined. Emphasis is on the development of clinical decision making skills using a problem solving approach. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.619 Neurological Physical Therapy Laboratory I

Course ID: 4702

Course Details: This laboratory course must be taken concurrently with Neurological Physical Therapy I, 34.617. Emphasis is on the development of problem solving and psychomotor skills necessary for successful management of the patient/client with neurological dysfunction. Videotapes and patient demonstrations are used to develop skills in examination, evaluation, and clinical decision making. Peer practice is used to promote the development of psychomotor skills in advanced therapeutic exercise and functional training. Problem solving in the application of interventions for different levels of impairments, functional limitations, and disabilities is stressed. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.620 Neurological Physical Therapy II

Course ID: 4703

Course Details: This course is the second of two courses dealing with physical therapy management of adult patients with neurological dysfunction. Concepts, practical applications, and strategies based on theories of motor skill development, motor control, and motor learning will be discussed. A variety of neurological conditions with differing levels of impairments, functional limitations, and disabilities will be examined. Emphasis is on the development of clinical decision making skills using a problem-solving approach. Practice is offered in the development of appropriate plans of care. Concurrent laboratory sessions emphasize the development of assessment and intervention skills. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.621 Musculoskeletal Physical Therapy II Lecture

Course ID: 4704

Course Details: This course is the second of a three-course series which focuses on physical therapy management of musculoskeletal dysfunction. Treatment of the ankle and foot will be included as a continuation of the first course. The evaluation, treatment and prevention of pathological conditions affecting the upper extremity will be emphasized. Normal function will be included as a basis for recognizing and therapeutically resolving dysfunction of skeletal and joint structures, muscular and soft tissues. A problem-solving approach to resolve impairments, which contribute to functional limitations and disabilities, will be stressed. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.622 Neurological Physical Therapy II Laboratory

Course ID: 4705

Course Details: This course is the second of two lab courses dealing with physical therapy management of adult patients with neurological dysfunction. Videotapes and patient demonstrations will be used to promote clinical decision making skills in examination and evaluation of patients with neurological dysfunction. Classroom laboratory experiences (peer practice) will be used to provide the student with the opportunity to gain mastery of psychomotor skills in advanced therapeutic exercise. Problem solving in the application of interventions for different levels of impairments, functional limitations, and disabilities will be stressed. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.623 Musculoskeletal Physical Therapy II Laboratory

Course ID: 4706

Course Details: This laboratory course develops the psychomotor skills to allow clinical application of didactic knowledge gained in Musculoskeletal Physical Therapy II Lecture. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.625 Physical Therapy Interventions II

Course ID: 4708

Course Details: This course is a study of advanced physical therapy procedures which utilize electrophysics and electrophysiology in evaluating and treating a variety of physical impairments. The course will emphasize theories and techniques used in electrodiagnosis, electromyography, functional electrical stimulation, iontophoresis, transcutaneous electrical stimulation, biofeedback, laser and therapeutic electrical currents including light and radar waves. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.626 Geriatric Physical Therapy

Course ID: 4709

Course Details: This course will focus on the special needs of the elderly and on the physical therapy management of the geriatric client. The physical changes associated with normal aging as well as pathological changes will be discussed and analyzed. Program planning will stress holistic consideration of the rehabilitative, cognitive/behavioral, and psychosocial needs of the elderly. (Re)Evaluation including functional evaluation, treatment planning (and treatment plan evaluation), treatment cost effectiveness, documentation, reimbursement issues will be analyzed as they relate to the physical therapy management of the geriatric client. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.627 Physical Therapy Interventions II Laboratory

Course ID: 4710

Course Details: This course is a practical application of theories and principles presented in 34.625, Physical Therapy Interventions II Lecture. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.628 Musculoskeletal Physical Therapy III

Course ID: 4711

Course Details: This course provides the second-year physical therapy student with an introduction to physical therapy evaluation and management of dysfunction of the cervical, thoracic and lumbar spine, ribcage, and pelvis. The development of evaluation strategies, documentation skills, organized clinical decision making, and effective patient management techniques will be emphasized. Discussions and exercises will focus on developing patient diagnoses, functional problems lists, long and short-term goals, and treatment strategies. Critical thinking/problem solving strategies will be incorporated into all aspects of patient management. Emphasis will be on creating a climate that encourages learning. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.629 Directed Research

Course ID: 4712

Course Details: The directed research experience provides students with the opportunity to develop a research project with the guidance of a faculty advisor. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 1

34.630 Musculoskeletal III Laboratory

Course ID: 4713

Course Details: This laboratory course provides the student the opportunity to apply the didactic knowledge gained in the Musculoskeletal Physical Therapy II Lecture through a problem solving approach. Additionally, specific evaluation and functional management techniques for the spine and pelvis will be demonstrated by instructors and practiced by students. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.631 Pediatric Physical Therapy Lecture

Course ID: 4714

Course Details: This laboratory course provides the student the opportunity to apply the didactic knowledge gained in the Musculoskeletal Physical Therapy II Lecture through a problem solving approach. Additionally, specific evaluation and functional management techniques for the spine and pelvis will be demonstrated by instructors and practiced by students. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.633 Pediatric Physical Therapy Laboratory

Course ID: 4716

Course Details: Through classroom and clinical laboratory experiences, the student will be given the opportunity to gain introductory level skill in the examination, evaluation, intervention, and development of a physical therapy plan of care for infants, children, and adolescents who have disabling problems requiring physical therapy intervention. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.635 Clinical Education II Seminar

Course ID: 4718

Course Details: This course is the second in a series of two one-credit weekly seminars. The class will continue to explore the professional issues and clinical practice begun in 34.611 and 34.615 in various practice settings. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.637 Clinical Reasoning I

Course ID: 4720

Course Details: This capstone course provides students with the opportunity to integrate medical and physical therapy examination procedures using a case study format. Includes advanced topics of diagnostic imaging (e.g. CT scans, MRI, radiography, arthrography). Discussions focus on understanding laboratory chemistry values, and data derived from vascular, neurologic, cardiopulmonary, metabolic, and endocrine tests. Students are expected to evaluate complex case data and determine a differential diagnosis. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.639 Medical/Surgical -Orthopedics

Course ID: 4722

Course Details: Medical Surgical conditions (Orthopedics) presents topics related to the pathology and medical-surgical treatment of musculoskeletal disorders. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.640 Clinical Reasoning In Physical Therapy II

Course ID: 4723

Course Details: This capstone course provides students with the opportunity to integrate medical and physical therapy management related to complex cases (patients who have disorders of several systems, e.g. musculoskeletal, cardiovascular, neurological). Students will present a patient, including history, examination, evaluation, diagnosis, prognosis, and intervention. Students are expected to

articulate and justify their clinical reasoning, contrasting different approaches to management in both acute and active rehabilitation phases. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.641 Business Skills in Physical Therapy

Course ID: 4724

Course Details: This course provides an overview of the operation of physical therapy services. The course will emphasize a micro approach concerning issues and trends related to the delivery of health care and their implications for the management of physical therapy services. Key issues will include facilities design and clinic organization, personnel management, budgeting, and operations management. Topics related to the key issues will include: marketing, quality improvement, utilization review, legal and ethical issues such as sexual harassment, and integration of the Guide to Physical Therapy Practice and the LAMP (Leadership, Administration, Management, and Professionalism) document with respect to these topics. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 2

Min Credits: 2

34.642 Health Care Issues

Course ID: 4725

Course Details: This course provides an overview of the operation of physical therapy services within the structure of the United States health care system. The course will emphasize a macro approach concerning issues and trends related to the delivery of health care and their implications for the management of physical therapy services. Key issues will include: the politics of health care, re-engineering of the health care system, reimbursement for services, managed care organizations, the code of ethics and standards of practice, and integration of the Guide to Physical Therapy Practice and the LAMP (Leadership, Administration, Management, and Professionalism) document with respect to these topics. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 2

Min Credits: 2

34.644 Clinical Education Fieldwork II

Course ID: 4727

Course Details: This is the continuance of Directed Research experience providing students with the opportunity to complete and present a research project with the guidance of a faculty advisor. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.645 Physical Interventions III

Course ID: 4728

Course Details: All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.647 PT Interventions III Lab

Course ID: 4730

Course Details: All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.648 Service Learning in Physical Therapy

Course ID: 30345

Course Details: All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 1

Min Credits: 1

34.650 Clinical Education Experience I

Course ID: 4732

Course Details: (Summer 1st year) An eight-week full time clinical experience designed to integrate basic physical therapy evaluative and treatment procedures with an emphasis on the musculoskeletal and cardiopulmonary systems. Students are directly supervised by qualified physical therapists in general acute facilities and outpatient settings. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.651 Sectional Human Anatomy

Course ID: 37338

Course Details: Sectional Human Anatomy is a study of the structures of the human body as revealed through Computed Tomographic images. It is a foundational course for the medical physics program.

Max Credits: 3

Min Credits: 3

34.652 Clinical Education Experience II

Course ID: 4733

Course Details: (Summer 2nd year) An eight-week full time experience promotes the development of an autonomous professional through the synthesis and utilization of advanced academic theory in evaluation and treatment. Students are expected to use sound scientific rationale and a problem solving approach in all aspects of patient care. Students are allowed to explore areas of interest in a variety of settings. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.653 Clinical Education III

Course ID: 4734

Course Details: (Fall 3rd year) This full time eight week clinical experience is designed to promote socialization into the professions of physical therapy. Students are expected to function as independently as possible using the problem solving process as a basis for all clinical decision making. Communication, coordination and consultation with other members of the health care team and responsibility for total client management is emphasized. Settings in pediatrics, neurological rehabilitation, outpatient orthopedics and acute care facilities are appropriate for this experience. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.654 Clinical Education Experience IV

Course ID: 4735

Course Details: (Spring, 3rd year) The final full time eight-week clinical experience is designed to promote socialization into the profession of physical therapy. Students are expected to function as independently as possible using the problem solving process as a basis for all clinical decision making. Communication, coordination and consultation with other members of the health care team and responsibility for total client management is emphasized. Settings in pediatrics, neurological rehabilitation, outpatient orthopedics and acute care facilities are appropriate for this experience. All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.658 Independent Studies

Course ID: 4739

Course Details: All physical therapy graduate courses (number 34.) are restricted to PT majors only.

Max Credits: 3

Min Credits: 3

34.659 Sectional Human Anatomy Laboratory

Course ID: 37337

Course Details: Sectional Human Anatomy Laboratory provides training in the recognition of anatomical structures from CT images, and the direct translations among CT images, Body surface features, and cadaveric structures.

Max Credits: 1

Min Credits: 1

34.660 Directed Research

Course ID: 35040

Course Details: Directed Research toward the DPT degree.

Max Credits: 2

Min Credits: 2

36.506 Biochemistry of Lipids

Course ID: 4832

Course Details: This advanced course in the nutritional biochemistry and physiology of lipids will detail the role of lipids in the normal and pathological processes at both the cellular and whole organism level. Topics will range from general discussions of the digestion, absorption and transport of lipids to the role of eicosanoids and lipid soluble anti-oxidants during normal and diseased states, such as atherosclerosis, diabetes and hypertension. Subject matter will also include a discussion of the various interventions for the prevention and treatment of certain of these disease states. There will also be discussion of the current issues in lipid nutrition.

Max Credits: 3

Min Credits: 3

36.512 Medical Bacteriology I

Course ID: 4783

Course Details: A study of the cultural, biochemical, genetic, serological and pathogenic characteristics of disease producing microorganisms. Emphasis will be placed on the pathophysiology of the infectious diseases and their relationship to isolation and identification of the pathogenic microorganisms.

Max Credits: 3

Min Credits: 3

36.531 Clinical Immunohematology

Course ID: 4834

Course Details: Lecture and case study discussions look at the major red cell antigen/antibody systems that are of importance in understanding transfusion therapies, compatibility testing, and pathological diseases. Emphasis is on differentiation and clinical significance of each system. Donor selection regulations, component preparation, and hemotherapy will also be discussed. Students will be required to do a presentation, poster, and paper on an advanced topic in Clinical Immunohematology.

Max Credits: 3

Min Credits: 3

36.541 Introduction to Public Health and the Public Health Laboratory

Course ID: 33182

Course Details: This course is designed to provide an overview of public health and the public health laboratory covering topics such as the legal basis and history of public health, public health structure, communications and interactions, and epidemiology. Emphasis will be placed on the role of the public health laboratory and its core functions, its role in policy development, infectious disease, environmental issues, emergency preparedness, newborn screening, global issues, and public health research. Public health laboratory methodology, regulation and improvement, and quality assurance will also be examined.

Max Credits: 3

Min Credits: 3

36.551 Advanced Pathophysiology

Course ID: 4837

Course Details: Disease processes as appropriate and inappropriate as variants of normal physiological functions. A detailed examination of certain important and illustrative diseases rather than a survey of diseases in general.

Max Credits: 3

Min Credits: 3

36.553 Advanced Clinical Chemistry

Course ID: 4838

Course Details: This course is designed to give an in-depth understanding in clinical chemistry. Topics include: analytical techniques and the selection of methodologies. The course allows for a detailed examination and discussion of selected articles from the Journal of Clinical Chemistry.

Max Credits: 3

Min Credits: 3

36.560 Molecular Pathology

Course ID: 36721

Course Details: This graduate course is designed to study the molecular aspects of disease. Applications and techniques utilized in the field of molecular pathology are emphasized. This course is intended to provide students with information required to understand the increasing role of molecular pathology in the daily practice and management of chronic disease in medicine. Major emphasis on strength and limitations of clinical diagnostics technologies and their utilization in these applications are presented. This course will also provide a review of current molecular pathology literature and principles as they relate to specific organ systems.

Max Credits: 3

Min Credits: 3

36.563 Vitamins and Minerals

Course ID: 4842

Course Details: Provides a foundation for understanding the role of vitamins and minerals in human nutrition. Emphasis is placed on their roles in human biochemistry and physiology. The mechanism of action for each nutrient is examined. The course will explore the effects of nutrient deficiency, and identify the best dietary sources for each vitamin and mineral.

Max Credits: 3

Min Credits: 3

36.565 Lab Methods in Nutrition Assessment

Course ID: 31884

Course Details: This course provides the student the the opportunity to assess nutritional status using several modern analytical

methods. The course uses spectrophotometry, HPLC and automated procedures to assess the status of vitamins, lipids, iron, glucose, and insulin. The student will learn the mathematical calculations needed for the methods. This course enables the student to appreciate how nutrient analysis is designed and implemented in the analytical laboratory.

Max Credits: 3

Min Credits: 3

36.572 Nutrition and Gene Expression

Course ID: 4844

Course Details: Regulation of eukaryotic gene expression by specific nutrients, hormones, and metabolites will be discussed. Transcriptional, post-transcriptional, and translational mechanisms of specific nutrients with emphasis in disease development or prevention. The information gained will be useful for design of appropriate diets, based on inherited biochemical characteristics. This course will enable students to link their knowledge of nutrition with the growing body of knowledge on the human genome and specific hereditary diseases with a nutritional component. Students will be required to submit a paper in nutrition and gene expression, on a topic agreed upon by student and instructor.

Max Credits: 3

Min Credits: 3

36.575 Topics in Clinical Laboratory Science I

Course ID: 4846

Course Details: This course provides students with the knowledge that is fundamentally necessary to understand the routine operations of the clinical diagnostic laboratory. The course will familiarize students with the diagnostic application of the most current testing methodologies and also provide a forum to discuss and critically review primary literature pertinent to current clinical laboratory issues.

Max Credits: 3

Min Credits: 3

36.580 Clinical Applications of Molecular Genetics

Course ID: 4848

Course Details: This course begins with a review of basic molecular genetics, followed by a discussion of the human genome project, including the application of its technology to the management of genetic diseases. Laboratory techniques used to analyze pre- and postnatal tissue samples is described, including RFLP-Southern blot technology, real-time PCR, VNTR assessment, and gene expression analysis by microchip arrays. Cloning and stem cell analysis follows, including the ethical, legal, and social issues surrounding these areas. Cancer genetics and cytogenesis is presented, with emphasis on molecular changes that lead to the onset of cancer. Genetic treatments for cancer are reviewed. Gene therapy is detailed, including the historical perspective, gene therapy vectors and their mode of action, and the newest methods for treating genetic disorders at the DNA level. Structural and functional genomics follows, centering around the creation of pharmaceuticals solely based on the genetic basis of diseases. The course ends with a discussion of the human proteome project, including goals and objectives, current progress, and the storage of data in complex bioinformatic databases.

Max Credits: 3

Min Credits: 3

36.582 Seminar in Advanced Nutrition

Course ID: 30346

Course Details: Review and analysis of contemporary research publications in human nutrition. Recently discovered nutrients that may be essential to human health will be evaluated. We will critically examine the benefits of dietary modification in controlled investigations. Course will focus on published studies of the relation of dietary practices to health and disease. We will examine nutrition policy, and the way scientific findings in nutrition translate into public health practice. This course will be of value to students who wish to critically examine literature in human nutrition, and who seek to develop new directions for nutrition research.

Max Credits: 3

Min Credits: 3

36.613 Infectious Disease

Course ID: 4851

Course Details: This course is designed for graduate students in the health sciences focusing on the pathophysiology of infectious disease. Major infectious organisms will be discussed as biological models and presented in the way they affect major systems of the body. Emphasis will be placed on journal readings describing significant episodes of emerging infections and current technology in diagnosis and treatment of infectious diseases.

Max Credits: 3

Min Credits: 3

36.615 Medical Mycology and Parasitology

Course ID: 4852

Course Details: This course is designed to instruct students in diagnostic medical mycology and parasitology. Diseases, specimen collection and handling, laboratory identification and treatment of medically significant fungi and parasites will be studied. Discussion of AIDS related infections and prophylactic treatment will be evaluated. Life cycles of parasites, prevention and environmental protection plans will be analyzed.

Max Credits: 3

Min Credits: 3

36.640 Quality Assurance, Control and Improvement in the Clinical and Public Health Laboratory

Course ID: 34606

Course Details: This course is designed to provide an overview of total quality management issues in the Clinical and Public Health laboratory. Topics presented will include CLIA and quality control in the laboratory, clinical and public health laboratory QC calculations, charts and graphs, regulations involving new control lots, out-of-control QC situations, method comparison, instrument validation, and quality assurance. Emphasis will be placed on meeting all federal regulations including the FDA, state regulations, as well as meeting professional agency regulations such as JCAHO, CAP, and APHL.

Max Credits: 3

Min Credits: 3

36.707 Drug Metabolism

Course ID: 37846

Course Details: This course provides an overview of the structure, function and regulation of major drug metabolic enzymes and transporters.

Max Credits: 3

Min Credits: 3

36.708 Mechanisms of Drug Action

Course ID: 37845

Course Details: This course reviews the general principles of drug action and the pharmacological activities of various classes of drugs. The major focus is on the molecular mechanisms of drug action, with a detailed discussion of one or more prototypes of each drug class. Selected examples of drug discovery and development are also discussed. At the completion of the course, students will have knowledge of the molecular basis of pharmacological activity, the mode of action of major classes of therapeutic agents and familiarity with rational approaches to drug design.

Max Credits: 3

Min Credits: 3

36.709 Pharmacogenomic Principles and Applications

Course ID: 37847

Course Details: Pharmacogenomics utilizes knowledge related to the variability in the human genome to understand and predict the differences in drug response and toxicity of pharmaceutical agents. This includes not only the determination of pharmacologically relevant genes that alter individual pharmacokinetic and pharmacodynamic response but also those polymorphisms and other

mutations that predispose a person to development of various diseases. Personalizing therapies based on genotypic information should increase efficacy and decrease toxicity of agents. Current applications covered include anti-cancer and anti-viral therapies and anticoagulation.

Max Credits: 3

Min Credits: 3

36.710 Nutrigenomics

Course ID: 37844

Course Details: The elucidation of the human genome has created a unique opportunity to study and understand how nutrients and bioactive food components influence gene expression and product activity. This knowledge will allow for a better understanding of how these interactions vary with individual genetic diversity in the development of chronic disease states. The goal will be to improve the quality of life through the use of diet in the prevention and treatment of human disease. This includes the use or restriction the specific nutrients and food compounds to maintain homeostasis in the body from the biochemical level to organ systems. The ability for nutritionists and healthcare professionals to create and optimize diets requires and understanding of the interactions between nutrients and genes, proteins and metabolic pathways in regulation of disease pathways.

Max Credits: 3

Min Credits: 3

36.733 Graduate Project - Clinical Laboratory Sciences

Course ID: 4860

Course Details: An independent study or laboratory project which has been approved and is under the direction of the project advisor. Projects are approved by the graduate coordinator in conjunction with the project advisor.

Max Credits: 3

Min Credits: 3

36.734 Graduate Project - Clinical Laboratory Sciences

Course ID: 4861

Course Details: An independent study or laboratory project which has been approved and is under the direction of the project advisor. Projects are approved by the graduate coordinator in conjunction with the project advisor.

Max Credits: 4

Min Credits: 4

36.743 Master's Thesis - Clinical Lab Sciences

Course ID: 4865

Course Details: Analytical and/or experimental work conducted under the direction of a thesis advisor and in accordance to the Graduate School Guidelines. Students are required to submit a written proposal for approval by a thesis committee and to present an oral defense at a college seminar.

Max Credits: 3

Min Credits: 3

36.744 Master's Thesis - Clinical Laboratory Science

Course ID: 4866

Course Details: Research Design and Methodology. Analytical and/or experimental work conducted under the direction of a thesis advisor and in accordance to the Graduate School Guidelines. Students are required to submit a written proposal for approval by a thesis committee and to present an oral defense at a college seminar.

Max Credits: 4

Min Credits: 4

36.753 Doctoral Research

Course ID: 4867

Course Details:

Max Credits: 3

Min Credits: 3

36.756 Doctoral Research

Course ID: 4868

Course Details:

Max Credits: 6

Min Credits: 6

36.759 Doctoral Research

Course ID: 4869

Course Details:

Max Credits: 9

Min Credits: 9

36.770 Professional Internship and Seminar

Course ID: 35788

Course Details: A Professional Internship is required for students in the Professional Sciences Option of the Clinical Laboratory Sciences Masters Program. It is expected to be a minimum of 350 hours and have 3-6 month duration. The internship is designed to provide students with an opportunity to obtain real-world experience in business, government agencies, non-profit organizations or research laboratories. Internships or research project experiences will typically take place in Clinical, Pharmaceutical, Diagnostic, Biotechnological or Medical Device Companies or Institutions. Research experience can also be obtained at the University or other Research Centers. All students will be required to submit a final written report and give oral presentation on their work at a Seminar that all post-internship students participate in. To be eligible for the Professional Internship, students will be required to have 1) completed a minimum of 12.0 credits of STEM courses, 2) completed a minimum of 6.0 credits of PLUS courses, 3) attained an overall minimum GPA of 3.0, and 4) Department Permission.

Max Credits: 1

Min Credits: 1

38.501 Physiological Dynamics

Course ID: 36396

Course Details: This course will provide intermediate to advanced coverage of physiological dynamics. A myriad of complex dynamics underlie health and disease and represent highly integrated regulatory systems with cycles, oscillations and feedbacks across time and scale. Physiological Dynamics will teach students basic tools for analyzing the dynamics of the physiological systems; and to identify normal dynamics and relate altered dynamics to disease. The course will focus on the interpretation of physiological dynamics in understanding healthy response to exercise, stress, fatigue and disease. Topics will include physiological origins and implications of: the normal electrocardiogram (ECG); common ECG abnormalities, temporal variations in the physiological system (heart rate variability, blood pressure variability, blood flow, pulse transit time); and multi level relationships between components of physiological regulation. A common theme will be the added clinical information associated with understanding the temporal and spatial dynamics of the physiological systems. Temporal dynamics will include both short cycle dynamics (days to weeks) as well as longer range cycles (i.e. the life cycle). Spatial dynamics will include multi level - bidirectional interactions that emerge through cell, organ, system, organism, and environmental scales. There will be an emphasis on the important recurrent feedback loops between human and environment in long-term health trajectories and transitions from health to disease and from acute disturbances to chronic conditions. .

Max Credits: 3

Min Credits: 3

41.514 Engineering Law

Course ID: 5006

Course Details:

Max Credits: 3

Min Credits: 3

42.506 Writing in the Community

Course ID: 5187

Course Details: Students learn advanced writing techniques in the classroom and apply them to real writing tasks in the community. Assignments include a writing project designed to meet the needs of a local organization, along with research and reflective pieces.

Max Credits: 3

Min Credits: 3

42.520 Experiencing Poetry: Sound and Sense

Course ID: 37779

Course Details: The class offers seminar-style discussions on specific aspects of poetry, considering a range of excellent poems from various eras. Through hands-on writing exercises, we will examine the art from the vantage point of the practitioner, using imitation and exploration of technique as a kind of close reading. Assignments include analytical essays as well as creative work.

Max Credits: 3

Min Credits: 3

42.540 Modernist Literature

Course ID: 37780

Course Details: Much of the influential literature produced during the modernist period, roughly 1900-1950, was considered radical in its time. This course will focus on the experimental, avant-garde impulse that manifests itself in the themes and techniques of key modernist texts, relating that impulse to questions about the nature of identity, the role of gender and class in constituting the modernist subject, and the sociocultural functions of literature itself. Readings will include primary texts such as Virginia Woolf's *Mrs. Dalloway*, Zora Neale Hurston's *Their Eyes were Watching God*, T.S. Eliot's poetry, and James Joyce's *Portrait of the Artist as a Young Man*, as well as theoretical texts. We will explore this period by examining these exemplary texts, historical and social events, and films.

Max Credits: 3

Min Credits: 3

43.510 Modern Revolutions in a Global Context

Course ID: 37585

Course Details: Starting from a consideration of Crane Brinton's "Anatomy of Revolution", we will conduct a comparative historical study of the causes, courses, and outcomes of revolutions since 1917. Do the patterns outlined by Briton apply to revolutions in Russia, China, Algeria, Vietnam, Nicaragua, Iran, Hungary (1956), and the demise of Communism in Eastern Europe? What are the policy implications for peaceful social change or national security? Students will write a paper applying the lessons of the course to a revolution of their choice.

Max Credits: 3

Min Credits: 3

43.511 History of College, 1100-1900

Course ID: 37584

Course Details: The foundation of universities in late medieval Europe also ushered in the earliest colleges, intended primarily to house students but also to provide tutoring, social support, and financial assistance. The earliest colleges arose in Paris but soon spread to Bologna, Oxford, and other university towns. This course traces the history of colleges from late medieval Europe to nineteenth-century America. It considers the various models of colleges that developed in northern and southern Europe, and how those models were transferred across the Atlantic. Some colleges remained primarily residences, while others expanded to offer a full graduate and undergraduate curriculum. We will also consider topics like student life, financial arrangements, admissions, alumni, and academic requirements.

Max Credits: 3

Min Credits: 3

43.552 Enterprise in Latin America

Course ID: 37169

Course Details: This M.A.-level course introduces students to the history of enterprise in Latin America through four case studies and a research project. No prior knowledge of Latin American history is required or expected. Each of the case studies, including the students' own research projects on an enterprise in Latin America, will consider the wide range of factors that impact a business. These include infrastructure, government regulations and policy, labor, markets, and environmental concerns, among others. The case studies and readings may change from semester to semester, but will be representative of different time periods and regions within Latin America. Throughout the semester, the class will also consider the historical legacies of each enterprise and how it continues to affect the region's economic and political development today.

Max Credits: 3

Min Credits: 3

43.559 Reconstructing America: Upheaval, Immigration, and Reform

Course ID: 36838

Course Details: The second year of the Teaching American History Project, involving UMass Lowell and eight school districts in the Greater Boston Area, will include a week-long Summer Institute, title "reconstructing America: Upheaval, Immigration, and Reform". The institute's seminars, readings, and field trip will focus on several topics tied to immigration, internal migration, social and economic struggle, and reform. This encompasses a history of the major immigrant groups in late 19th and early 20th century America; settlement, acculturation and resistance; Jim Crow and the Great Migration in the early 20th century; and post World War II immigration and refugee settlement. The Summer Institute will offer a blend of U.S. history and local history, namely Lowell and Lawrence, Massachusetts, with readings tied to recent scholarship in African-American, Latino, and Euro-American immigrant history.

Max Credits: 3

Min Credits: 3

43.590 Topics in History

Course ID: 35708

Course Details: An advanced course of study and examination of a variety of issues and topics in history. Students without a sufficient background in history courses should not attempt this course. Subject matter to be announced in advance.

Max Credits: 3

Min Credits: 3

43.591 Directed Study

Course ID: 5339

Course Details: Directed study offers the student the opportunity to engage in an independent study or research project under the supervision of a department member. Working closely with the instructor, students define and investigate a research topic in an area of special interest and present the results of their investigation in a significant paper. Juniors and seniors only.

Max Credits: 4

Min Credits: 1

44.503 Administration of Criminal Justice

Course ID: 5428

Course Details: An examination of the components of the criminal justice system and a review of the administration of federal, state and local criminal justice agencies, including a focus on criminal law and procedure.

Max Credits: 3

Min Credits: 3

44.513 Crisis and Emergency Management

Course ID: 34637

Course Details: This course will provide a broad introduction to the critical challenges of disaster management. The course will address past and present strategies for reducing and responding to hazards posed by both manmade and natural disasters. Emphasis will be placed on what we can learn from the history of disasters, and on how we can apply those lessons to the management of future events.

Max Credits: 3

Min Credits: 3

44.521 Criminological Theory: Foundations

Course ID: 5431

Course Details: This course provides a detailed examination of the best known and most influential theories of crime causation. Topics include: theory construction, hypothesis testing, theory integration, and the links among theory, research, and policy.

Max Credits: 3

Min Credits: 3

44.522 Victimology

Course ID: 5432

Course Details: This course examines the study of crime victims and of the patterns, impact, and formal responses to criminal victimization. Particular attention is given to research issues such as measurement of victimization, fear of crime and related measures, and conducting research with victimized populations, as well as discussion of current issues in the field of Victimology. Substantive topics may include theories of victimization, the overlap between victims and offenders, social-psychological and other impacts of victimization on primary and secondary victims, media coverage of victimization, and evaluation of prevention and intervention programs for victims (criminal justice system based programs and others).

Max Credits: 3

Min Credits: 3

44.526 Domestic Terrorism and Hate Crimes

Course ID: 5434

Course Details: This course examines bigotry and hate and how they are manifested in criminal behavior. Various groups who have been labeled as supporting or engaging in domestic terrorism are studied. Focus is placed on federal and state statutory laws and the dynamics of police, court, and corrections based responses to hate crimes and domestic terrorism.

Max Credits: 3

Min Credits: 3

44.541 Issues in Policing

Course ID: 5439

Course Details: An introduction to research on the police, both basic research and applied, evaluative research. Since police discretion was discovered in the 1950s, basic research has focused on factors that explain the discretionary use (and abuse) of police authority, and particularly on factors that would signify bias in police decision-making, and also on the mechanisms by which police may be held accountable to the public. Evaluative research, beginning with the Kansas City Preventive Patrol Experiment in the 1970s, has been concerned with estimating the effects of programmatic and tactical innovations on social conditions such as crime, fear of crime, satisfaction with police services and quality of life.

Max Credits: 3

Min Credits: 3

44.542 Criminal Profiling

Course ID: 5440

Course Details: An overview of the development and characteristics of violent offenders, some of whom will evolve to become criminal

psychopaths. The class provides an analytical understanding of the unique characteristics of serial criminals and the methodologies used to commit their crimes.

Max Credits: 3

Min Credits: 3

44.543 Forensic Psychology

Course ID: 5441

Course Details: This course applies psychological theories, principles, and research to issues of concern to the criminal justice system with a special focus on the intersection of the mental health and criminal justice systems.

Max Credits: 3

Min Credits: 3

44.545 Criminal Mind and Behavior

Course ID: 5443

Course Details: This course is designed to address a broad range of topics relevant to criminal behavior and the development of the so called criminal personality. Factors that are considered to influence the evolution of criminal mentality are examined and the laws and the past and current response of the criminal justice system to repeat offenders are explored.

Max Credits: 3

Min Credits: 3

44.546 Mental Health & Criminal Justice

Course ID: 33236

Course Details: The course focuses on how and why individuals with serious mental illness become involved in the criminal justice system, and on how the criminal justice and public mental health systems respond to that involvement. Topics include law enforcement responses, court-based strategies, mental health and corrections, community supervision of individuals with mental illness, violence and mental disorder, and unique challenges associated with female and juvenile populations.

Max Credits: 3

Min Credits: 3

44.549 Terrorism/Counter-Terrorism

Course ID: 5444

Course Details: In order to combat "terrorism" one must be aware of what it is and is not and this course will explore "terrorism" in its totality as it occurred in the past, is occurring in the present, and how it might occur in the future. Various dominant International Terrorist groups are examined relative to their ideology, organizational behavior, and method(s) of operation. There is a heavy emphasis on the impact terrorism has and will have on the criminal justice system relative to investigation.

Max Credits: 3

Min Credits: 3

44.554 Threat Assessment and Risk Management

Course ID: 32166

Course Details: The goal of this course is to enhance understanding and increase expertise regarding risk management and the impact of terrorism on economic and other critical infrastructures in the United States. The course will provide the tools (operational and statistical) and technology required to mitigate these risks. A second purpose of the course is to examine and critically discuss current and future methods to create best practices in security management.

Max Credits: 3

Min Credits: 3

44.560 Gender, Race & Crime

Course ID: 5448

Course Details: The implications of criminal laws, criminal justice practices and programs. Focus on inequalities based on gender, race and class.

Max Credits: 3

Min Credits: 3

44.567 Overview of Homeland Security

Course ID: 32167

Course Details: The U.S. has embraced the homeland security monolith without a full understanding of what it encompasses. This course provides a comprehensive overview of homeland security and defense as undertaken in the United States since 9/11. The course critically examines the current body of knowledge with a specific focus on understanding security threats, sources, and reasons for these threats. The roles of the key players at the federal, state and local levels, the policies and procedures enacted since 9/11, and the homeland security system in practice are also examined.

Max Credits: 3

Min Credits: 3

44.568 Contemporary Security Studies

Course ID: 36405

Course Details: This course examines the complex nature of key domestic and international security threats and responses. Topics include terrorism and insurgency, transnational organized crime, WMD proliferation, cyber-security, intelligence, national and homeland security strategies, critical infrastructure protection, and theories of international security.

Max Credits: 3

Min Credits: 3

44.569 Scientific & Technological Dimensions of National Security

Course ID: 37103

Course Details: In this required course for the MS in Security Studies program, students will take this course to learn all about the efforts in the public and private sector to design new sensors, scanner, and the general role of science and technology in homeland and national security.

Max Credits: 3

Min Credits: 3

44.570 Managing Criminal Justice Organizations

Course ID: 5452

Course Details: A range of criminal justice management issues are addressed, including organizational structure, purpose, rewards and relationships, leadership and management styles, and the development of effective change strategies by criminal justice agencies. The complex role of the criminal justice manager in both the adult and juvenile justice system is emphasized.

Max Credits: 3

Min Credits: 3

44.573 Law and Public Policy

Course ID: 5454

Course Details: The course is an introduction to crime and the efforts to control crime through public policy. We explore the foundations of the policy-making process at the federal, state, and local levels. The course also considers broad theoretical applications pertaining to public opinion, national culture, and comparative analyses among Western democracies and their differing approaches to crime. This course employs a variety of learning tools, from roundtable discussions to policy cases.

Max Credits: 3

Min Credits: 3

44.574 Economic Crime

Course ID: 35786

Course Details: Introduction to economic crime including nature, causes, consequence, investigation, and prevention. Empirical findings and major economic crime cases will also be examined.

Max Credits: 3

Min Credits: 3

44.575 Criminal Homicide

Course ID: 36676

Course Details: A survey of the nature and extent of criminal homicide. There will be five main components: statutory definitions of homicide; theories of homicide; homicide rates over time and across jurisdictions; trends and patterns in homicide characteristics; and cross-cultural comparisons. Homicide is an important topic in criminology for three reasons: (1) it is the crime of greatest severity in any penal code; (2) it is a fairly reliable barometer of all violent crime; and (3) at a national level, no other crime is measured as accurately, precisely, and comprehensively.

Max Credits: 3

Min Credits: 3

44.576 History of Terrorism and Counterterrorism

Course ID: 37105

Course Details: This course will study the history and potential future of the global al-Qaida movement. Inspirational leaders, strategies, operations, tactics, finances and other key dimensions of this network will be examined in depth. The course will also examine specific vulnerabilities of a decentralized networked organization like al-Qaida, to include tactical control, strategic authority, dependence on technologies, and transactional integrity.

Max Credits: 3

Min Credits: 3

44.577 Terrorist Networks Al Qaida and Affiliated Groups

Course ID: 37102

Course Details: This course will study the history and potential future of the global Al-Qaida movement. Inspirational leaders, strategies, operations, tactics, finances and other key dimensions of this network will be examined in depth. The course will also examine specific vulnerabilities of a decentralized networked organization like Al-Qaida, to include tactical control, strategic authority, dependence on technologies, and transactional integrity.

Max Credits: 3

Min Credits: 3

44.578 Intelligence Analysis Policy and Practice

Course ID: 37085

Course Details: Students will examine the tradecraft of intelligence collection and analysis from various perspectives. Topics will include strategies, tactics, legal and ethical implications, sources, means, methods, limitations, covert action, methods of analysis, and case studies of prominent intelligence successes and failures in the last half century.

Max Credits: 3

Min Credits: 3

44.580 Descriptive & Inferential Statistics

Course ID: 5455

Course Details: This course is a rigorous introduction to statistical inference: probability theory, confidence intervals, and hypothesis tests. The course also covers regression analysis, which is developed in a non-technical way, with an emphasis on interpretation of regression results, using examples from recent research.

Max Credits: 3

Min Credits: 3

44.588 Strategic Intelligence and Homeland Security

Course ID: 32202

Course Details: This course is designed to provide an overview of the past, present, and future role of intelligence in national security. The course addresses the development and institutional structure of intelligence organizations and explains their purpose, roles, responsibilities, and realms of authority. It also provides an overview on oversight and accountability of intelligence agencies, intelligence cultures, the impact of technology, the development of collection and analytic capabilities, and the interaction between intelligence and policy. The course makes extensive use of case studies to examine incidents where intelligence played a significant role and the dilemmas in its application, primarily in the areas of national security and military policy.

Max Credits: 3

Min Credits: 3

44.590 Research Design

Course ID: 5456

Course Details: Research design is a graduate-level introduction to methodology as used in criminology/criminal justice. The course surveys the research design enterprise and covers a host of issues on the measurement and collection of data, and other procedures that influence whether a research study will lead the investigator to scientifically rigorous information. This course explains various strategies for devising social science studies, compares the relative benefits of various designs, and identifies the tools necessary to conduct studies that will yield data worthy of analysis and interpretation. This material will be valuable for students who will conduct research and administrators who must evaluate the research of others.

Max Credits: 3

Min Credits: 3

44.594 Crime Analysis and Mapping

Course ID: 5460

Course Details: This course examines the use of new technologies to analyze crime patterns and develop crime prevention strategies. Students study theories that explain the geographic distribution of crime and learn how to use Geographic Information Systems to study crime in ways that draw upon theory as well as how to apply GIS techniques in the law enforcement and corrections fields.

Max Credits: 3

Min Credits: 3

44.595 Program Evaluation

Course ID: 5461

Course Details: A detailed examination of methods of evaluating criminal justice programs. Focuses on both process and outcome evaluation.

Max Credits: 3

Min Credits: 3

44.599 Criminal Justice Intelligence and Information Sharing

Course ID: 32203

Course Details: A primary function of law enforcement is the gathering of information. However, information by itself does little to support the law enforcement mission. Intelligence, in the context of law enforcement, is the outcome of rigorous analysis of information, and often generates key decisions and/or guides tactical strategies that help facilitate the enforcement mission. This course examines the role of information and intelligence in defining and achieving the law enforcement mission. Problem solving tools such as SARA, and management tools like COMPSTAT, which rely heavily on both information and intelligence, are discussed. In a world now confronted by the threat of terrorism, the course examines the sharing/lack of sharing of information and intelligence among local law enforcement and federal agencies and the impact of this contentious relationship.

Max Credits: 3

Min Credits: 3

44.622 Intimate Partner Violence

Course ID: 5463

Course Details: An examination of the nature and extent of intimate partner violence and an analysis of the causes and consequences of violence between partners as well as the latest research regarding the criminal justice response.

Max Credits: 3

Min Credits: 3

44.623 Responding to Child Maltreatment

Course ID: 5464

Course Details: Introduction to empirical findings and theoretical perspectives concerned with the maltreatment of children and youth. Includes an examination of prevalence rates, risk factors, consequences, and system responses.

Max Credits: 3

Min Credits: 3

44.624 Violence in America

Course ID: 5465

Course Details: This course provides an in-depth analysis of the causes, context, and control of a wide range of violent crimes. Topics covered in this class include: Murder, rape, robbery, assault, and violence in the helping professions, the workplace, school, gang violence, cult violence, and institutional violence. For each form of violence, we examine issues related to (1) the extent of the problem, characteristics of the crime, victim, and offender, (2) causation, (3) crime prevention, and (4) crime control strategies.

Max Credits: 3

Min Credits: 3

44.642 Issues in Computer Crime and Cyber Security

Course ID: 37097

Course Details: This course will examine the history and evolving nature of the relationship between technology, crime, and security, with a particular focus on legitimate and illegitimate Internet commerce, and cyber criminal methodologies and techniques. We will study major issues in cyber security including criminal and state-sponsored hacking; data, intellectual property, and identity theft; financial and personal data security; cyber-terrorism; tools and methods used to exploit computer networks, and strategies to protect against them; and new and emerging technologies. This course will be taught specifically for non-computer science majors, although students with computer science backgrounds are welcome for the experiences that they can bring to the class discussions.

Max Credits: 3

Min Credits: 3

44.643 Weapons of Mass Destruction

Course ID: 37100

Course Details: This course explores the threats that weapons of mass destruction (WMD) pose to the U.S. and its interests along with the strategies to meet those threats. The course will examine the technical aspects, history, and contemporary threat of each category of weapon ? Chemical, biological, radiological, and nuclear ? followed by a critical analysis of U.S. and global efforts to limit access to these weapons and prohibit their production, proliferation and use. The course will also review some aspects of WMD attack response, recovery, and mitigation.

Max Credits: 3

Min Credits: 3

44.644 Global Trafficking and Criminal Networks

Course ID: 37101

Course Details: Illicit economic activities are a global phenomenon with local impact. This course will examine the threat that global trafficking poses to a nation's security, political stability, economic development, and social fabric. The lessons in this advanced graduate-level seminar are organized around the trafficking activities of greatest concern to the United Nations, Interpol, IAEA and other international agencies ? as well as to the U.S. Departments of State, Defense, Justice, and Homeland Security.

Max Credits: 3

Min Credits: 3

44.646 Sex Crimes and Offenders

Course ID: 32172

Course Details: This course examines the nature of sex offenses as well as the mind of the sex offender, and focuses on motives, possible victims, and rehabilitation. The responses of the mental health and criminal justice systems are examined and the effectiveness of those responses is assessed.

Max Credits: 3

Min Credits: 3

44.650 Community Based Correction

Course ID: 5470

Course Details: This course presents a detailed examination of current theory, research, and policy development in the field of community corrections, both nationally and internationally. Topic areas include sentencing, probation, parole, fines, community service, and intermediate sanctions (intensive supervision, house arrest/electronic monitoring, boot camps). Issues include the punishment vs. control argument, community justice models, special offender populations (drug offenders, sex offenders, mentally ill offenders, AIDS), and the cost effectiveness of community corrections.

Max Credits: 3

Min Credits: 3

44.680 Selected Topics

Course ID: 5473

Course Details: A comprehensive examination of a current issue in criminal justice.

Max Credits: 3

Min Credits: 3

44.689 Special topics in Criminal Justice and Criminology

Course ID: 37106

Course Details: Special topics classes are used to address timely issues that do not fit into the regular course offerings.

Max Credits: 3

Min Credits: 3

44.691 Directed Study in Criminal Justice

Course ID: 5478

Course Details: This course is designed as an independent study of a subject not offered in the standard curriculum.

Max Credits: 3

Min Credits: 3

44.697 Security Studies Project Design and Defense

Course ID: 37111

Course Details: Under faculty supervision, students in the MS in Security Studies program will design a science or technology-related project that demonstrates mastery in a subject relevant to security. Examples could include chemical or biological sensors, computer

firewall intrusion detection system, baggage scanners, signals interception device, etc.

Max Credits: 3

Min Credits: 3

44.698 Security Studies Capstone 1 Data Collection and Analysis

Course ID: 37112

Course Details: This course is the first of a 2-part culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.591: Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Master's level research paper of at least 50 pages on a topic of their choosing related to security studies. The design of the 2-course capstone sequence emphasizes independent research and writing, thus required class periods are kept to a minimum.

Max Credits: 3

Min Credits: 3

44.699 Security Studies Capstone 2 Writing and Presentation

Course ID: 37113

Course Details: This course is the second of a 2-part culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.591: Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Master's level research paper of at least 50 pages on a topic of their choosing related to security studies. In this second course of the sequence, students will prepare drafts of their paper for review by their faculty mentor, and at the end of the semester will give a presentation (graded), open to the community, on their research.

Max Credits: 3

Min Credits: 3

44.741 Thesis Review

Course ID: 35263

Course Details:

Max Credits: 1

Min Credits: 1

44.743 Master's Thesis - Criminal Justice

Course ID: 5488

Course Details:

Max Credits: 3

Min Credits: 3

44.746 Master's Thesis - Criminal Justice

Course ID: 5489

Course Details:

Max Credits: 6

Min Credits: 6

44.749 Master's Thesis - Criminal Justice

Course ID: 5490

Course Details:

Max Credits: 9

Min Credits: 9

46.544 Advanced Research Methods

Course ID: 37360

Course Details: The purpose of this course is to introduce students to the fundamentals of research while also conveying the need for skepticism as the foundation of scientific inquiry. Both quantitative and qualitative methods will be examined. Students will gain first-hand knowledge of the research process by formulating their own research questions, locating current literature to frame their topic, developing causal theories and then empirically testing these theories. With that in mind, the first goal of this course is for students to become critical consumers of research in general and peace and conflict research in particular. The second goal is for students to develop theories about peace and conflict and research designs to test those theories. Students are encouraged to use this course to develop their thesis or projects.

Max Credits: 3

Min Credits: 3

47.500 Introduction to Community Social Psychology

Course ID: 5760

Course Details: Introduces history and contemporary trends of community and social psychology with focus on how social and environmental forces affect individual and group quality of life. This course surveys the history, theoretical frameworks, core values, methods/approaches and orienting concepts in the field.

Max Credits: 3

Min Credits: 3

47.501 Applied Developmental Psychology

Course ID: 5761

Course Details: Provides a life span developmental perspective on individual and social adaptation and change. Examines appropriate theory and research, and illustrates the influences of environmental, social and cultural factors.

Max Credits: 3

Min Credits: 3

47.502 Seminar in Community Social Psychology

Course ID: 5762

Course Details: Offered from time to time to highlight specialized areas of faculty interest and to acquaint the student with new developments from a broad range of current psychological theory and research and how these developments might affect social and community life.

Max Credits: 3

Min Credits: 3

47.503 Applied Social Psychology

Course ID: 5763

Course Details: Introduces students to social psychology as an applied discipline. Covers such applied topics as attitude change, aggression, helping behavior, attribution, and interpersonal influence.

Max Credits: 3

Min Credits: 3

47.504 The Family System

Course ID: 5764

Course Details: Studies family processes and the interplay between the family and other social, cultural, and socio-economic systems. Topics include parental roles, changing family structures, racial and ethnic factors, and interactions between family, work, and

community.

Max Credits: 3

Min Credits: 3

47.509 Psychological Approches to Child Maltreatment

Course ID: 35082

Course Details: The course addresses the painful topic of Child Maltreatment in the context of research on optimal, typical, and unacceptable treatment of children, as maltreatment cannot be considered apart from acceptable and even optimal treatment. The impact of maltreatment on the development of the child from the first growth of physical organs in the prenatal infant through the development of moral reasoning in the adolescent is addressed. Both theories and research will be discussed.

Max Credits: 3

Min Credits: 3

47.512 Applied Research Methods

Course ID: 5767

Course Details: Considers strengths and limitations of various approaches to community and social psychological research. Develops skills for formulating research questions and translating them into practical study designs. Sensitivity to research ethics as well as research practicality and validity are emphasized. Pre- or Co-requisite: 47.500

Max Credits: 3

Min Credits: 3

47.522 Psychology of Diversity

Course ID: 5770

Course Details: This course introduces students to theoretical, philosophical and experiential frameworks for thinking about diversity in our communities and society. It includes an examination of the experiences of diverse groups, especially traditionally oppressed groups and individuals. This course is designed to engage students in a process of introspection and self-examination about issues such as racism, sexism, classism, and homophobia. Emphasis will be placed on challenging one's own world view and the way it fits into institutional oppression, as well as the way it may affect our work as community change agents.

Max Credits: 3

Min Credits: 3

47.523 Women in the Community

Course ID: 5771

Course Details: An examination of women's roles in the home, community, and work place; examines psychological consequences, social structural influences, and options for change. Topics include: housework and childcare; violence against women; work place stratification issues; and women's contributions to their communities.

Max Credits: 3

Min Credits: 3

47.526 Workplace Diversity

Course ID: 30411

Course Details: This course will explore the challenges presented by the increasingly diverse workforce within the United States. Students will consider how work groups and organizations can effectively incorporate a diversity of perspectives. Students will consider issues of oppression, discrimination and bias, with particular attention paid to the situation here in the Merrimack Valley. There will also be some focus on personal awareness and the development of skills for addressing diversity concerns.

Max Credits: 3

Min Credits: 3

47.527 Immigrant Psychology and Communities

Course ID: 33083

Course Details: This course will focus on the immigrant experience and the various immigrant groups in the United States with emphasis on recent immigrants in Lowell and Massachusetts. Theories of acculturation and adaptation to a new cultural environment will be extensively examined in the course. An experiential approach will be integrated throughout the course via the incorporation of guest speakers, films, autobiographies/novels, and food. Students will have ample opportunities to read, reflect, discuss and write about the immigrant experience. As our country is a country of immigrants, this course should have relevance to anyone working in the community.

Max Credits: 3

Min Credits: 3

47.542 Working with Groups

Course ID: 5783

Course Details: This course uses a community-based approach to working with groups. Guided by an understanding of theoretical principles, students will gain insights about group dynamics and process. Students will develop and apply various skills, including assessment, enhanced communication, conflict resolution, problem solving, decision-making, and evaluation. Emphasis is placed on working within diverse groups, attaining outcomes, and utilizing resources. Organizational, prevention/intervention, and focus groups are examined.

Max Credits: 3

Min Credits: 3

47.543 Forensic Psychology

Course ID: 5441

Course Details: This course applies psychological theories, principles, and research to issues of concern to the criminal justice system with a special focus on the intersection of the mental health and criminal justice systems.

Max Credits: 3

Min Credits: 3

47.545 Community and Organizational Change

Course ID: 5784

Course Details: A review of skills, techniques, and qualities associated with effective community and organizational interventions. Topics include the possibility and desirability of change, methods for studying change, assessment of needs and resources, visioning and planning, membership recruitment and retention, strategy and tactics, leadership styles, publicizing, funding, advocacy, evaluation techniques, and the personal qualities of the change agent. Both cultural factors and the community context of interventions will be discussed. Application to specific cases will be made. Students will have the opportunity to apply course material to settings outside the classroom.

Max Credits: 3

Min Credits: 3

47.546 Grant Writing

Course ID: 5785

Course Details: This course will be a hands-on course in grant writing. One of the first lessons that you will learn is that grant writing is only to a small degree about writing. Successful grants emerge from working effectively with others to draw out ideas, capture those ideas to create a program or a plan for research, show how the plan is an appropriate one to respond to the "Request for Proposals", and package those ideas so that they make sense to the people who will review the proposal. Grant writing is increasingly a team building activity. Whether or not you obtain the funding is sometimes less important than the networking and planning that you do as a part of developing a grant proposal.

Max Credits: 3

Min Credits: 3

47.561 Introduction to Behavioral Intervention in Autism

Course ID: 32169

Course Details: This course provides an introduction to the causes and diagnosis of autism, scientific validation, applied behavior analysis, and ethical treatment. Students also learn to write functional objectives, plan positive reinforcement, and design an applied measurement system in the context of developing Individualized Family Service Plans and Individualized Education plans. The issue of culturally appropriate interventions is addressed. Prerequisite: coursework in the psychology of child development, or permission.

Max Credits: 3

Min Credits: 3

47.562 Teaching and Positive Behavioral Support in Autism

Course ID: 32546

Course Details: This course covers the application of specific behavioral teaching procedures, including prompting, reinforcement, shaping, chaining, error correction and generalization methods, and the development of instructional plans. Emphasis is placed on procedures and plans to teach communication, social, self-help and per-academic skills. Application of such methods in inclusive classroom settings is also considered.

Max Credits: 3

Min Credits: 3

47.565 Measurement and Experimental Design in Behavioral Intervention

Course ID: 33068

Course Details: This course provides advanced coverage of measurement methods used in behavioral intervention. It also offers in-depth coverage of the "within-subject" experimental designs commonly used in behavioral research and practice. Component analysis and parametric analysis methods, and ethical considerations in research, are also covered.

Max Credits: 3

Min Credits: 3

47.566 Functional Analysis and Treatment of Challenging Behavior

Course ID: 33066

Course Details: This course covers the purpose, rationale and methods used in conducting and interpreting functional analyses of challenging, or "maladaptive", behaviors (self-injury, stereotypy, aggression). It also describes the full range of behavioral procedures used to decrease or eliminate these behaviors, with emphasis placed on ethical interventions and the desirability of least restrictive and non-aversive strategies.

Max Credits: 3

Min Credits: 3

47.568 Behavioral Intervention Program Models in Autism

Course ID: 33067

Course Details: This course explores how educational environments can be designed to maximize learning. Different models of effective, evidence-based behavioral interventions are analyzed. The use of teaching activity schedules and staff training to build supportive educational settings is also covered.

Max Credits: 3

Min Credits: 3

47.571 Autism and Developmental Psychopathology

Course ID: 37675

Course Details: This course is designed to explore Autism Spectrum Disorders (ASDs) in the developing person and in changing social contexts (e.g., family, school, employment) across development. An empirical and theoretical review of developmental transformations and reorganizations across the lifespan provides the basis for examining biological, social, psychological, and cultural contributions to the continuity and discontinuity of both adaptive and maladaptive processes over time as well as an analysis of individual and environmental risk and protective factors across development. Special attention is given to the changing competencies and challenges of developmental periods and their role in the assessment, display, meaning, and implications of ASDs from infancy through adulthood.

Max Credits: 3

Min Credits: 3

47.572 Legal and Ethical Issues in Professional Practice.

Course ID: 37676

Course Details: This course will explore the legal and ethical issues facing professionals working with individuals diagnosed with disabilities, particularly those on the autism spectrum. The goal is to provide behavior analysts and other professionals the opportunity to develop skills in dealing with the complex legal and ethical issues that arise when working in human service fields.

Max Credits: 3

Min Credits: 3

47.574 Community and Social Interventions in Autism

Course ID: 37998

Course Details: This course will focus on current perspectives of community-based programming for individuals on the autism spectrum, particularly among the adolescent and adult age range. We will overview the challenges experienced by those with an autism spectrum disorder (ASD) during adolescence and adulthood, and consider the issues involved in designing, implementing, and evaluating social and community interventions for this population.

Max Credits: 3

Min Credits: 3

47.586 Community Service Learning (1, 2, or 3 credits)

Course ID: 5756

Course Details: Students will take an applied role in the community where they will have the opportunity to provide some form of meaningful service to individuals, groups or communities. Students will meet regularly with a designated faculty member on campus to consider their experiences in the context of current psychological thought. In some instances, the commitment to community service may extend over the course of a full year. Graded as Satisfactory or Unsatisfactory. 1, 2 or 3 credits. This course may be repeated but no more than 9 credits total from any combination of 47.486, 47.488 and 47.491 may be counted toward the degree.

Max Credits: 3

Min Credits: 1

47.611 Program Evaluation

Course ID: 5790

Course Details: A skill-oriented approach that considers both formative and summative evaluation techniques. Emphasizes mastery of the technical aspects of the evaluation process, and includes consideration of the importance of program evaluation in community psychology, health, education, etc.

Max Credits: 3

Min Credits: 3

47.625 Advanced Community Dynamics: Lowell

Course ID: 5795

Course Details: An examination of principles that influence community structure, function, and evolution over time. Students will learn how community patterns and activities can best be understood and how community problems and concerns can best be addressed, employing psychological and other conceptual frameworks and perspectives. Specific emphasis will be placed on the historic and diverse city of Lowell. Prerequisites: 47.500 and 47.512.

Max Credits: 3

Min Credits: 3

47.631 Practicum I

Course ID: 5796

Course Details: Provides supervised field experience in a setting appropriate to the student's area of specialization, plus on-campus class meetings. An average of approximately ten hours of fieldwork in an approved setting for two consecutive semesters is required. Prerequisites: 47.500 and 47.512: pre-or Co-rquisite: 47.625

Max Credits: 3

Min Credits: 3

47.632 Practicum II

Course ID: 5797

Course Details: Continuation of 47.631, which is pre-requisite.

Max Credits: 3

Min Credits: 3

47.661 Social and Community Interventions in Autism

Course ID: 37677

Course Details: This course will focus on current perspectives of community-based programming for individuals on the autism spectrum, particularly among the adolescent and adult age range. We will overview the challenges experienced by those with an autism spectrum disorder (ASD) during adolescence and adulthood, and consider the issues involved in designing, implementing, and evaluating social and community interventions for this population. The class will incorporate weekly readings focusing on research in the field, presentations, and guest speakers.

Max Credits: 3

Min Credits: 3

47.663 Experimental Analysis of Behavior

Course ID: 37678

Course Details: This course will explore the basic principles of the experimental analysis of behavior and their application to an understanding of learning. Emphasis will be placed on the historical underpinnings of the field, the methods of analysis, and current issues in the field.

Max Credits: 3

Min Credits: 3

47.671 Supervised Practicum in Behavioral Intervention in Autism: I

Course ID: 37672

Course Details: The practicum sequence of courses is designed to provide students with a total of 750 hours of practicum experience. In this first of 2- or 3-course sequence, students will complete 250 or 375 hours of experience in applying behavioral principles and methods to children on the autism spectrum or with forms of developmental disability. Students will be placed in approved settings, and though on-site supervision and supervision provided by the practicum instructor will receive some of the BCBA-supervision hours required by the Behavior Analyst Certification Board. Students will average approximately 17 or 25 hours per week at their practicum site and will also participate in an on-campus practicum seminar with weekly class meetings. Fall Semesters only.

Max Credits: 3

Min Credits: 3

47.672 Supervised Practicum in Behavioral Intervention in Autism:II

Course ID: 37673

Course Details: In this second of a 2- or 3-course sequence, students will complete 250 hours or 375 hours of experience in applying behavioral principles and methods to children on the autism spectrum or with other forms of developmental disability. Students will be placed in approved settings, and through on-site supervision and supervision provided by the practicum instructor will receive one-third of the BCBA-supervision hours required by the Behavior Analyst certification Board. Students will average approximately 17 or 25 hours per week at their practicum site and will also participate in an on-campus practicum seminar with weekly class meetings. Spring semesters only.

Max Credits: 3

Min Credits: 3

47.673 Supervised Practicum in Behavioral Intervention in Autism:Continuing

Course ID: 37674

Course Details: For students who did not complete the required 750 experience and supervision hours in 47.671 and 672, in this third course students will complete 250 hours of experience in applying behavioral principles and methods to children on the autism spectrum or with other forms of developmental disability. Students will be placed in approved settings, and through on-site supervision and supervision provided by the practicum instructor will receive some of the BCBA-supervision hours required by the Behavior Analyst Certification Board. Students will average approximately 17 or 25 hours per week at their practicum site and will also participate in an on-campus practicum seminar with weekly class meetings. Summer semesters only.

Max Credits: 3

Min Credits: 3

47.691 Directed Study in Community and Social Psychology

Course ID: 5799

Course Details: This course is designed as an independent study under the supervision of a member of the department of a subject not offered in the standard curriculum.

Max Credits: 3

Min Credits: 3

47.692 Directed Study in Autism

Course ID: 37740

Course Details: This course is designed as an independent study under the supervision of a member of the department of a subject not offered in the standard curriculum.

Max Credits: 3

Min Credits: 3

47.733 Master's Project in Community-Social Psychology

Course ID: 5802

Course Details: For graduate students actively engaged in developing a change-oriented intervention leading to the submission of a written project report. A program of supervised study will be arranged between the student and a faculty supervisor. Prerequisite: Approval of major advisor.

Max Credits: 3

Min Credits: 3

47.741 Graduate Research: Psychology

Course ID: 5803

Course Details:

Max Credits: 1

Min Credits: 1

47.743 Master's Thesis in Community Social Psychology

Course ID: 5804

Course Details: For graduate students actively engaged in research leading toward the submission of a written thesis. A program of supervised work will be arranged between the student and a faculty supervisor. This course may be repeated for credit, but only a total of 6 credits may be counted toward the Master's degree. Prerequisite: 47.500 and 47.512 and permission of the faculty member who will

supervise the thesis.

Max Credits: 3

Min Credits: 3

47.744 Master's Thesis in Autism Studies

Course ID: 38223

Course Details: For graduate students actively engaged in research leading toward the submission of a written thesis. A program of supervised work will be arranged between the student and faculty supervisor. This course may be repeated for credit, but only a total of 6 credits may be counted toward the Master's degree. Prerequisite: 47.512 and 47.561 and permission of the faculty member who will supervise the thesis.

Max Credits: 3

Min Credits: 3

49.593 Econometrics

Course ID: 37457

Course Details: This graduate level course introduces students to econometric methods. The prerequisites are either the equivalent to Statistics for Business and Economics I (49.211) and Statistics II (49.212) as described in the UML course catalogue. This course will cover econometric techniques such as bivariate and multivariate regressions. These techniques are commonly used in economics. Throughout the course the students will use Stata, a statistical software, and they will learn how to apply the methods from the book to real datasets. The students will learn how to find the appropriate statistical approach starting from a verbal formulation of an empirical hypothesis. They will also learn to evaluate the relevance, quality and limitations of empirical results. The students will refine these skills via homework, a paper, class participation and presentations.

Max Credits: 3

Min Credits: 3

49.730 Microeconomic /Organization Theory

Course ID: 36931

Course Details: This course is an introduction to microeconomic theory. The focus is on the behavior of individual consumers and firms in competitive settings. Topics will include consumer preferences and utility, consumer choice, market demand, production theory and market structure.

Max Credits: 3

Min Credits: 3

49.731 Statistics

Course ID: 36927

Course Details: This course covers descriptive statistics, random variables and expected value, discrete and continuous probability distributions, joint distribution functions, sampling distributions, point and interval estimation, and hypothesis testing, and non-parametric statistics. This course will also provide a brief introduction to linear regression and analysis of variance (ANOVA).

Max Credits: 3

Min Credits: 3

49.733 Econometrics I

Course ID: 36928

Course Details: After a brief review of the required mathematics for the course, the primary focus will be on the multivariate linear model. Topics include: consistency and asymptotic normality of the parameter estimates, sampling distributions, hypothesis testing, parameter restrictions, and specification test and corrections for violation of model assumptions. This course will also include working with various statistical packages.

Max Credits: 3

Min Credits: 3

49.734 Econometrics II

Course ID: 36929

Course Details: This course is a continuation of Econometrics II; the focus will be on the more advanced techniques used in estimation and inference problems in social science research. Possible topics include nonlinear models, the generalized method of moments, limited dependent variable and sample selection problems, multi-equations models, time-series models, and panel data analysis. Statistical packages will be utilized for a hands-on approach to the techniques.

Max Credits: 3

Min Credits: 3

57.503 Work, Technology and Training

Course ID: 6183

Course Details: This course surveys issues of work organization and technological change and the key roles they play in the development process. Contrasts are made among different systems of production, and key changes in the work roles and responsibilities of non-supervisory employees, front line supervisors and middle and upper management are identified. This course includes comparisons of historical transformations at key moments in the emergence of internationally competitive developed economies. In addition, selected contemporary cases exemplify current issues in the ongoing transformation of work organization and technology. Students are introduced to practical considerations in work process design. Student projects are required.

Max Credits: 3

Min Credits: 3

57.506 Research Methods

Course ID: 6186

Course Details: This course is an applied survey of research methods appropriate for regional economic and social development. Students will learn data presentation and basic descriptive and inferential statistics, as well as the basics of researching data sources and primary data-gathering techniques (survey, case study, archival), and a framework for deciding when particular methods of data-gathering and analysis are appropriate. Students will apply the techniques as they learn them.

Max Credits: 3

Min Credits: 3

57.508 The Budget as a Policy, Planning and Information Tool

Course ID: 33622

Course Details: In simple terms, an organization's budget is its financial plan of operations based on expected income and anticipated expenses for a given period. The budget involves the priority ranking of desired ends and the selection of means to reach those ends in an environment of competing demands and limited resources. Budgeting is an ongoing process of gathering information, applying that information to the allocation of scarce resources as well as to the evaluation of the achievement of desired ends. The budget is also a policy document used to both communicate organizational goals and to promote their realization. This course will examine the various forms financial plans can take in local government entities and not-for-profit organizations. It will focus on the budget as a policy, planning and information tool for managing practitioners. It will begin with an overview of the legal, procedural and practical framework of budgeting in the public and nongovernmental organization (NGO) sectors, examine closely the applications of the various stages of the budget process, delve into modern strategic program management and conclude with case studies of both a municipal jurisdiction and a regional community action agency..

Max Credits: 3

Min Credits: 3

57.511 Dynamics Power and Authority

Course ID: 6189

Course Details: This course surveys theories of power, authority, participation, and politics. Building on these theories, students will examine changing social, political, and economic patterns of inequality based on class, race (and related divisions of ethnicity, religion, caste, nationality), and gender. Reviews various approaches to altering these dynamics (business strategy, public policy, community and social movements). Cuts across units of firm, community, region, and nation, along with corresponding governmental institutions, and links theoretical analysis with study of practical problem solving. Instructor-initiated cases drawn from a variety of national experiences. Students will learn techniques of power analysis and prepare a power analysis project.

Max Credits: 3

Min Credits: 3

57.512 Community Conflict Resolution

Course ID: 6190

Course Details: This course gives students an understanding of the main issues and solutions involved in community level conflict resolution; e.g., in neighborhoods, workplaces, and other institutions. It develops students' skills in practicing conflict resolution and/or evaluating programs in the field of dispute resolution. It is important to understand why conflict happens and how to resolve conflict.

Max Credits: 3

Min Credits: 3

57.513 Foundations Of Comparative Regional Development

Course ID: 6191

Course Details: This course offers an initial grounding in economic, historical, political, and sociological methodologies and introduces discipline-based and interdisciplinary approaches to regional development. It introduces students to: identifying and assessing structural factors influencing regional development, defining regional development challenges, and generating problem-solving strategies and public policies. The course highlights the relationship between theory and application, and looks at development at the community, national, and international levels. It makes extensive use of case materials on regional development, including a unit on the development of the Massachusetts economy. Students will learn how to find, prepare and analyze data on regional economies and will learn several basic quantitative tools for regional analysis.

Max Credits: 3

Min Credits: 3

57.514 Community Mapping

Course ID: 6192

Course Details: Interest in community mapping as a way to identify, analyze, and address problems is growing as new computer tools become available. This course provides students with hands-on training in using geographic information systems (GIS) for research, problem solving, and social action. Students will read the interdisciplinary literature that shows how scholars from such fields as regional economic and social development, public policy, community psychology, management, environmental sciences, health care, and criminal justice are using GIS to explore questions and work with different constituencies. Students will learn about how people in different jobs (in government, industry, nonprofits) are employing community mapping in innovative ways for grant writing, needs assessment, strategic planning, evaluation, and as a way to identify and address inequities. At the completion of the course, students will be adept at using GIS programs applying the technology to problems of their choice.

Max Credits: 3

Min Credits: 3

57.515 Politics and Economics of Public Policy

Course ID: 6193

Course Details: The course will provide students with both a set of analytical frameworks to understand how and why specific public policies develop, and a set of normative perspectives to assess what makes for good public policy. Our treatment will be interdisciplinary drawing from areas of economics and political science. Following some grounding in the political economy of the role of government and policy making in a market based economy such as the United States, we will do case studies to understand and to evaluate policies from a variety of current areas of interest to the students and professors. Students will be introduced to basic ideas of cost benefit analysis, program evaluation, and implementation analysis.

Max Credits: 3

Min Credits: 3

57.518 Comparative Environmental Study

Course ID: 6196

Course Details: In this course, students will explore the dynamics and interactions of social, economic and political factors that aid or impede a community's ability to contribute to global environmental sustainability, one that does not threaten the well being of future

generation. Students will each select a city from one of six developing regions (Latin America, China, Southeast Asia, India and South Asia, Sub-Saharan Africa, and North Africa & the Middle East), a city from one of two transitional regions (Russia and Eastern Europe), and a city from an industrial region (the New England area of the United States) of similar population size. Using information from government documents and other library resources, personal contacts, as well as the World Wide Web sites which use maps and geographic information systems (GIS) to explore environmental health issues, students will research the status of environmental sustainability for each of their 3 chosen regions. At the conclusion of the course students will present a comparison of their 3 regions.

Max Credits: 3

Min Credits: 3

57.520 Inequality and Organization

Course ID: 6198

Course Details: Despite the lowest unemployment rate in 25 years, the economic recovery of the 1990s has brought a Treadmill Economy running faster with minimal gain. With low productivity growth, surprisingly little growth in wages and a long-term slowdown in economic growth since the 1970s, the United States continues to experience increasing inequality. What forces are at work shaping these trends and can they be modified or reversed on the local, state and regional levels? How have these trends both shaped and been influenced by social and business policies concerning poverty and welfare, local and urban development, technology and economic development, changes in work organization and labor-management relations, domestic investment and international competition? This seminar course will bring local and national experts on these issues to present their findings and discuss their view of future prospects for local and regional social and economic development policy.

Max Credits: 3

Min Credits: 3

57.527 Sustainable Housing Development and Land Use: Conflict, Policy, and Practice

Course ID: 37781

Course Details: Housing is fundamental to the quality of life in communities, and housing conflict, policy and practice shape the availability of this fundamental good. This course will examine the economic, environmental, social, and cultural factors that shape housing and its sustainability. The contentious nature of housing and land use policy in the United States will be summarized, with students learning how housing policy impacts communities, states, and regions. The course will then give students a detailed understanding of the conflictive process through which housing is developed and the role the market, government, funders, workers, and housing consumers play in influencing the creation and development of housing. The course will highlight ways in which current housing development policy and practices are not sustainable, and will examine more recent efforts to establish standards and practices that enhance consensus and sustainability. Students will learn how to manage conflict and take a housing project through the various stages, such as project conceptualization, market analysis, design, site acquisition, financing, construction, and occupancy. While the course focuses on the U.S. context, students will learn of international efforts to achieve greater sustainability in housing. The course will provide students with both practical and theoretical knowledge of housing and land use conflict, policy and development practices. Case studies of actual projects will be presented.

Max Credits: 3

Min Credits: 3

57.537 Developing Economies

Course ID: 6205

Course Details: This course explores alternative visions of what is meant by development, what is involved in the development process, and who benefits from it. A country must choose the goals (such as growth, equity, or sustainable human development) it hopes to achieve and develop a strategy for attaining them. It must make critical decisions regarding the roles of major sectors of the economy (agriculture, industry, services, the extent of foreign involvement), the form of organization they will have (large or small scale, centralized or decentralized, private or public ownership), and the roles of major institutions (government, financial sectors, multinational corporations, and international aid agencies). The theoretical and practical issues we will discuss have broad relevance for understanding the varied development process in Asian countries, the struggles of middle-level developing countries (such as Mexico or Brazil) or the despair of the broad group of countries for which development seems an increasingly dimmer vision (many African countries). The course emphasizes interconnections in the world economy. On the one hand, policies shaped by institutions in First World or industrialized countries have a significant and often adverse impact on developing countries. On the other hand, the failure of development programs in many countries thought to be "developing" has a critical impact on the future of industrialized nations. Students will be expected to develop thoughtful positions on current controversial issues in development and to suggest appropriate strategies for change.

Max Credits: 3

Min Credits: 3

57.539 Justice and Trade in the Global Economy

Course ID: 37372

Course Details: We know that we are part of a global economy and that many of the things we buy and consume are produced in other countries. But what do we know of how they are made? Do we understand that there may be hidden costs in the price we pay for goods at the supermarket, in a department store? Understanding the nature of global trade is critical for us to be effective citizens in the world. Perhaps more important is that we understand how goods are produced and traded - what many think of as "fair" trade. The subject of Fair Trade isn't simply limited to the production and sale of coffee and chocolate. Fair Trade principles encompass environmental issues, human rights, and politics. Once aware of the ramifications of consumerism on all parts of the world, including the United States, people can make informed choices about the products they buy, the companies that employ them, and the political views they support. By the end of this course students should understand the major ideas and tools used to comprehend complex international and global trade relations. Students will understand the way in which goods are produced for global markets and the possible human and environmental costs such production entails.

Max Credits: 3

Min Credits: 3

57.540 China and India in the Global Economy

Course ID: 34691

Course Details: In recent years China and India, with one-third of the world's population, have emerged as economic powerhouses in the global economy. This course will explain how these once-latent giants have become major participants in global competition, focusing in particular on their capabilities in the information and communication technologies industries. The course will cover the roles of the state, foreign investment and trade, high-tech districts, industrial enterprises, education, skill formation, knowledge creation, indigenous innovation in Chinese and Indian economic development. We will conclude the course by considering the sustainability of the Chinese and Indian development paths. Throughout the course, we will compare the social structures and economic experiences of the two nations to gain insight into their distinctive development paths.

Max Credits: 3

Min Credits: 3

57.545 The Political Economy of Employment

Course ID: 35782

Course Details: This course provides an analysis of the ways in which employment opportunities are created, sustained, and destroyed in a modern capitalist economy such as the United States. We begin by taking a close look at the current state of employment in the US economy. Then we delve into the US historical experience over the past century, focusing along the way on the Great Depression of the 1930s, the post-World War II expansion, the stagflation of the 1970s, and the profound transformation in the conditions of employment over the last two decades of the 20th century which have made jobs of even the best educated members of the labor force much less secure than previously. With this historical perspective as a foundation, we consider alternative theories of why and how the economic system creates, sustains and destroys jobs. We then ask in what ways these processes operate in the business sector, where companies need to generate profits to survive, and the government sector, which has as its foundation the taxation of the population. This understanding of the dynamics of employment in the United States provides an essential basis for explaining two key intertwined features of the US political economy over the past three decades: an increasingly unequal distribution of income and the polarization of income from employment with the disappearance of "middle class" jobs. Contributing to these outcomes, especially in the 2000s, has been the globalization of the labor force, including the "offshoring" of jobs by US companies to lower wage areas of the world. The course explores differential access to employment opportunities by race, ethnicity, and gender. The remainder of the course examines the ideologies and social movements that underpin business and government employment policy, culminating in an evaluation of the effectiveness of the current government's attempt to stimulate job creation and avert a deepening economic crisis.

Max Credits: 3

Min Credits: 3

57.546 Grant Writing

Course ID: 5785

Course Details: This course will be a hands-on course in grant writing. One of the first lessons that you will learn is that grant writing is only to a small degree about writing. Successful grants emerge from working effectively with others to draw out ideas, capture those ideas to create a program or a plan for research, show how the plan is an appropriate one to respond to the "Request for Proposals", and package those ideas so that they make sense to the people who will review the proposal. Grant writing is increasingly a team building activity. Whether or not you obtain the funding is sometimes less important than the networking and planning that you do as a part of developing a grant proposal.

Max Credits: 3

Min Credits: 3

57.552 Enterprise in Latin America

Course ID: 37169

Course Details: This M.A.-level course introduces students to the history of enterprise in Latin America through four case studies and a research project. No prior knowledge of Latin American history is required or expected. Each of the case studies, including the students' own research projects on an enterprise in Latin America, will consider the wide range of factors that impact a business. These include infrastructure, government regulations and policy, labor, markets, and environmental concerns, among others. The case studies and readings may change from semester to semester, but will be representative of different time periods and regions within Latin America.. Throughout the semester, the class will also consider the historical legacies of each enterprise and how it continues to affect the region's economic and political development today.

Max Credits: 3

Min Credits: 3

57.558 Peace and Conflict Field Experience

Course ID: 37366

Course Details: A program of practical experience in the field of Peace and Conflict. Students can work in a variety of areas related to Peace and Conflict Studies. Students meet regularly as a class on campus with the designated instructor to discuss their experiences and to learn more about the settings in which they practice and the challenges that they confront.

Max Credits: 3

Min Credits: 3

57.567 Introduction to Environmental and Natural Resource Economics

Course ID: 3615

Course Details: This course introduces students to the economic and policy aspects of environmental quality and natural resource issues. The course also incorporates relevant work-environment related issues. Simple and complex models are used to blend economic theory with environmental facts. Students will learn to derive policy insights from theoretical constructs. The primary objective is to show how the basic principles in economics can play a valuable role in analyzing and evaluating critical environmental issues and help in determining policy guidelines. Standard benefit cost of efficiency criteria will be applied to a wide variety of environmental, work-environment and natural resource problems. In attempting to do so we shall also emphasize how difficult it is to model actual environmental problems in the real world. We shall draw upon the basic tools of environmental and health economics to discuss current policy issues and questions that policy makers confront in practice. Graduate students in work environment will be required to do an economic analysis of an occupational health and safety intervention.

Max Credits: 3

Min Credits: 3

57.587 Cooperative Education

Course ID: 35614

Course Details: Course for F-1 students engaged in Curricular Practical Training

Max Credits: 1

Min Credits: 1

57.591 Directed Study in Regional Economic Social Development

Course ID: 6207

Course Details: Students work under the supervision of a professor on a project of scale and scope agreed to by the professor and the student and commensurate with the number of credits awarded for the course.

Max Credits: 3

Min Credits: 1

57.592 Qualitative Research Methods

Course ID: 6208

Course Details: This course provides an in-depth introduction to theoretical and practical issues of qualitative research methodologies, including survey design, interviewing techniques, case studies, ethnography and related tools. The goal and final result of this course is for students to design a research or action project in their own field of interest. This final product often forms the proposal for the student's capstone thesis or project.

Max Credits: 3

Min Credits: 3

57.593 Advanced Quantitative Research Methods

Course ID: 37458

Course Details: This M.A.-level course introduces students to advanced quantitative research methods. The prerequisites are either Research Methods (57.506) or courses that are equivalent to Statistics I (49.211) and Statistics II (49.212) as described in the UML course catalogue. This course will cover statistical techniques such as bivariate and multivariate regressions. These techniques are used in many social sciences and so they are of interest to, for example, economics, sociology, psychology and political science students. Throughout the course the students will use Stata, a statistical software, and they will learn how to apply the methods from the book to real datasets. The students will learn how to find the appropriate statistical approach starting from a verbal formulation of an empirical hypothesis. They will also learn to evaluate the relevance, quality and limitations of empirical results. The students will refine these skills via homework, a paper class participation and presentations.

Max Credits: 3

Min Credits: 3

57.598 Organizational Dynamics and Regional Development

Course ID: 6209

Course Details: This course presents theory and practice of how to develop organizations capable of learning, innovating, and empowering their participants. Case studies will focus on challenges and opportunities posed to contemporary organizations and institutions engaged in economic development. These cases will be drawn from, and principles will be applicable to, for-profit businesses, public and nonprofit agencies, and voluntary organizations. This course will also examine the nature of interactions among these various types of organizations and institutions within a variety of social and historical settings.

Max Credits: 3

Min Credits: 3

57.601 RESD Study Abroad I

Course ID: 33071

Course Details: Graduate study abroad in an institution with a GPAC-approved graduate-level exchange program. The specific course to be taken will be approved by the RESD Graduate Coordinator.

Max Credits: 3

Min Credits: 3

57.602 RESD Study Abroad 2

Course ID: 33072

Course Details: Graduate study abroad in an institution with a GPAC-approved graduate-level exchange program. The specific course to be taken abroad will be approved by the RESD Graduate Coordinator.

Max Credits: 3

Min Credits: 3

57.603 RESD Study Abroad 3

Course ID: 33073

Course Details: Graduate study abroad in an institution with a GPAC-approved graduate level exchange program. The specific course to be taken abroad will be approved by the RESD Graduate Coordinator.

Max Credits: 3

Min Credits: 3

57.605 Social Movements And Empowerment

Course ID: 6211

Course Details: This course focuses on ways in which non-elite groups and individuals can gain control over important aspects of economic and social development. These aspects include decisions about such matters as industrial location, work conditions, community services and environmental protection; and the status of women, ethnic/racial minorities and other disadvantaged groups. Special attention is paid to the dynamics and potential impact of grass-roots social movements.

Max Credits: 3

Min Credits: 3

57.691 Practicum in Regional Economic Social Development

Course ID: 6212

Course Details: Practicum in Regional Economic Social Development

Max Credits: 3

Min Credits: 1

57.733 Master Project Regional Economic Social Development

Course ID: 6215

Course Details: Approval of advisor and Graduate Coordinator. The student carries out a major project of professional practice in collaboration with an agency engaged in economic or social development. A faculty supervisor and an agency-based supervisor both oversee the work.

Max Credits: 3

Min Credits: 3

57.746 Masters Thesis Regional Economic Social Development

Course ID: 6216

Course Details: Approval of advisor and Graduate Coordinator. For graduate students actively engaged in research leading toward the submission of a written thesis. A program of supervised study will be arranged between the student and a faculty supervisor.

Max Credits: 6

Min Credits: 6

57.747 Thesis Review

Course ID: 35595

Course Details: Continuing work to complete thesis.

Max Credits: 1

Min Credits: 1

60.501 Financial Accounting

Course ID: 6357

Course Details: An introduction to financial accounting within the context of business transactions and business decisions. This course is a broad introduction to using accounting information from the user's perspective with little emphasis on traditional debits, credits, journal entries and ledgers. Emphasis is placed on preparing and understanding financial statements.

Max Credits: 2

Min Credits: 2

60.601 Accounting Information for Management Decisions

Course ID: 6360

Course Details: Prerequisite: Student must be matriculated and must have completed foundation core courses. Focuses on the manager's view as opposed to the accountant's view of the decision process and related quantitative and qualitative information needs. The course material examines accounting information that will achieve faster, better, and cheaper operations. New strategic cost management models, such as ABC and target costing, are explored and contrasted with traditional cost approaches.

Max Credits: 3

Min Credits: 3

60.602 Advanced Management and Sustainability Accounting

Course ID: 37228

Course Details: In the new environment of change, accountants are increasingly called on to support strategy through increasing efficiencies and reducing costs. This course will examine the different ways that accountants can add value through an understanding of value chain activities, use of technology, and extending value chain activities to develop a sustainability strategy.

Max Credits: 3

Min Credits: 3

60.603 Accounting Information Systems

Course ID: 37222

Course Details: Presents accounting as a system designed to meet the needs of external and internal users. Accounting information system concepts are emphasized. Topics include accounting transaction cycles, internal controls, and systems development processes.

Max Credits: 3

Min Credits: 3

60.612 Advanced Cost Management

Course ID: 6361

Course Details: An examination of cost data in ambiguous situations to assist managers in decision-making and strategy implementation. Emphasis is placed on advanced cost management for strategic planning, management control and, performance evaluation in multinational business entities.

Max Credits: 3

Min Credits: 3

60.621 Tax Factors in Business Decisions

Course ID: 35726

Course Details:

Max Credits: 3

Min Credits: 3

60.622 Globalization and Accounting

Course ID: 35725

Course Details:

Max Credits: 3

Min Credits: 3

60.623 Contemporary Accounting Issues

Course ID: 35727

Course Details: Significant and rapid changes in accounting rules are impacting the financial reporting and analysis that management uses to make business decisions. This course will explore contemporary accounting topics that accounting professionals will face in the workplace and how the accompanying requirements are changing the way that companies and their business partners use, report, analyze, and interpret financial data. Subjects covered will vary as conditions change but may include International Financial Reporting Standards (IFRS), Fair Value Measurements, Post-Retirement Benefits, Revenue Recognition, or other current accounting topics.

Max Credits: 3

Min Credits: 3

60.630 Taxation of Business Entities

Course ID: 37226

Course Details: This course provides coverage of gross income and business deductions, and provides a comprehensive overview of the taxation of corporations, partnerships, and sole proprietorships. This course will also cover the history of federal taxation, estate and gift taxes, and how the taxation of business entities fits into the entire tax system.

Max Credits: 3

Min Credits: 3

60.640 Financial Accounting Theory and Research

Course ID: 37223

Course Details: A comprehensive exposure at an intermediate level to accounting theory and practice. Emphasis is placed on applying underlying accounting theory to complex accounting measurement problems. The effects of alternative methods are considered throughout the entire course.

Max Credits: 3

Min Credits: 3

60.641 Corporate Financial Reporting II

Course ID: 37225

Course Details: Corporate Financial Reporting - II is a comprehensive analysis of financial accounting topics involved in preparing financial statements and in external reporting that began in Corporate Financial Reporting - I. It includes topics such as current and long term liabilities and contingencies; stockholders' equity; dilutive securities and earnings per share calculations; investments; pensions; leases, financial statement analysis; the statement of cash flows; and full disclosure in financial reporting.

Max Credits: 3

Min Credits: 3

60.645 Fraud Examination and Forensic Accounting

Course ID: 37227

Course Details: Fraud is an extremely costly business problem. Wells, Chairman of the Association of Certified Fraud Examiners, estimates that all forms of corporate dishonesty from "cooking the books" to embezzling could run as high as \$660 billion annually. Business owners, executives, managers and accountants will benefit from understanding the causes, types and scope of fraud, fraud prevention, fraud detection, and fraud investigation. This course will cover management fraud, employee embezzlement and other types of fraud. The principles and methodology of fraud prevention, detection and investigation (e.g., forensic accounting) will be discussed.

Max Credits: 3

Min Credits: 3

60.650 International Accounting

Course ID: 37224

Course Details: This course integrates International Financial Reporting Standards (IFRS) into a financial accounting course and

leverages comparisons between US GAAP and IFRS (the two most commonly applied sets of accounting standards in the world) to enhance the development of a "critical thinking" approach to financial accounting and reporting. The goal of the course is to enhance student understanding of the links between the underlying transactions, the application of reporting standards for those transactions, and the financial reports obtained from a global/international perspective. Accounting standards set in the US and internationally (US GAAP and IFRS) are guided by general concepts but the specifics of the standards, and national cultures across different countries and geographical areas. In this course, we will consider those differences to better understand both US GAAP and IFRS accounting standards and the financial reports produced by them. In addition, the course will provide students with a basic understanding of IFRS, a relatively new set of accounting standards gaining wide acceptance throughout the world and being considered for adoption within the US.

Max Credits: 3

Min Credits: 3

60.655 Advanced Auditing

Course ID: 37221

Course Details: This course provides a more in-depth study of auditing topics including audit planning, evidence gathering and evaluation, professional standards and regulatory agencies, and a practical approach to accounting and auditing research. Applications will be drawn from public and private sector audits.

Max Credits: 3

Min Credits: 3

60.677 Directed Study: Accounting

Course ID: 6366

Course Details:

Max Credits: 3

Min Credits: 3

60.720 Fraud Examination

Course ID: 33569

Course Details: Fraud is an extremely costly business problem. Wells, Chairman of The Association of Certified Fraud Examiners, estimates that all forms of corporate dishonesty from "cooking the books" to embezzling could run as high as \$660 billion annually. Business owners, executives, managers and accountants will benefit from understanding the causes, types and scope of fraud, fraud prevention, fraud detection, and fraud investigation. This course will cover management fraud, employee embezzlement and other types of fraud. The principles and methodology of fraud prevention, detection and investigation will be discussed.

Max Credits: 3

Min Credits: 3

60.751 Accounting Research Methodology

Course ID: 38344

Course Details: This course situates accounting and organization management research in the context of scientific inquiry generally, and social science in particular. It introduces students to the philosophical background of epistemological and metaphysical issues, the framing of scientific research, theory development, and the formulation of testable hypotheses. Operationalization, measurement and validity issues are studied, and a wide range of research paradigms and methodologies for accounting and organization management research are introduced and illustrated.

Max Credits: 3

Min Credits: 3

61.501 Business Financial Analysis

Course ID: 6402

Course Details: Introduces students to the finance function in a firm. Students are exposed to a variety of analytical techniques and to theory applied to financial decision making. Study will include effects of major financial decisions such as investment, financing and dividends on the value of a firm, in the light of their risk-return relationship under the assumption that the maximization of shareholder

wealth is the goal of management. Pre-requisites: MBA or Certificate Programs or Permission of MBA Director.

Max Credits: 2

Min Credits: 2

61.601 Corporate Finance

Course ID: 6404

Course Details: Relates working capital strategy, capital investment analysis, long-term financing, and capital structure decisions in a risk-return framework to the dynamics of the firm and the market in which it operates.

Max Credits: 3

Min Credits: 3

61.610 Global Financial Markets and Monetary Policy

Course ID: 6405

Course Details:

Max Credits: 3

Min Credits: 3

61.624 Fixed Income Securities

Course ID: 38390

Course Details: Financial securities whose valuation depends on interest rates, such as Treasury securities, municipal bonds, and corporate bonds are called Fixed Income Securities. In this course, students will learn how to value and manage the risk of these securities.

Max Credits: 3

Min Credits: 3

61.640 Financing Innovation and Technology Ventures

Course ID: 35577

Course Details: This course focuses on strategies for financing innovation and new technology ventures both within a firm and on a stand-alone basis. Topics covered will include: different types of business organizations; different sources of funding including internal sources and external sources such as angel investors, venture capitalists, etc.; short-term and long-term financial planning and forecasting; business valuation; term sheet negotiation and exit strategies including mergers and acquisitions and IPOs. Each aspect of the course will be covered within the context of a business plan and venture life-cycle.

Max Credits: 3

Min Credits: 3

61.675 Financial Derivatives

Course ID: 35765

Course Details:

Max Credits: 3

Min Credits: 3

61.677 Independent Study: Finance

Course ID: 6408

Course Details: Pre-Requisites: MBA Foundation Core and 61.601, or permission of MBA Coordinator.

Max Credits: 3

Min Credits: 3

61.688 Current Topics in Finance

Course ID: 6409

Course Details: Topics of current interest in Finance. Subject matter to be announced in advance. For a current semester course title, please log on to ISIS, the Inter-Campus Student Information System.

Max Credits: 3

Min Credits: 3

61.691 International Finance

Course ID: 6410

Course Details: The international dimension of the finance function of the firm. Financial constraints of the international environment and their effect on the standard concepts of financial management. The techniques of adapting risk analysis to the international situation. Study of international currency flows, monetary systems, forward cover and international banking policies.

Max Credits: 3

Min Credits: 3

61.735 Portfolio Investment and Security Analysis

Course ID: 6416

Course Details: This course develops investment theory as applicable to portfolio management and securities selection. Topics covered include identification of investor goals, identification of investment opportunities in real and financial assets under volatile capital market conditions as well as analysis and decision making under conditions of certainty and uncertainty. Related concepts include technical analysis and fundamental analysis, pyramid approach to investing, changing risk and return through asset allocation and portfolio formation, valuation of basic securities and rebalancing of portfolios.

Max Credits: 3

Min Credits: 3

61.740 Corporate Finance Theory

Course ID: 36933

Course Details: This course covers topics in corporate finance including agency theory, theory of the firm, market for corporate control, financing policy, and dividend policy, among others.

Max Credits: 3

Min Credits: 3

61.741 Investments Theory

Course ID: 36934

Course Details: This course covers topics in optimal portfolio choice and asset pricing including discrete-time and continuous time models for portfolio choice and security prices, Black-Scholes model of asset pricing, and general-equilibrium asset pricing models, among others.

Max Credits: 3

Min Credits: 3

61.742 Empirical Research in Finance

Course ID: 36935

Course Details: This course introduces students to empirical research in finance. It covers applications of econometric methods in finance including both time-series and panel data econometrics.

Max Credits: 0

Min Credits: 0

61.743 Seminar in Corporate Finance

Course ID: 36936

Course Details: This course is a doctoral level seminar covering both theoretical and empirical research in the area of corporate finance.

Max Credits: 3

Min Credits: 3

61.744 Seminar in Investment Analysis

Course ID: 36948

Course Details: This course is a doctoral level seminar covering both theoretical and empirical research in the area of investments and asset pricing.

Max Credits: 3

Min Credits: 3

61.745 Econometrics III

Course ID: 36949

Course Details: This course is a doctoral level seminar covering quantitative methods that are requisite for publishing in high level finance journals.

Max Credits: 3

Min Credits: 3

61.746 International Finance Research

Course ID: 36971

Course Details: The doctoral seminar provides an extensive survey on theory and empirical research in international finance, such as international investments and implications for the theory of corporate finance in a global business environment. It covers various international financial management topics related to international capital markets, foreign exchange rate determination and global financial management. The aim of the doctoral seminar is to help students develop an advanced understanding of theory, concept development, research design, and research results within in field of international management.

Max Credits: 3

Min Credits: 3

61.780 Market Microstructure

Course ID: 36979

Course Details: This course examines trading mechanisms for financial securities. Topics of study include both theoretical models and the empirical research to test these models.

Max Credits: 3

Min Credits: 3

61.781 Behavioral Finance

Course ID: 36980

Course Details: This course covers both the theoretical and the empirical research in finance. It includes introduction to the psychology evidence relevant to finance and focuses on recent research in this area.

Max Credits: 3

Min Credits: 3

61.782 Financial Derivatives

Course ID: 36981

Course Details: This course is an -in-depth analysis of contingent claims valuation. Financial assets considered will include European and American style options, forwards, futures, swaps, real options, and corporate securities.

Max Credits: 3

Min Credits: 3

61.783 International Financial Management

Course ID: 36982

Course Details: This course investigates issues in corporate financial management for multinational firms including foreign exchange forecasting and risk management, multinational capital budgeting, multinational capital structure, and international financial markets.

Max Credits: 3

Min Credits: 3

61.784 Special Topics in Finance

Course ID: 36983

Course Details: This is a doctoral level course covering both theoretical and empirical research in an area of finance as determined by the instructor.

Max Credits: 3

Min Credits: 3

61.801 Technology Adoption Finance

Course ID: 6424

Course Details:

Max Credits: 3

Min Credits: 3

62.501 Marketing Fundamentals

Course ID: 6450

Course Details: Describes how marketing strategies and plans of a competitive enterprise are formulated, implemented, and adjusted over time. Behavioral and quantitative aspects are covered, as well as analysis of the environmental forces affecting marketing decisions. Pre-requisites: MBA or Certificate Programs, or Permission of MBA Director.

Max Credits: 2

Min Credits: 2

62.601 Customers And Markets

Course ID: 6452

Course Details: Prerequisite: Student must be matriculated and have finished foundation core. Pursues the development of comprehensive and integrated marketing plans using industry/competitor analysis, market value chains, and forecasting. An emphasis is given to business-to-business marketing situations which require an in-depth analysis of the firms' complex organizational behavior and evolving buyer-seller relationship.

Max Credits: 3

Min Credits: 3

62.615 Sustainable Marketing

Course ID: 35711

Course Details:

Max Credits: 3

Min Credits: 3

62.625 Marketing Intelligence

Course ID: 35712

Course Details:

Max Credits: 3

Min Credits: 3

62.630 Market Research

Course ID: 35578

Course Details: In this course students will learn and apply various marketing research techniques that will enable them to make soundly based decisions about new products or services in either an existing firm or new venture. Some of the topics covered include: assessing customer needs, estimating market demand, deciding the features of a proposed product/service and the price that would be most attractive in its target market. The course will provide students with an overview of key marketing concepts, and understanding of the statistical methodology behind market research techniques and practical application of these techniques through cases and projects.

Max Credits: 3

Min Credits: 3

62.670 International Marketing

Course ID: 6461

Course Details:

Max Credits: 3

Min Credits: 3

62.677 Independent Study: Marketing

Course ID: 6462

Course Details: Pre-Requisite: MBA Foundation Core and 62.601 or permission of MBA Coordinator.

Max Credits: 3

Min Credits: 3

62.688 Current Topics in Marketing

Course ID: 6464

Course Details: Topics of current interest in Marketing. Subject matter to be announced in advance. For a current semester course title, please log on to ISIS, the Inter-Campus Student Information System

Max Credits: 3

Min Credits: 3

62.740 International Marketing Research

Course ID: 36970

Course Details: The doctoral seminar is designed to expose students to the cutting-edge research in marketing models and discuss the relevance and implications of these marketing theories in a global business environment. It covers various research topics including pricing, new product development, marketing, brand management, and consumer behavior in a cross-national setting, with emphasis on

developing a critical understanding of theory, concept development, research design, and research results within the field of international marketing.

Max Credits: 3

Min Credits: 3

63.501 Operations Fundamentals

Course ID: 6513

Course Details: Provides students with an introduction to operations management and operations analysis. The latter furnishes the student with a set of quantitative tools which are useful in designing and operating the former. These techniques are also generally applicable to other functional areas/courses within the MBA Program. Pre-requisites: MBA or Certificate Programs, or Permission of MBA Director.

Max Credits: 2

Min Credits: 2

63.601 Management Information Systems

Course ID: 6516

Course Details: Examines computer technologies, database management, and data communications as vehicle to improve and/or restructure business processes and decision making effectiveness to create competitive advantage.

Max Credits: 3

Min Credits: 3

63.610 Information Technology Infrastructure

Course ID: 37589

Course Details: This course examines in detail, the two major technologies for establishing the Information Technology (IT) architecture & Infrastructure in an organization. Topics include Multi-user Database environments, review of IT architectures, the migration of legacy systems, network (WAN, LAN) design, deployment, and management, and role of the Internet, Extranet, and Intranet.

Max Credits: 3

Min Credits: 3

63.620 Information Technology Project Management

Course ID: 35732

Course Details: Application and integration of the project management body of knowledge (PMBOK) areas to managing information technology (IT) projects. Focuses on project management tools and techniques for defining and managing the project's goal, scope, schedule, and budget. Other topics include quality management, risk management, change management, and knowledge management as they are related to IT projects.

Max Credits: 3

Min Credits: 3

63.630 E-business

Course ID: 30437

Course Details: This course provides a foundation on digital commerce and e-business for MBA students. It will cover both technological and managerial aspects of managing e-business operations in either a traditional or pure "dot.com" organization. Issues covered include interactive marketing and market-spaces, agent-based commerce and intelligent markets, electronic shopping carts, user interface issues, EDI transaction via Extranets, database interfaces, personalization and targeted communications, security, encryption, and payment systems, privacy and intellectual property.

Max Credits: 3

Min Credits: 3

63.640 Enterprise System Management

Course ID: 30883

Course Details: This course, an MBA elective, will focus on Enterprise Resource Planning (ERP) systems that integrate information spanning the functional boundaries within an organization. ERP systems include like SAP/R3, PeopleSoft, Oracle, and Customer Relationship Management (CRM) like Seibel, Tariva, etc. The goals of the course are to help students understand ERP systems and their underlying components and technologies, the implications of implementing ERP in organizations. Course will cover management and technical issues during the pre-implementation, installation, and post-installation stages of the ERP and/or CRM software in organizations. This course will cover topics such as: ES planning, business process re-engineering, selection of ES software and vendors, role of outside consultants, budgeting and resource planning, systems conversion, testing, user training, stabilization, role of top management, IT staff, consultants, design teams, and employee, and other topics.

Max Credits: 3

Min Credits: 3

63.671 Operations Management

Course ID: 34656

Course Details: Examines the strategic and tactical operations processes of manufacturing and service firms that foster global competitiveness. This course focuses on traditional and newer approaches including just-in-time, total quality management, MRP, flexible manufacturing systems, and capacity and management that lead to an integrated operations strategy. Cost reductions, flexibility, and market responsiveness are also considered.

Max Credits: 3

Min Credits: 3

63.688 Current Topics in Management Information Systems

Course ID: 6524

Course Details: Selected topics having current and future impact in the field of MIS. Subject matter to be announced in advance.

Max Credits: 3

Min Credits: 3

63.690 Managerial Quality Control

Course ID: 6525

Course Details:

Max Credits: 3

Min Credits: 3

63.706 Data Analytics

Course ID: 38321

Course Details: This course introduces the concepts and technologies of data analytics and data mining for transforming data into insight and business intelligence. The course studies how the data-driven analytics technologies can be used by organizations to gain competitive advantages, and how to design and develop these technologies. Topics include data integration, data transformation, prediction, classification, clustering, association, text mining, optimization, model and performance evaluation, and data-mining related privacy and ethical issues.

Max Credits: 3

Min Credits: 3

63.709 Independent Study in Management Information Systems

Course ID: 6527

Course Details: An opportunity for the student to carry out individualized study relating to the field of Management Information Systems under the supervision of a member of the faculty. Pre-requisites: MBA Foundation Core and Permission of MBA Coordinator

Max Credits: 3

Min Credits: 1

63.730 Advanced Data Management

Course ID: 36974

Course Details: This course provides students with in-dept knowledge for modeling, designing, implementing, and managing database systems for operational and decision support purposes. Topics covered include relational database model, entity-relationship modeling, normalization, SQL language, data warehousing, data quality and integration, data and database administration, and object-oriented database.

Max Credits: 3

Min Credits: 3

63.735 Advanced Systems Development Methodology

Course ID: 36975

Course Details: This course emphasizes the theory and applications for business systems development. Application development strategies. Application system development management. Individual behavior and group dynamics in the development process. Systems implementation and operation. Students learn concepts in a systematic approach to the analysis, design, implementation and maintenance of information systems. Students apply these principles in projects to improve the quality of their development process and final products. Students produce and evaluate artifacts (constructs, models, methods, tools) that enable more efficient and effective information systems to be developed.

Max Credits: 3

Min Credits: 3

63.740 Advanced Data Communications and Networking Technologies

Course ID: 36976

Course Details: This course provides a comprehensive overview on modern Business Data Communications and Networking technologies. Internet-based information systems play a vital role in the production, management, creative marketing, and delivery of financial services today. This course explores the principles and applications of data communications in organizations. The student is led from the foundation networking principals into the more advanced networking concepts and applications such as Semantic Web, Web Services, and Cloud Computing. The students will learn how these technologies were designed and implemented as well as how they are used in business to support various strategies and gain competitive advantages.

Max Credits: 3

Min Credits: 3

63.745 Electronic Commerce

Course ID: 36977

Course Details: This course provides a foundation on digital commerce and e-business for PhD program. It will cover both theory and practice of e-commerce (B2C), e-business (B2B) and emerging e-business technologies such as Web 2.0 and social networking, all with an organizational perspective. Various theoretical models will be analyzed on topics such as e-strategy, interactive/e-marketing and supply-chain, agent-based commerce and intelligent markets, shopping carts and payment systems, user interface design, EDI transactions and Extranets, personalization and privacy security, encryption, and intellectual property. Students will be assessed through research paper and exams.

Max Credits: 3

Min Credits: 3

63.750 Seminar in Information Systems Research

Course ID: 36978

Course Details: This course focuses on the contemporary topics in information systems research. The materials discussed in this course will be selected from leading IS research publications. Subject areas may be organizational, social, or technological in nature. Research methodologies may be empirical, computational or economics oriented. This course will normally be taught by multiple faculty members jointly.

Max Credits: 3

Min Credits: 3

63.755 Business Intelligence and Data Mining

Course ID: 36985

Course Details: This Course introduces the concepts and technologies of business intelligence and data mining. The course studies how data-oriented business intelligence techniques can be used by organizations to gain competitive advantages, as well as how to design and develop these techniques. Topics include classification, clustering, association analysis, prediction, and text and web mining. Data-mining related ethical issues will also be discussed.

Max Credits: 3

Min Credits: 3

63.760 Enterprise Information Systems

Course ID: 36986

Course Details: This course will focus on Enterprise Systems such as Enterprise Resource Planning (ERP) systems and customer relationship Management (CRM) that integrate information spanning the functional boundaries (cross-functional) within an organization and link them with customers. This course will analyze theory and practice of implementing enterprise systems and their underlying components and technologies, their implications organization change and business processes. Students will be assessed through research paper and exams.

Max Credits: 3

Min Credits: 3

63.765 Global Supply Chain Management

Course ID: 36987

Course Details: This course provides a foundation on global supply chain management (GSCM) for the Ph.D. program. The course explores the interconnections and dependencies among marketing, finance, operations, and information systems with respect to GSCM. It covers topics related to the design of global facility networks, logistical planning across borders, and financial and accounting considerations such as duties, tax differentials, and exchange rates. In addition, the course will analyze the benefits and risks associated with outsourcing and offshoring and explore the importance of information technology and Enterprise Resource Planning (ERP) in managing global supply chains. Finally, it will address recent trends in designing sustainable supply chains and managing financial, economic, and political risk throughout the supply chain. Students will be assessed through research papers and exams.

Max Credits: 3

Min Credits: 3

63.770 Information Privacy and Security

Course ID: 36988

Course Details: This course examines information privacy and security from various perspectives. The course provides students with in-depth understanding of the privacy and security issues due to advances in information technology, as well as related legal, organizational, social and economic implications and consequences. The course also explores approaches to analyze, design and implement the privacy and security components/functions of information systems.

Max Credits: 3

Min Credits: 3

63.779 Independent Study: Operations Management

Course ID: 6534

Course Details: Pre-requisites: MBA Foundation Core and Permission of MBA Coordinator

Max Credits: 3

Min Credits: 3

63.780 Information Technology Project Management

Course ID: 36989

Course Details: This course covers the concepts,, practices, processes, tools, techniques and resources used by information system (IS) project managers. The entire project life cycle will be covered from project initiation to project termination. The course will closely apply the framework of the Project Management Body of Knowledge (PMBok) to carry out IT projects. The course will focus on how to manage the scope, schedule, budget and change of projects, with research emphasis on information systems and information technology projects.

Max Credits: 3

Min Credits: 3

63.785 Knowledge Management

Course ID: 36990

Course Details: Knowledge management capability is essential to an organization's knowledge transfer, adaptation to rapidly changing environments, and the creation of innovative products and services to enhance organizational productivity and competitiveness. Knowledge management has considerable appeal to high-tech firms as a strategy to improve group collaboration, support virtual teams, and engage communities. This course explores the theory and practice of knowledge management with emphasis on research in the field.

Max Credits: 3

Min Credits: 3

63.795 Strategic Information Systems

Course ID: 36991

Course Details: This course will focus on Strategic Information Systems such as Decision Support Systems, Executive Information Systems, and Knowledge Management Systems. The course introduces students to the theories and principals of Strategic Information Systems as well as the technologies used to design and implement such systems. The social, ethical, and global issues involved with Strategic Information Systems will also be discussed.

Max Credits: 3

Min Credits: 3

63.798 Independent Study in Management Information Systems

Course ID: 6538

Course Details:

Max Credits: 3

Min Credits: 3

64.591 Independent Study

Course ID: 6566

Course Details:

Max Credits: 1

Min Credits: 1

64.640 New Venture Creation

Course ID: 37840

Course Details: This course is designed for students who are interested in entrepreneurship. The focus is on entrepreneurship as generic activity. It explores the opportunities and challenges face by individuals who seek to start a new ventures and the probable career development paths that are available. For those who may be interested in starting or running a new business, the course will provide an essential foundation for this process, identify the skills and resources required, and explore the opportunities available to the young entrepreneur.

Max Credits: 3

Min Credits: 3

64.650 Innovation and Emerging Technology

Course ID: 35579

Course Details: This course examines technological innovation and its relationship to value-creation and business strategy. Emphasis is placed on emerging scientific and technical innovations and the opportunities and challenges they present to both existing businesses and new venture entrepreneurs. The overall goal of this course is to help you to understand, appreciate and learn to manage the technology innovation process. Students examine innovation strategies, planning models, evaluation models, licensing and the commercialization process required to launch new businesses around innovative products and technologies.

Max Credits: 3

Min Credits: 3

64.655 Corporate Entrepreneurship

Course ID: 35580

Course Details: This course focuses on entrepreneurship in established companies. Corporate Entrepreneurship (CE) is a process by which companies adopt a conscious strategy to encourage creativity, innovation, outside-the-box thinking, experimentation and risk taking. As a result, companies promoting and implementing CE strive for competitive advantages in rapidly changing global markets. The course will cover components of CE, developing & implementing CE strategies and managing CE.

Max Credits: 3

Min Credits: 3

64.680 Practicum I - New Venture Planning

Course ID: 35581

Course Details: The first of two practicum courses focusing on technology commercialization, business planning and initial incubation of an early-stage business; and development of an investment proposal to launch a new business. Student teams will be working hands-on to explore, identify and analyze the path "from Idea to Market" for technology and research projects. They will evaluate selected technology and research projects for commercial applications; explore different options available to productize & introduce products to market; complete a new venture business plan where appropriate; and potentially launch or participate in launching a new business. Practicum I and II will be offered as continuous courses over two consecutive semesters. Each student team will be assigned to a faculty member who will guide them throughout the practicum experience.

Max Credits: 3

Min Credits: 3

64.681 Practicum II - New Venture Implementation

Course ID: 35582

Course Details: The second of two practicum courses focusing on technology commercialization, business planning and initial incubation of an early-stage business; and development of an investment proposal to launch a new business. Students will be working hands-on to explore, identify and analyze the path "from Idea to Market" for technology and research projects. They will evaluate selected technology and research projects for commercial applications; explore different options available to productize & introduce products to market; complete a new venture business plan where appropriate; and potentially launch or participate in launching a new business. Practicum I and II will be offered as continuous courses over two consecutive semesters. Each student team will be assigned to a faculty who will guide them throughout the practicum experience.

Max Credits: 3

Min Credits: 3

64.688 Current Topics in Entrepreneurship

Course ID: 35586

Course Details: Topics of current interest in Entrepreneurship, Innovation and Technology Management. Subject matter to be announced in advance.

Max Credits: 3

Min Credits: 3

64.699 Independent Study

Course ID: 6584

Course Details:

Max Credits: 3

Min Credits: 3

64.740 Technology Commercialization

Course ID: 36952

Course Details: The course examines extant literature on bringing technology from concept to commercialization. It will draw from various streams of literature including but not limited to invention, product development, technical and market feasibility analysis, intellectual property acquisition, business planning, and venture funding. We will also examine research that focuses on the vehicles for innovation, such as incubators, university - private partnerships, innovation clusters, open innovation.

Max Credits: 3

Min Credits: 3

64.741 Corporate Entrepreneurship

Course ID: 36953

Course Details: The course investigates the extant literature on innovation within the confines of an established organization. Corporate entrepreneurship is concerned with firm level entrepreneurship, specifically the notion of strategic renewal. Specific attention will be paid to underlying theoretical constructs associated with innovation, such as risk, culture, top management disposition, as well as their affect on organizational performance.

Max Credits: 3

Min Credits: 3

64.742 Independent Study

Course ID: 36954

Course Details: Students will be expected to establish a relationship with a faculty member and develop and submit a paper to a top academic conference within their first two years.

Max Credits: 3

Min Credits: 3

64.901 Research Seminar: Industrial Competition

Course ID: 6592

Course Details:

Max Credits: 3

Min Credits: 3

65.612 Dynamics: Competition And Cooperation

Course ID: 6604

Course Details:

Max Credits: 3

Min Credits: 3

66.501 Organizational Behavior

Course ID: 6680

Course Details: Introduces students to management and organizational behavior. Its general purpose is to study and understand the behavior of individuals and groups in organizations. It is directed toward behavioral action components and emphasizes the close relationship between the study of organizational behavior and the practice of management. Pre-requisites: MBA or Certificate Programs, or Permission of MBA Director.

Max Credits: 2

Min Credits: 2

66.504 Curricular Practical Training

Course ID: 37811

Course Details: An internship, practicum or other type of employment that is either required by the student's academic program or an experience for which a student receives academic credit. To be eligible the student must be in legal F-1 status and have been enrolled full-time for one academic year. CPT work experience must be in the student's field of study and contain a curricular component. Contact the Manning School of Business Graduate Programs office for additional details.

Max Credits: 1

Min Credits: 1

66.511 Global Enterprise and Competition

Course ID: 6682

Course Details: To be taken as last course in foundation core. Is an integrated investigation of global competitive issues to help students understand the processes of organization and technological innovation which permit businesses to achieve competitive advantages in a global environment. This course also deals with the nature and techniques of industry analysis necessary to the formulation of effective global strategy for the firm.

Max Credits: 2

Min Credits: 2

66.601 Managing Organizational Change

Course ID: 6686

Course Details: Examines how business enterprises are designed, managed and changed to operate efficiently and perform effectively within their competitive environments. It critically examines organizations that vary in terms of such characteristics as size, complexity, goals, and technology as they operate under different circumstances and at various stages of their life cycles. The role and impact of individual managers receive particular attention.

Max Credits: 3

Min Credits: 3

66.607 Independent Study in MIS

Course ID: 6689

Course Details:

Max Credits: 3

Min Credits: 3

66.630 New Product Development

Course ID: 35583

Course Details: This course will enable students to understand the complexities involved in new innovation and technology-based product development. Through examples and exercises, students will be exposed to such topics as creative problem solving, customers/suppliers/partners involvements and inputs processes, integration among all functions, building and managing cross functional teams, rapid prototyping and development, creating a learning organization and measurements.

Max Credits: 3

Min Credits: 3

66.635 Project Management

Course ID: 35584

Course Details: This course will focus on managing innovation and technology projects and the critical role that a project manager plays in successful execution. Topics included in the course are: project planning, deliverables, managing quality, change management, documentation, communication, risks management, project team and human resource management approaches and creating and managing expectations.

Max Credits: 3

Min Credits: 3

66.640 Building and Managing Teams

Course ID: 35585

Course Details: One critical determinant of success in an on-going corporate venture or launch of a new product, service or company is the performance of teams. This course examines the key roles of leader and follower in the development of project teams in both start startups and existing companies. It will address issues relating to team composition, team member capabilities, and team dynamics as teams develop and change over time. Emphasis is placed on acquiring the interpersonal, communication and collaboration skills necessary for effective team performance.

Max Credits: 3

Min Credits: 3

66.645 Advanced Professional Communication

Course ID: 35731

Course Details:

Max Credits: 3

Min Credits: 3

66.652 Human Resources Management

Course ID: 6696

Course Details:

Max Credits: 3

Min Credits: 3

66.655 Mid-Management Skills for the New Business Environment

Course ID: 35730

Course Details: This reading and discussion course for advanced MBA students explores the new skill and performance requirements imposed on middle managers by globalization and technology. Particular attention is given to emerging organizational forms that expand the emphasis on such things as individual free agency, the creation and synthesis of innovations, internal entrepreneurship, influence without authority and the coordination of activities over remote work sites.

Max Credits: 3

Min Credits: 3

66.677 Independent Study: Management

Course ID: 6702

Course Details: Prerequisite: MBA Foundation Core and 66.601, or permission of MBA Coordinator

Max Credits: 3

Min Credits: 3

66.688 Current Topics in Management

Course ID: 6703

Course Details: Topics of current interest in Management. Subject matter to be announced in advance. For a current semester course title, please log onto ISIS, the Inter-Campus Student Information System.

Max Credits: 3

Min Credits: 3

66.691 Strategy Formation and Implementation

Course ID: 6705

Course Details: Reviews strategies for positioning a firm within its competitive environment. Fundamental concepts in strategic management; role of the CEO, levels and components of strategy, competitive analysis, and formulation and implementation of strategy are explored. Pre-Requisite: MBA Advanced Core.

Max Credits: 3

Min Credits: 3

66.715 Managing Quality In Comp Or

Course ID: 6712

Course Details:

Max Credits: 3

Min Credits: 3

66.725 Negotiations

Course ID: 6716

Course Details: Pre-Requisite: MBA Foundation Core.

Max Credits: 3

Min Credits: 3

66.728 Organization Theory

Course ID: 37044

Course Details: This course is a basic survey of theory and research on macro-organizational issues. It examines organization design, relations between organizations and environments, and inter-organizational relationships. The emphasis is on the behavior of organizations as systems and on their linkages to the larger context within which they operate. The course examines such topics as: organizations as open systems, as institutions, as elements in ecological systems and other perspectives that address organizations and their dynamics.

Max Credits: 3

Min Credits: 3

66.730 Research Design Methods I

Course ID: 36925

Course Details: Seminar will address study design, including but not limited to methods, hypothesis development and testing, reliability, and validity.

Max Credits: 3

Min Credits: 3

66.733 Research Design Methods II

Course ID: 36926

Course Details: Expanding beyond Research Design Methods | Student will begin the design of a research project which considers the range of research methodologies and the implications of their use.

Max Credits: 3

Min Credits: 3

66.734 Qualitative Research Methods

Course ID: 36930

Course Details: The purpose of this course is to introduce doctoral students to the field of qualitative research, in order to prepare them to undertake independent research using this methodology. Students in this course will learn about the historical and theoretical foundations of this methodology and principles for research design in qualitative research; and gain skill in multiple data collection techniques. Significant attention will be given to issues of analysis and interpretation.

Max Credits: 3

Min Credits: 3

66.735 Managerial Research Seminar

Course ID: 36932

Course Details: The course will involve an ongoing monthly presentation from across scholarly disciplines. Speakers will be drawn from local, national, and international universities. Attendance will be mandatory; PhD students should gain an appreciation for high level scholarship.

Max Credits: 3

Min Credits: 3

66.740 Leadership Theory & Principles

Course ID: 36955

Course Details: This course will help students develop a strong understanding of the theoretical lineage of leadership, from great man theory and trait theory up until more recent dynamic leadership theories. In addition to an understanding of the historical theoretical development, students will also gain an appreciation of current knowledge concerning leadership.

Max Credits: 3

Min Credits: 3

66.741 Leadership & Decision Making

Course ID: 36963

Course Details: This course will examine the manner and nature in which leaders make decisions, specifically decisions as it relates to the larger organization. The course will draw from a diverse spectrum of organizational theories, such as economics, behavioral economics, and psychology. Additionally, we will examine the manner which heuristics, bias and perception influence otherwise rationale decisions. The course will also examine decision making dynamics within the confines of senior leadership teams.

Max Credits: 3

Min Credits: 3

66.742 Leadership & Change Management

Course ID: 36965

Course Details: The course will focus on research that examines leaders within the context of organizations that are undergoing significant change and restructuring initiatives. Specific attention will be paid to the moderating role of leadership on change and organizational outcome. Numerous research streams will be examined including but not limited to leaders ability to interpret shifts in the environment, leaders role in various phases of the change process, the role of leaders in addressing culture within change efforts, and leaders' ability to manage continuous change and strategic renewal.

Max Credits: 3

Min Credits: 3

66.743 Leadership & Ethics

Course ID: 36966

Course Details: This course will focus on ethics as it pertains to organizational leaders. Theoretical principles underlying business ethics, specifically as it related to organizational leaders will be addressed, such as the role leaders play in establishing ethics within the organization, the manner in which ethics impacts top management team decision making, and ethical culture.

Max Credits: 3

Min Credits: 3

66.744 Independent Study

Course ID: 36968

Course Details: Students will be expected to establish a relationship with a faculty member and develop and submit a paper to a top academic conference within their first two years.

Max Credits: 3

Min Credits: 3

66.750 Macro, Industry, & Competitive Dynamics

Course ID: 36950

Course Details: The course focuses on the broader industry dynamics associated with the manner and nature that technology industries evolve. Focus will put on macro level theoretical explanations for industry development, such as creative destruction, the s-curve, and industry structure. Additional topics may include first mover advantages and innovation, dynamic capabilities and knowledge-based theories of competence, strategic groups, competitor analysis and inter-firm rivalry, entry and exit strategies within an industry, strategic flexibility, and cooperative strategy including strategic networks, alliances and joint ventures.

Max Credits: 3

Min Credits: 3

66.751 Public & Business Policy Practicum

Course ID: 36951

Course Details: Examines the larger context of technology, specifically the role that government policy plays in stimulating technology industry clusters. The course will focus on public policy, public economics, and drivers for government support. Specific attention will be paid to research that examines national and regional competitiveness, as it related to role of state and federal government. The class will address comparative policies with other developing economies, such as China and India. Significant emphasis will be placed of the competitiveness of the U.S. technology industries, such as pharmaceuticals, information technology, etc. Students will be expected to put forth original research that addresses current public and business policy concerns, such as whether or not the United States is in decline? Such introspection is not only meant to be provocative, but relevant to the current discussion going on in business policy and public policy circles.

Max Credits: 3

Min Credits: 3

66.760 International Business Research

Course ID: 36969

Course Details: The aim of the doctoral seminar is to help students develop an advanced understanding of the evolution of international business theories and the present state of international business literature. It introduces a variety of economic and management theories as well as their relevance and application in the field of international business, including models of international trade, product cycle model, competitive advantage model, eclectic paradigm, etc... The course also discusses selected research topics on international trade, international production, and multinational enterprise practices with emphasis on theoretic contributions to international business study.

Max Credits: 3

Min Credits: 3

66.761 International Management Research

Course ID: 36972

Course Details: This seminar provides an in-dept review of the evolution of the multinational enterprise and the theoretical and empirical literature on international management research. It introduces multiple theoretical lenses through which multinational enterprise management practices can be studied, including international economics, organizational behavior, strategic management, organizational theory, and public policy. The topics include culture, global corporate strategy, cross-cultural communication and negotiation, corporate governance and organizational form cross-nationally and international human resource management issues. It emphasizes on developing a critical understanding of theory, concept development, research design and research results within the field of international management.

Max Credits: 3

Min Credits: 3

66.762 International Business Research Methods

Course ID: 36973

Course Details: The course is designed to provide students with an overview of methodologies (specifically multivariate data analysis) used in international business research. In the process, students will also tackle methods in international business research and what it takes to write a high-impact international business article.

Max Credits: 3

Min Credits: 3

66.782 Business Policy & Strategy

Course ID: 36984

Course Details: This course will focus on the various schools of thought for explaining firm performance variance, specifically industry structure, competitive advantage, and competitive position.

Max Credits: 3

Min Credits: 3

66.784 Country/regional Studies Seminar

Course ID: 36992

Course Details: This class would primarily be an onsite placement in a country/region worked out between the student and their advising committee. Prior to the onsite placement, student would go through an in-depth review of issues related to the overseas placement: economic, technical, financial, management, political, legal, organizational formalities and issues. Of particular importance would be a demonstration of language skills necessary to work successfully in the specific area of the world.

Max Credits: 3

Min Credits: 3

71.595 Graduate Directed Study in Music Theory

Course ID: 6943

Course Details:

Max Credits: 3

Min Credits: 3

71.610 Structure, Context and Style

Course ID: 6945

Course Details: This course will bring the student to a concept of music in its theoretical, historical and cultural contexts, building on the materials and techniques acquired in undergraduate studies. Required for all Master of Music Students.

Max Credits: 3

Min Credits: 3

72.501 Graduate Applied Keyboard I

Course ID: 7047

Course Details:

Max Credits: 2

Min Credits: 2

72.502 Graduate Applied Keyboard 2

Course ID: 7048

Course Details:

Max Credits: 2

Min Credits: 2

72.511 Graduate Applied Voice I

Course ID: 7049

Course Details:

Max Credits: 2

Min Credits: 2

72.512 Graduate Applied Voice 2

Course ID: 7050

Course Details:

Max Credits: 2

Min Credits: 2

72.521 Graduate Applied Woodwinds 1

Course ID: 7051

Course Details:

Max Credits: 2

Min Credits: 2

72.522 Graduate Applied Woodwinds 2

Course ID: 7052

Course Details:

Max Credits: 2

Min Credits: 2

72.531 Graduate Applied Brass And Percussion 1

Course ID: 7053

Course Details:

Max Credits: 2

Min Credits: 2

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72.532 Graduate Applied Brass And Percussion 2

Course ID: 7054

Course Details:

Max Credits: 2

Min Credits: 2

72.541 Graduate Applied Strings 1

Course ID: 7055

Course Details:

Max Credits: 2

Min Credits: 2

72.542 Graduate Applied Strings 2

Course ID: 7056

Course Details:

Max Credits: 2

Min Credits: 2

73.500 Global Music for Classroom

Course ID: 7116

Course Details: Focus on the music education profession's response to multiculturalism in education as evidenced through the National Music Standards and an examination of resources and methodologies for teaching and understanding the music of diverse cultures, styles, and genres. As one of the core professional music education courses, the course includes the component of pre-practicum fieldwork. There will be an additional research project for Graduate Students enrolled in 73.500.

Max Credits: 3

Min Credits: 3

73.501 Introduction To Brass Pedagogy 1

Course ID: 7092

Course Details: Intensive class instruction toward the development of basic performance proficiency on brass instruments and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.502 Introduction to Brass Pedagogy 2

Course ID: 7093

Course Details: A continuation of 73.141. Intensive class instruction toward the development of basic performance proficiency on brass instruments and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.503 Introduction to Guitar Pedagogy

Course ID: 7094

Course Details: Intensive class instruction toward the development of basic performance proficiency on the guitar and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.504 Introduction to Woodwind Pedagogy I

Course ID: 7095

Course Details: Intensive class instruction toward the development of basic performance proficiency on woodwind instruments and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.505 Introduction to Woodwind Pedagogy 2

Course ID: 7096

Course Details: A continuation of 73.144. Intensive class instruction toward the development of basic performance proficiency on woodwind instruments and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.506 Introduction to Percussion Pedagogy

Course ID: 7099

Course Details: Intensive class instruction toward the development of basic performance proficiency on percussion instruments and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.507 Introduction to Strings Pedagogy 1

Course ID: 7104

Course Details:

Max Credits: 1

Min Credits: 1

73.508 Introduction to String Pedagogy 2

Course ID: 7105

Course Details: Intensive class instruction toward the development of basic performance proficiency on string instruments and the development of pedagogical skills and techniques for beginning instruction and demonstration purposes.

Max Credits: 1

Min Credits: 1

73.510 Foundations Of Music Education

Course ID: 7146

Course Details: This course is intended for undergraduate students preparing for teacher certification in music. Course participants will explore the historical, psychological, and philosophical foundations upon which current practices in music education are built. Students will explore these concepts through readings, class discussions, individual and group presentations, and other dynamic and interactive processes.

Max Credits: 3

Min Credits: 3

73.515 Special Topics in Music Education

Course ID: 35084

Course Details: A variety of topics in Music Education will be explored such as children and the composition process, curriculum design, assessment and technology, which will vary from semester to semester.

Max Credits: 3

Min Credits: 3

73.516 Introduction to Voice Pedagogy 1

Course ID: 7107

Course Details: Intended to cultivate the fundamental principles of singing. The psychology of singing and the psychology of the singing voice are considered as they apply to tone production and resonance.

Max Credits: 1

Min Credits: 1

73.517 Introduction to Voice Pedagogy 2

Course ID: 7108

Course Details: A continuation of Voice Pedagogy 1. Intended to cultivate the fundamental principles of singing. The psychology of singing and the psychology of the singing voice are considered as they apply to tone production and resonance.

Max Credits: 1

Min Credits: 1

73.522 Curriculum Design in Music Education

Course ID: 36643

Course Details: This course will focus on how to design developmentally appropriate learner centered music curricula. We will explore what it is we are looking to achieve through the arts, what types of learning we are looking to develop and what are the instructional materials and methods needed to achieve these goals.

Max Credits: 3

Min Credits: 3

73.542 Instrumental Repertoire and Rehearsal Techniques

Course ID: 7139

Course Details: Examination of appropriate instrumental repertoire for the secondary level and effective instrumental rehearsal techniques. Includes study of rehearsal planning, score preparation, and the development of fundamental musicianship skills necessary for a successful instrumental ensemble.

Max Credits: 3

Min Credits: 3

73.544 General Music Methods 1

Course ID: 7121

Course Details: A course designed to present the basic fundamentals of general music pedagogy, including lesson planning and the writing of instructional objectives. The course discusses basic principles of curriculum and instruction, assessment, learning styles, and developmental psychology. These are related to state curriculum frameworks and National Music Standards 1-5. As one of the core professional music education courses, the course includes the component of pre-practicum fieldwork in selected settings.

Max Credits: 3

Min Credits: 3

73.545 General Music Methods 2

Course ID: 7123

Course Details: Investigation of some of the most popular methods of teaching general music, including Orff, Kodaly, Dalcroze, and comprehensive musicianship. Discussion of contemporary issues including music in special education, multicultural music education, and National Music Standards 6-9. As one of the core professional music education courses, the course includes the component of fieldwork in selected settings.

Max Credits: 3

Min Credits: 3

73.563 Choral Repertoire and Rehearsal Techniques

Course ID: 35817

Course Details: Examination of appropriate choral repertoire for the secondary school level and effective choral rehearsal techniques. Covers auditioning, warmups, choral tone, diction, score preparation, and development of fundamental musicianship skills necessary for a successful choral ensemble. Serves as a choral laboratory setting for the practice of score preparation and rehearsal techniques.

Max Credits: 3

Min Credits: 3

73.577 Instrumental Music Workshop

Course ID: 7168

Course Details: This workshop is designed for music educators working with elementary, middle or high school instrumental ensembles, and for students seeking materials for practical application. Participants will explore band music through performance on instruments. Clinician will provide additional information as to technical facility and instrument specific rehearsal techniques.

Max Credits: 3

Min Credits: 1

73.578 Music/Way of Knowing

Course ID: 7169

Course Details: Nick Page presents a unique and practical fusion of ideas and skills, combining multiple intelligence and multicultural theories to create a powerful vision for music education. Using his book "Music as a Way of Knowing," Nick Page will show how music can come alive in a creative, positive environment with music as the center of a school's curriculum - to teach history, culture, and science as well as an amazing aid to listening skills, memory, and emotional well being. Nick is a master song leader who has inspired music educators throughout North America. He is also the author of Sing and Shine On! An Innovative Guide to Leading Multicultural Song, and his choral music is published by Boosey & Hawkes and by World Music Press.

Max Credits: 2

Min Credits: 2

73.583 Intro to Technology Applications for the Music Classroom

Course ID: 30375

Course Details: Introduction to the role of computers and technology in music education programs. Course includes the development of computer literacy, including knowledge of word processing, database and spreadsheet applications as essential to educators, and explores MIDI, the Internet, music software, recording, multimedia and other technologies as educational tools.

Max Credits: 3

Min Credits: 2

73.595 Practicum & Analysis

Course ID: 7180

Course Details:

Max Credits: 9

Min Credits: 9

73.596 Graduate Directed Study: Music Education

Course ID: 7181

Course Details:

Max Credits: 3

Min Credits: 3

73.601 Seminar In Music Education

Course ID: 7185

Course Details:

Max Credits: 3

Min Credits: 3

73.625 Community Internship

Course ID: 35592

Course Details: This course will provide students with the opportunity to gain real world experience in the administration of a Community Arts organization. Students will be required to undergo 300 hours of work under the direct supervision of the director of a Community Arts organization, in coordination with a University advisor. Students will conduct research into various arts organizations, revise resumes, and draft cover letters under the guidance of the course advisor in preparation for the internship application process. Students will be required to secure the internship pending approval of the course advisor.

Max Credits: 6

Min Credits: 6

73.650 Research in Music Education

Course ID: 31972

Course Details:

Max Credits: 3

Min Credits: 3

73.695 Direct Study and Research

Course ID: 7188

Course Details:

Max Credits: 3

Min Credits: 3

73.696 Project Report

Course ID: 7189

Course Details:

Max Credits: 3

Min Credits: 3

73.743 Master's Thesis, Music Education

Course ID: 7192

Course Details:

Max Credits: 3

Min Credits: 3

74.594 Graduate Directed Study in Musicology

Course ID: 7249

Course Details:

Max Credits: 3

Min Credits: 3

74.595 Graduate Directed Study In Musicology

Course ID: 7250

Course Details:

Max Credits: 3

Min Credits: 3

75.553 Instrumental Pedagogy

Course ID: 34653

Course Details: This course is directed toward the development and refinement of instrumental repertoire and pedagogy. The course will examine the application of musical content and learning sequences to the teaching of instrumental music to students at all levels. It will include the study of teaching methods and materials for use in private and group instruction. Observation of studio and class teaching and supervised teaching experience will also be included. This course is directed toward meeting the NASM undergraduate pedagogy component.

Max Credits: 3

Min Credits: 3

75.563 Vocal Pedagogy

Course ID: 7286

Course Details: Course will introduce students to the basics of teaching singing. It will include an overview of the anatomy of the respiratory and vocal mechanism and their application to singing; the categorization of voice types with suggestions for repertoire for young solo singers; an overview of vocal exercises for various technical goals and the diagnosis of common vocal problems and how to treat them. The class will also cover the child and adolescent voice and include in-class supervised teaching.

Max Credits: 3

Min Credits: 3

75.595 Graduate Direct Study: Research in Performance

Course ID: 7301

Course Details:

Max Credits: 3

Min Credits: 3

76.501 University Orchestra

Course ID: 7346

Course Details:

Max Credits: 1

Min Credits: 1

76.502 Wind Ensemble

Course ID: 7347

Course Details:

Max Credits: 1

Min Credits: 1

76.503 Chamber Singers

Course ID: 7348

Course Details:

Max Credits: 1

Min Credits: 1

76.504 University Choir

Course ID: 7349

Course Details: Open to all students by audition. Includes the study and performance of a wide variety of choral compositions.

Max Credits: 1

Min Credits: 1

76.505 Concert Band

Course ID: 7350

Course Details:

Max Credits: 1

Min Credits: 1

76.508 Studio Orchestra

Course ID: 7351

Course Details:

Max Credits: 1

Min Credits: 1

76.510 Opera Workshop

Course ID: 7339

Course Details:

Max Credits: 1

Min Credits: 1

76.551 Choral Union

Course ID: 7352

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Course Details: A large chorus open to the campus and the community without audition. Performs larger works in the choral repertoire including oratorios, masses, motets and opera.

Max Credits: 1

Min Credits: 1

76.553 Percussion Ensemble

Course ID: 7354

Course Details: Open to all students by audition. Exploration of the growing body of literature for percussion ensemble. Public performance.

Max Credits: 1

Min Credits: 1

76.554 Classical Guitar Ensemble

Course ID: 7355

Course Details:

Max Credits: 1

Min Credits: 1

76.555 Brass Ensemble

Course ID: 7356

Course Details: Open to all students by audition. Provides a wide range of performance experience through varied brass literature.

Max Credits: 1

Min Credits: 1

76.556 Electric Guitar Ensemble

Course ID: 7357

Course Details: Open to all students by audition. Provides study and performance of literature for guitar, lute, etc. Required of all guitar majors each semester

Max Credits: 1

Min Credits: 1

76.558 Piano Ensemble

Course ID: 7359

Course Details: Open to all students by audition. Provides performance experiences through varied piano ensemble literature for one and two pianos.

Max Credits: 1

Min Credits: 1

76.559 Mixed Chamber Ensemble

Course ID: 7360

Course Details: Open to all students by audition. Offers a wide range of performance experience through a selection of literature for varying combinations of instruments.

Max Credits: 1

Min Credits: 1

76.560 String Ensemble

Course ID: 7361

Course Details: Open to all students by audition. Provides experience in the performance of string orchestra literature.

Max Credits: 1

Min Credits: 1

76.561 Small Jazz Ensemble

Course ID: 7362

Course Details: Open to all students by audition. Provides experience in the performance of jazz literature for groups ranging from four to eight members.

Max Credits: 1

Min Credits: 1

76.562 Jazz Laboratory Ensemble

Course ID: 7363

Course Details: Open to all students by audition. Provides students with a clear understanding of the skills, knowledge and attitudes necessary to satisfactory ensemble performance and practical experience in the application of such skills, knowledge and attitudes.

Max Credits: 1

Min Credits: 1

76.563 Recording Studio Ensemble

Course ID: 33122

Course Details: This course introduces students to the music-making paradigm of the recording studio. Issues of musicianship and ensemble performance are addressed within the context of creating music recordings. Recording musicians must demonstrate music abilities in a range of spaces from live rooms to sound isolation booths, interacting with other musicians via microphones and headphones, contributing to music played live and previously recorded to a multitrack recorder by musicians at earlier recording sessions, collaborating with music producers and recording engineers. The ensemble includes a core rock/pop rhythm section of drums, electric bass, electric guitar, keyboards, and vocalists. Other musicians are welcome to contribute to the Studio ensemble as repertoire requires. Students will prepare representative recording studio works and original compositions. Students will complete several recordings by the end of the semester.

Max Credits: 1

Min Credits: 1

76.565 Jazz/Rock Big Band

Course ID: 7364

Course Details: Open to all students by audition. Fusion big band covering a wide variety of contemporary jazz rock literature. Solo improvisational opportunities. Numerous performances.

Max Credits: 1

Min Credits: 1

76.570 Contemp Electronic Ensemble

Course ID: 7365

Course Details:

Max Credits: 1

Min Credits: 1

76.601 World Music Ensemble

Course ID: 7366

Course Details: An immersion into the music of non-Western cultures, this course will provide instrumental and vocal instruction, as well as an introduction to the theory and cultural contexts that shape the practice of traditional music. The ensemble will meet weekly, with the goal of a public performance at the close of the semester.

Max Credits: 1

Min Credits: 1

76.602 Graduate Instrumental Ensemble

Course ID: 7367

Course Details:

Max Credits: 2

Min Credits: 2

76.625 Community Internship

Course ID: 35593

Course Details: This course will provide students with the opportunity to gain real world experience in the administration of a Community Arts organization. Students will be required to undergo 300 hours of work under the direct supervision of the director of a Community Arts organization, in coordination with a University advisor. Students will conduct research into various arts organizations, revise resumes, and draft cover letters under the guidance of the course advisor in preparation for the internship application process. Students will be required to secure the internship pending approval of the course advisor.

Max Credits: 6

Min Credits: 6

76.656 Seminar : Choral Literature

Course ID: 7369

Course Details:

Max Credits: 3

Min Credits: 3

77.504 Arts Administration and Marketing

Course ID: 35589

Course Details: This course is designed to provide essential information regarding the structure and strategies for creating and maintaining a sustainable non-profit arts organization. Topics to be covered include; organizational structure; development; production; market research; and promotion.

Max Credits: 3

Min Credits: 3

77.525 Community Outreach Practicum 1

Course ID: 35590

Course Details: The Community Outreach Practicum provides mentorship and initial hands-on training in the educational and arts management skills which will enable the student to build and direct community-based youth music programs.

Max Credits: 1

Min Credits: 1

77.526 Community Outreach Practicum 2

Course ID: 35591

Course Details: The Community Outreach Practicum provides mentorship and initial hands-on training in the educational and arts management skills which will enable the student to build and direct community-based youth music programs.

Max Credits: 1

Min Credits: 1

77.625 Community Internship

Course ID: 35594

Course Details: This course will provide students with the opportunity to gain real world experience in the administration of a Community Arts organization. Students will be required to undergo 300 hours of work under the direct supervision of the director of a Community Arts organization, in coordination with a University advisor. Students will conduct research into various arts organizations, revise resumes, and draft cover letters under the guidance of the course advisor in preparation for the internship application process. Students will be required to secure the internship pending approval of the course advisor.

Max Credits: 6

Min Credits: 6

78.520 Recording Analysis

Course ID: 30835

Course Details: Recognition of the unique dimensions of audio recordings, and evaluation of how they can be crafted to support musical expression. Aural analysis of audio device performance, integrity of audio quality, recording environments, and sound source characteristics. Understanding of the mix as musical interpretation and performance.

Max Credits: 3

Min Credits: 3

78.521 Sound Synthesis 2

Course ID: 7396

Course Details: Advanced sound synthesis techniques are studied and supplemented with sound synthesis studio laboratory work. The course will cover MIDI implementation in analog and digital sound synthesis, the historic origins of computer music and electro-acoustic music, live electronic music performance, audio equipment and applications of MIDI-based and functional devices and processors, advanced music production and sound synthesis via MIDI. Permission of Coordinator and Chair.

Max Credits: 3

Min Credits: 3

78.545 Advanced Mix Techniques

Course ID: 38317

Course Details: This course develops deep technical mastery and advanced aesthetic achievement in the multitrack mixdown phase of sound recording. Key families of effects are covered from first principles and technical basics to advanced applications. Processes are integrated into contemporary production strategies for music, film, game, broadcast, and live mixing.

Max Credits: 3

Min Credits: 3

78.550 Advanced Video Production

Course ID: 32802

Course Details: Extends basic music production skills into the professional sphere. Hands on experience is emphasized. Students are involved with exercises that teach approaches to dramatic lighting, audio-recording skills for challenging environments, specialized camera techniques used in Hollywood productions, and refined editing techniques. After completing several short video presentations, students will produce a multi-tracked production that demonstrates their competency in video and audio recording, sound effects, narration, and refined editing techniques. Prerequisite: 78.350

Max Credits: 3

Min Credits: 3

78.583 Intro Music Technology Applications

Course ID: 30376

Course Details:

Max Credits: 3

Min Credits: 3

78.590 Advanced Acoustics for Audio

Course ID: 32804

Course Details: This course includes measuring, predicting and modifying the acoustic behavior of rooms, instruments, and speaker enclosures, culminating in original student designs. An in-depth study of sound perception will also be included along with the latest research in live sound reinforcement and related technologies. Students must complete an original research project by the end of the term. Prerequisite: 78.630

Max Credits: 3

Min Credits: 3

78.595 Graduate Directed Study in SRT

Course ID: 33472

Course Details:

Max Credits: 3

Min Credits: 3

78.610 Digital Media

Course ID: 32813

Course Details: This course is an in-depth study of the systems and standards that collectively define "digital fusion", the convergence of all known media on a common platform and practice. Text, music, sound, images, and moving pictures are all digital objects that are stored, processed, and transmitted using the same set of technologies. The course examines each of these technologies and their common foundation in contemporary digital computing. The course also examines the impact of digital fusion on the traditional 5-tier media value-chain (producer/publisher/wholesaler/retailer/end user) Prerequisite: 78.630

Max Credits: 3

Min Credits: 3

78.630 Technologies of Audio

Course ID: 30377

Course Details: In-depth study of historical, current, and cutting edge technologies of audio devices, systems, and software; includes performance specifications, design and operational parameters, and interface considerations at all systems levels.

Max Credits: 3

Min Credits: 3

78.640 Production Practicum

Course ID: 32215

Course Details: Experimental and current recording production techniques, and historically significant approaches to recording. Performance of advanced production work including acoustic and electronic sound sources, automated mixdown, stereo and surround mixing, synchronization and MIDI, audio for visuals, multimedia. Studio production work led by lecture/demonstration classes and individual student research.

Max Credits: 3

Min Credits: 3

78.650 Research in Sound Recording Technology

Course ID: 32809

Course Details: An introduction to the knowledge and skills common to research in all areas of music: finding resources, reading and interpreting research, and understanding and applying the principles of objective investigation. The research paradigms of technology and engineering, the humanities, the natural sciences, and the social and behavioral sciences are explored and contrasted. This course consists of a sequence of lectures on the fundamental topics, followed by a series of modules or case studies in specific research areas pertaining to SRT. Each class meeting involves a project or lab for which the student must write a report or research document.

Max Credits: 3

Min Credits: 3

78.660 Seminar in Audio

Course ID: 32836

Course Details: Current topics are explored in a seminar setting requiring student participation and research. Topics selected for in-depth examination might include advanced SRT-related research methods and materials; advanced facility and systems design; experimental technologies and media; experimental production practices or artistic projects; evaluations of recordings; audio industry trends; facility and career management. Prerequisite: 78.630.

Max Credits: 3

Min Credits: 3

78.695 Directed Study and Research in SRT.

Course ID: 33362

Course Details: An in-depth independent study with a member of the Sound Recording Technology faculty. The topic and scope of the study must be approved by the faculty member and the Coordinator of SRT.

Max Credits: 3

Min Credits: 3

78.740 Masters Recording Project

Course ID: 32844

Course Details: Planning and execution of a substantial recording project under the supervision of an SRT faculty member.

Max Credits: 6

Min Credits: 6

78.741 Masters Recording Project A

Course ID: 38315

Course Details: Planning and execution of a substantial recording project under the supervision of an SRT faculty member. First part of two-course sequence. 78.742 - Masters Recording Project B must subsequently be taken to satisfy masters degree capstone requirement.

Max Credits: 3

Min Credits: 3

78.742 Masters Recording Project B

Course ID: 38316

Course Details: Planning and execution of a substantial recording project under the supervision of an SRT faculty member. Second part of two-course sequence to satisfy masters degree capstone requirement.

Max Credits: 3

Min Credits: 3

78.743 SRT Masters Thesis

Course ID: 32846

Course Details: The thesis is a scholarly investigation in SRT or an audio-related field resulting in a comprehensive written document. The student must complete acceptable research and defend it before a thesis committee. The choice of a thesis topic and a thesis advisor, the formation of a thesis committee, and the procedures for the preparation of the thesis and its defense are described in detail in the Master's Degree Requirements section of the UMASS Lowell Graduate Catalog. The specific procedures required by the Department of Music are published by the Department and are available in the main office.

Max Credits: 6

Min Credits: 6

78.744 SRT Masters Thesis A

Course ID: 38318

Course Details: The thesis is a scholarly investigation in SRT or an audio-related field resulting in a comprehensive written document. The student must complete acceptable research and defend it before a thesis committee. The choice of a thesis topic and a thesis advisor, the formation of a thesis committee, and the procedures for the preparation of the thesis and its defense are described in detail in the Master's Degree Requirements section of the University of Massachusetts Lowell Graduate Catalog. The specific procedures required by the Department of Music are published by the Department and are available in the main office. First part of two-course sequence. 78.745 - SRT Masters Thesis B must subsequently be taken to satisfy masters degree capstone requirement.

Max Credits: 3

Min Credits: 3

78.745 Continued Graduate Research SRT

Course ID: 35280

Course Details: Thesis/Project Continued Research

Max Credits: 1

Min Credits: 1

78.746 SRT Masters Thesis B

Course ID: 38341

Course Details: The thesis is a scholarly investigation in SRT or an audio-related field resulting in a comprehensive written document. The student must complete research and defend it before a thesis committee. The choice of a thesis topic and a thesis advisor, the formation of a thesis committee, and the procedures for the preparation of the thesis and its defense are described in detail in the Master's Degree Requirements section of the University of Massachusetts Lowell Graduate Catalog. The specific procedures required by the Department of Music are published by the Department and are available in the main office. Second part of two course sequence to satisfy masters degree capstone requirement.

Max Credits: 3

Min Credits: 3

81.500 Professional Experience

Course ID: 7536

Course Details: 3 Credits will be given to individuals who present evidence of having at least one full year of current experience in an academic, hospital, or industrial laboratory setting, or in secondary school science teaching

Max Credits: 3

Min Credits: 3

81.506 Environmental Microbiology Laboratory

Course ID: 7542

Course Details:

Max Credits: 1

Min Credits: 1

81.508 Cell Biology for Teachers

Course ID: 33596

Course Details: This online course will examine the structure and function of cells and the regulation of cellular processes characteristic of living organisms. Students will explore the complexity of the eukaryotic cell and gain an understanding of the mechanisms of cellular control and regulation. Course activities will make connections to state frameworks and national standards, and lead to the development of grade-appropriate curriculum materials for use in the elementary and middle school classroom. Class activities will include discussions, quizzes, lesson plans, web reviews, current events, and a final project.

Max Credits: 3

Min Credits: 3

81.509 Photobiology

Course ID: 36854

Course Details: Biological process involving light in plants and animals. Topics include mechanisms of light absorption, energy transduction, light reactions in photosynthesis, functions of color in flowering plants, visual systems and structural and pigment coloration in animals, pigmentation in animals affecting camouflage and reproductive strategies. In addition, the genetics involved in responses to light such as photoperiods, circadian rhythms, and seasonal cycles will be covered.

Max Credits: 3

Min Credits: 3

81.513 Invertebrate Zoology II

Course ID: 36646

Course Details: An in depth exploration of the deuterostome phyla with a focus on anatomy, ecology and evolution of the lophophorates, Echinodermata, Chaetognatha, Hemichordata and Chordata. Includes readings from the primary literature.

Max Credits: 3

Min Credits: 3

81.515 Invertebrate Zoology Lab II

Course ID: 36647

Course Details: The laboratory study of live and preserved specimens of invertebrate animals with a focus on anatomy and functional morphology.

Max Credits: 1

Min Credits: 1

81.516 Climate Change: Science, Communication, and Solutions

Course ID: 36712

Course Details: Climate change offers one of the greatest challenges yet faced by society and scientists. The scientific consensus is clear that climate change is occurring, its pace is accelerating, its impacts on human society will be largely negative, and it is largely caused by anthropogenic greenhouse gas emissions. Yet, despite strong scientific evidence for the enormous challenges that society may face, scientists' attempts to disseminate that evidence beyond their peers have not yet been successful. Indeed in today's media world of blogs, YouTube video clips, and sound-bites, confusion over the scientific reality of climate change frequently dominates the discourse in classrooms and communities. This course will provide students with the tools and knowledge that they need to develop their own well-informed view of climate change. Because climate change is both impacted by humans and will increasingly impact society, this course takes a cross-disciplinary approach, integrating science, policy solutions, and media literacy as they relate to climate change.

Max Credits: 4

Min Credits: 4

81.519 Biochemistry I

Course ID: 7547

Course Details: Primarily for M.S. students in biological sciences. Lecture and text assignments on the subjects of protein, carbohydrate, lipid, enzyme and membrane biochemistry will be supplemented with research journal readings.

Max Credits: 3

Min Credits: 3

81.520 Biochemistry II

Course ID: 7548

Course Details: This course is a continuation of 81-519 and will include discussions on all aspects of amino acid and nucleic acid metabolism and protein biosynthesis.

Max Credits: 3

Min Credits: 3

81.521 Biochemistry Techniques

Course ID: 7549

Course Details: Biochemistry Required of M.S. students in them Biotechnology Option. Emphasis on common techniques and instrumentation employed in modern research laboratories.

Max Credits: 2

Min Credits: 2

81.523 Biology of Global Change

Course ID: 7551

Course Details:

Max Credits: 3

Min Credits: 3

81.526 Evolutionary Biology

Course ID: 36581

Course Details: Lectures deal with the patterns and processes of biological evolution. Covers the history of evolutionary thought, the evidence for evolution, the generation and maintenance of population-level variation, natural selection, adaptation, sexual selection, speciation, phylogenetics, molecular evolution, the fossil record and extinctions. In addition to lecture and textbook material, the course surveys classic and contemporary primary literature from evolutionary biology. A written paper and/or seminar presentation will be required.

Max Credits: 3

Min Credits: 3

81.528 Molecular Biotechnology: Recombinant Protein Production

Course ID: 37368

Course Details: Proteins are major targets of Pharmaceuticals, and are themselves increasingly used as therapeutics. However both basic research and the pharmaceutical industry depends on availability of purified proteins that are often difficult to isolate from native sources. In this lecture course, students will learn basic and advanced theoretical background in expression and purification of recombinant proteins. It will cover a variety of expression systems, including prokaryotic and eukaryotic cells. The course will also address traditional and new methods in recombinant protein purification. Furthermore, students will be introduced to some downstream applications such as crystallization screens and biochemical/biophysical studies. Student will choose a term project for oral and written presentation.

Max Credits: 3

Min Credits: 3

81.529 Recombinant Protein Production Techniques

Course ID: 38228

Course Details: This course introduces students to the principles and practice of recombinant protein expression and purification's. Proteins are major targets of pharmaceuticals, and are themselves increasingly used as therapeutics. However both basic research and pharmaceutical industry depends on availability of purified proteins that are often difficult to isolate from native sources. This course will provide both didactic and laboratory instruction. It is comprised of a series of lecture and laboratory exercises, with an emphasis on practical techniques and hands-on experience of recombinant protein purification. The course will cover a variety of expression systems, including prokaryotic and eukaryotic cells, and address traditional and new methods in protein purification.

Max Credits: 4

Min Credits: 4

81.532 Genomics

Course ID: 37681

Course Details: This course surveys the field of genomics, examining current technologies and their biological applications. Lectures cover genome organization, genome sequencing and annotation, functional genomics, evolutionary genomics, transcriptomics, proteomics and the role of bioinformatics in organizing and interpreting genomic data. Students will be expected to submit written papers and to make oral presentations.

Max Credits: 3

Min Credits: 3

81.534 Genomics Laboratory

Course ID: 37680

Course Details: A series of molecular laboratory and computer-based bioinformatics exercises providing practical experience in the collection and analysis of genomic-level data.

Max Credits: 1

Min Credits: 1

81.537 Biology and Evolution of Arthropoda

Course ID: 37356

Course Details: A detailed examination of phylum Arthropoda from developmental, ecological, genetic, morphological and paleontological perspectives. Specific topics include arthropod origins and relationships to proto-arthropods, the evolution of segmentation, and current perspectives on relationships within the phylum.

Max Credits: 3

Min Credits: 3

81.539 Biology and Evolution of Arthropoda Laboratory

Course ID: 37355

Course Details: An exploration of protoarthropod and arthropod diversity using live and preserved specimens of the major taxa including Tardigrada, Onychophora, Chelicerata, Crustacea, Myriapoda and Hexapoda. Students will learn to collect, dissect, identify, handle and care for live specimens.

Max Credits: 1

Min Credits: 1

81.540 Advances in Plant Biology

Course ID: 32944

Course Details: Topics covered are similar to those considered in 81.440. However, students are required to complete a more in-depth review of a current research topic in plant biology and will conduct additional reading and writing assignments.

Max Credits: 3

Min Credits: 3

81.541 Topics in Cell Biology

Course ID: 7555

Course Details: Structure and function of the cell: a) cellular membranes, b) transport mechanisms, c) motility, d) excitable cells, and e) energy transduction mechanisms. May be repeated for credit when content varies.

Max Credits: 3

Min Credits: 3

81.542 Cell Biology

Course ID: 7556

Course Details: Ultrastructure and biochemistry of eukaryotic cells; cell membranes and organelles; energy capture and transduction; histochemical and biochemical studies of organelles at the optical and electron microscopic level; cytogenetics; brief discussion of prokaryotic cells. A substantial library investigation is required.

Max Credits: 3

Min Credits: 3

81.545 Isolation and Purification

Course ID: 1236

Course Details: Efficient isolation and purification of biological products, especially proteins, from complex natural mixtures.

Max Credits: 3

Min Credits: 3

81.547 Evolution in Context for Teachers

Course ID: 30381

Course Details: This course empowers life science teachers of all levels with the skills and knowledge to more effectively foster student understanding of evolution by natural selection. By exploring evolution in multiple contexts, the Darwinian framework for how life evolved (and continues to evolve) are presented in an interactive and engaging manner. Teachers learn to use virtual resources to enhance their students learning while digging deep into some of the most profound and interesting science conducted in the last 100 years. Evolution in context makes the science of evolution come alive in a real and relevant manner. From the historical and scientific to the environmental and political, Teachers will learn about evolution in ways they never imagined.

Max Credits: 3

Min Credits: 3

81.552 Quantitative Physiology

Course ID: 7561

Course Details:

Max Credits: 3

Min Credits: 3

81.557 Advanced Invertebrate Zoology

Course ID: 36648

Course Details: Comparative functional morphology, life histories, and phylogeny of a particular taxon (Crustacea, Mollusca) of

invertebrates.

Max Credits: 3

Min Credits: 3

81.559 Advanced Invertebrate Zoology Laboratory

Course ID: 36650

Course Details: Classification, identification, anatomy and physiology of selected invertebrates.

Max Credits: 1

Min Credits: 1

81.560 Stem Cell Biology

Course ID: 36651

Course Details: The molecular and genetic characteristics of stem cells and their developmental potential will be explored. Lectures and readings will cover the development of embryonic, fetal and adult stem cells, and will examine their use in treating human disorders receiving widespread attention, including neurodegenerative diseases, heart disease, spinal cord injury and leukemia. The ethical, legal and social implications of stem cell research will also be discussed. Additional library investigation and a term paper or seminar will be required.

Max Credits: 3

Min Credits: 3

81.561 Electron Microscopy

Course ID: 7564

Course Details:

Max Credits: 3

Min Credits: 3

81.567 Molecular Biology

Course ID: 36652

Course Details: A study of the principles and specialized techniques of cloning, purifying, and manipulating recombinant DNA molecules.

Max Credits: 3

Min Credits: 3

81.569 Molecular Biology

Course ID: 7567

Course Details: Laboratory experiments and independent projects designed to illustrate current techniques and instrumentation used in genetic engineering. Included are restriction mapping, cloning, plasmid purification, blot hybridization, and DNA sequencing. Students are introduced to computer software utilized for DNA sequence analysis and manipulation.

Max Credits: 4

Min Credits: 4

81.572 Virology

Course ID: 7568

Course Details: A study of bacterial, animal, and plant viruses, including viral structure, modes of replication, biochemistry of the infected cell, genetic properties, and viral oncogenesis. Emphasis is on viruscell interaction at the molecular level.

Max Credits: 3

Min Credits: 3

81.576 Cell Culture

Course ID: 36653

Course Details: A series of lecture and laboratory exercises that will focus on the in vitro culture and analysis of multiple cell types commonly used in biomedical research laboratories. The lecture component will review methodologies used to establish immortalized cell lines, medium component for specific cell types, and techniques for genetically manipulating and analyzing cell lines. The laboratory exercises will emphasize the mastery of sterile techniques used to grow both established cell line and primary cultures, and molecular tools used for introducing recombinant genes and for analyzing cell growth and differentiation.

Max Credits: 4

Min Credits: 4

81.580 Developmental Biology

Course ID: 7571

Course Details: An in depth discussion of contemporary topics related to reproduction and embryogenesis. Lecture material is supplemented with reading assignments in a recently published textbook and current literature taken from research journals. Emphasis is on the dynamic nature of the interactions between developing cells as well as the events that occur during fertilization, implantation and the development of the mammalian embryo which lead to birth. Students examine how studies with nonmammalian model systems such as *Drosophila* and *Xenopus* have enhanced our knowledge of mammalian development. Among the topics discussed are the role of adhesion molecules, HOX genes, apoptosis, hypomethylation of genes, axis formation and hormonal control of differentiation. Class participation is expected. Critical scientific reading and thinking is encouraged by having students present to the class published original research papers on topics of current interest in the field of developmental biology.

Max Credits: 3

Min Credits: 3

81.582 Cancer Biology

Course ID: 36654

Course Details: A study of the genes and proteins implicated in the cause of human cancer and discussion of the complex behaviors of cancer cells that differ from their normal counterparts in human tissue. Lectures and original research papers will be used.

Max Credits: 3

Min Credits: 3

81.588 Structural Biology

Course ID: 37679

Course Details: Structural basis of the molecular biology of cells and the regulation of cellular processes will be discussed. This course will cover the fundamental knowledge about protein, nucleic acid and membrane structure in relation to central systems in biology. Topics to be discussed include structural enzymology, macromolecular assemblies for replication, transcription, translation, membrane proteins, signal transduction, cell motility and transport, cell-cell interactions, the immune system, and virus structure. Students will choose a recently published primary research article for an oral presentation, and will lead a class discussion on that topic.

Max Credits: 3

Min Credits: 3

81.589 Practical Protein Crystallography

Course ID: 38015

Course Details: This course provides grounding in the principles and practice of protein x-ray crystallography. The course will be unique in format and provide both didactic and laboratory instruction. It is comprised of a series of lecture and laboratory exercises, with an emphasis on practical techniques and hands-on experience of modern protein crystallography. The course will cover the fundamental knowledge about x-ray physics, instrumentation and geometrical diffraction, protein crystallization, macromolecular data collection and processing, phase estimation and improvement, model building and refinement, and model assessment. Student will also be given a recently published structural paper for writing a report on the subject.

Max Credits: 4

Min Credits: 4

81.590 Human Neurobiology

Course ID: 31890

Course Details: A study of cellular and systems neurobiology with a focus on how these relate to human health and disease. Particular attention will be given to illustrating functional neuroanatomy and neurophysiology of the human CNS using investigations into the pathogenic mechanisms of a variety of human neurodegenerative diseases including epilepsy, Alzheimer's Disease, Huntington's Disease, ALS among others. Note: Graduate level enrollees will be responsible for additional reading and writing.

Max Credits: 3

Min Credits: 3

81.593 Immunology

Course ID: 1231

Course Details: A study of the nature of the immune response with sections on antibody structure, function and production; antigen-antibody reactions; immunogenetics; and immune regulation, protection and injury.

Max Credits: 3

Min Credits: 3

81.595 Immunology Laboratory

Course ID: 1230

Course Details: A series of basic laboratory exercises dealing with the preparation, isolation and characterization of antigens, antibodies and effector cells.

Max Credits: 2

Min Credits: 2

81.601 Graduate Seminar Biology

Course ID: 7573

Course Details: Assists students in developing effective writing and speaking skills required for preparation of research papers, grants and professional presentations. Disclosure and conflict of interest, publishing ethics, publishing censorship/fraud, and electronic collaborations are also reviewed through outside readings.

Max Credits: 3

Min Credits: 3

81.603 Graduate Colloquium Biology

Course ID: 35237

Course Details: Presentations of current topics by visiting scientists and staff. Required of all graduate students.

Max Credits: 1

Min Credits: 1

81.604 Professional Communication in Science and Technology

Course ID: 35820

Course Details: The course instructs students in developing effective writing and speaking skills required for preparation of publishable scientific manuscripts and presentations. The importance of clear, concise writing style and delivery of presentations to both research, scientists and non-scientists is emphasized. Guest speakers discuss commercialization of technology, intellectual property, and electronic literature searches/citation. Experimental design, statistical analyses, research grant preparation, and poster presentations are also reviewed. Outside readings are used to critically evaluate contemporary issues related to disclosure, conflict of interest, publishing ethics, biosecurity, and electronic science collaborations/team research.

Max Credits: 3

Min Credits: 3

81.666 Selected Topics in Molecular and Cellular Biology

Course ID: 37198

Course Details: Topics will focus on the central dogma of molecular Biology (DNA to RNA to protein) and how they relate to the structure and function of the cell. Course material will be taken directly from the current, primary literature with emphasis on student presentations and discussion. Multidisciplinary groups will select topics of interest to present to the class, and topics will vary by semester depending on student interests. Student groups will be expected to organize presentations into background and discussion sections and will lead class discussions.

Max Credits: 3

Min Credits: 3

81.707 Internship Biology

Course ID: 35831

Course Details:

Max Credits: 1

Min Credits: 1

81.708 Graduate Course Review

Course ID: 35575

Course Details: Internship or co-op.

Max Credits: 1

Min Credits: 1

81.721 Special Problems In Biology

Course ID: 7584

Course Details:

Max Credits: 3

Min Credits: 1

81.731 M.S. Project in Biology

Course ID: 7587

Course Details:

Max Credits: 9

Min Credits: 1

81.743 Master's Thesis - Biology

Course ID: 7592

Course Details:

Max Credits: 9

Min Credits: 1

81.753 PhD Dissertation Biochemistry

Course ID: 7597

Course Details:

Max Credits: 9

Min Credits: 3

84.502 Matter in Context

Course ID: 30762

Course Details: This is the first course of a two-semester chemistry program that provides teachers with everyday experiences that are directly related to fundamental chemical concepts. As such, it emphasizes the need to make careful observations, collect data, formulate conclusions and make predictions based on those findings. Teachers gain knowledge and skills by observing local chemical phenomena that allow them to then examine more complex chemical systems like global warming, ozone depletion, and the greenhouse effect; air and water quality; ecosystems; environmental factors in evolution and biodiversity; the earth, and the food web. Inherent in this process is an exposure to modeling, both developing and using physical and mathematical models to describe observed chemical phenomena. Teachers will practice inquiry methods, enhance their critical thinking skills and learn to use a variety of technical and laboratory skills to design, perform and interpret experiments

Max Credits: 3

Min Credits: 3

84.514 Advanced Analytical Chemistry

Course ID: 7701

Course Details: Designed to provide graduate students and senior undergraduate students with an understanding of the principles and the theory of analytical measurements and instrumentation. The course is divided into three sections consisting of a) analytical measurements including potentiometry and voltammetry, b) spectrophotometric measurements (i.e. molecular spectrometry), and c) ionic equilibria and statistics. This course is required for graduate programs in Analytical Chemistry and Environmental Studies (Ph.D.) and is recommended for students in other graduate programs such as Biology, Biochemistry and Environmental Studies (MS) and other areas of chemistry.

Max Credits: 3

Min Credits: 3

84.516 Advanced Techniques

Course ID: 7703

Course Details:

Max Credits: 3

Min Credits: 3

84.520 Chromatography

Course ID: 7706

Course Details:

Max Credits: 3

Min Credits: 3

84.523 Organic Reaction Mechanisms

Course ID: 7708

Course Details: Provides insight into how reactions occur and how reaction mechanisms are studied. Emphasis is placed on bonding, structure and reactivity. Conformational analysis and stereoelectronic effects, including an introduction to the application of computational chemistry to these subjects.

Max Credits: 3

Min Credits: 3

84.524 Organic Synthesis

Course ID: 7709

Course Details: Mechanism, scope and limitations of important selected types of reactions and design of synthetic sequences. Emphasis is placed on methodology of synthesis and current literature.

Max Credits: 3

Min Credits: 3

84.526 Chromatography

Course ID: 7711

Course Details: Coverage directed to the performance of packed and capillary column for gas chromatography and HPLC. Modern injection, detector and pumping systems used in chromatography are also discussed.

Max Credits: 3

Min Credits: 3

84.532 Advanced Physical Chemistry

Course ID: 7715

Course Details: Extension of introductory physical chemistry. Open to undergraduates and graduate students in chemistry and related fields. Emphasis is placed on classical and statistical thermodynamics; surface and colloid chemistry; and electronic and vibration-rotation spectra.

Max Credits: 3

Min Credits: 3

84.538 Biochemical Mechanisms

Course ID: 7720

Course Details: Discussion of various biochemical reactions from the point of view of organic reaction mechanisms. Kinetics, coenzymes and methods of the study of enzyme and catalysis and mechanisms are emphasized.

Max Credits: 3

Min Credits: 3

84.543 Modern Inorganic Chemistry

Course ID: 7722

Course Details: A theoretical treatment of atomic structure and chemical bonds, included are such topics as Russell Saunders' coupling, molecular orbital theory, ligand field theory, and descriptive coordination chemistry.

Max Credits: 3

Min Credits: 3

84.550 Biochemistry I

Course ID: 7726

Course Details: An advanced study of the structure and properties of proteins, nucleic acids, carbohydrates and lipids, including kinetics and mechanisms of enzyme action and detailed description of metabolic pathways of carbohydrates and lipids.

Max Credits: 3

Min Credits: 3

84.551 Biochemistry II

Course ID: 7727

Course Details: A continuation of 84.550 with emphasis on metabolic pathways of amino acids and nucleic acid, biosynthesis of proteins and selected topics in molecular biology and various areas of biochemistry.

Max Credits: 3

Min Credits: 3

84.560 Advanced Physical Biochemistry

Course ID: 7732

Course Details: Physical chemistry encompasses a group of principles and methods helpful in solving many different types of problems. This course will present selected principles of thermodynamics, kinetics, statistical thermodynamics and quantum mechanics as they are applied to biochemical systems. Various experimental techniques will be strongly emphasized in view of their importance in biochemical research.

Max Credits: 3

Min Credits: 3

84.562 Pharmaceutical Biochemistry

Course ID: 36766

Course Details: Pharmaceutical Biochemistry examines the biochemical and molecular mechanisms of drug interaction. Topics include basic aspects of molecular complementarity (molecular recognition), specificity and stability of ligand binding (energetics), as well as crystallographic and computational approaches.

Max Credits: 3

Min Credits: 3

84.563 Chemistry Of Natural Products

Course ID: 7733

Course Details: Covers the proof of structure of various types of natural products, approaches to the total synthesis of these products and the biosynthetic pathways.

Max Credits: 3

Min Credits: 3

84.566 Nanomaterials and Nanostructures

Course ID: 37645

Course Details: Nanoscience and nanotechnology focus on the understanding and control of matter at the dimension of 1-100 nanometers, i.e., the nanoscale. Nanoscale structures, materials and devices have unique properties and functions solely because of their sizes. Research and technology development in nanoscience and nanotechnology aim at understanding the fundamental nanoscale phenomena, synthesizing, fabricating and imaging nanomaterials and nanostructures, and constructing nanoscale systems that offer unprecedented properties and functions. In this course, we will discuss the fundamental nanoscale phenomena. We will learn variety of nanomaterial characterization techniques including scanning probe, electron probe, absorption and particle spectroscopies. Fabrication processes of top-down and bottom-up approaches will be discussed, including molecular and material self-assembly. We will study surface phenomena and surface energy that are of critical importance for nanomaterials and nanostructures. We will also learn various ways to control the structures and properties of nanomaterials and surfaces. A variety of nanomaterials and nanostructures will be discussed, including metal, semiconductor, organic and inorganic nanoparticles, carbon nanomaterials, and various natural and synthetic nanostructured surfaces. Applications of these nanomaterials in nanomedicine and theranostics will also be discussed.

Max Credits: 3

Min Credits: 3

84.567 Computational Biochemistry

Course ID: 7735

Course Details: This course will provide an introductory survey of the basis of theory/simulations of biomolecules. It is accessible to anyone who has completed two semesters of undergraduate chemistry and who has some background in physical chemistry. Topics/examples will be borrowed from modern biological chemistry and biophysics of single biomolecules. The course will be useful for

senior undergraduates and beginning graduate students. Chem/Bioinformatics 84.567 will attempt to cultivate computational skills, which on needs to tackle current scientific problems of biology and biophysics.

Max Credits: 3

Min Credits: 3

84.568 Structural Analysis

Course ID: 7736

Course Details: Practical applications of instrumental data in the determination of the structure of organic compounds and polymers. Includes mass spectrometry, ultra-violet spectroscopy, infrared spectroscopy and nuclear magnetic resonance spectroscopy. Open to undergraduate students with permission.

Max Credits: 3

Min Credits: 3

84.570 Protein Chemistry

Course ID: 7737

Course Details: This course outlines the assembly process, structural and functional attributes of protein. Special attention will be given to three-dimensional structures, folding, post translational modifications, misfolding and degradations, as well as biochemical and biophysical techniques used to elucidate protein structure and function.

Max Credits: 3

Min Credits: 3

84.580 Bioanalytical Chemistry

Course ID: 7739

Course Details: Analytical biochemistry involves the separation, detection, and analysis of biological molecules. This course addresses advanced theory and applications of contemporary biochemical techniques and instrumentation. Topics covered include chromatographic and electrophoretic separation techniques, detection of biomolecules by spectroscopy and radiochemical methods, biological preparations, and structural analysis of proteins, nucleic acids, polysaccharides and lipids.

Max Credits: 3

Min Credits: 3

84.601 Chemistry Seminar

Course ID: 7741

Course Details: Required of all graduate students. Presentation of current topics by graduate students.

Max Credits: 2

Min Credits: 2

84.602 Chemistry Seminar

Course ID: 7742

Course Details: Required of all graduate students. Presentation of current topics by graduate students.

Max Credits: 2

Min Credits: 2

84.603 Chemistry Colloquium

Course ID: 7743

Course Details: Required of all graduate students. Presentation of current topics by visiting scientists and staff.

Max Credits: 1

Min Credits: 1

84.604 Chemistry Colloquium

Course ID: 7744

Course Details: Required of all graduate students. Presentation of current topics by visiting scientists and staff.

Max Credits: 1

Min Credits: 1

84.641 Co-Op Internship

Course ID: 35199

Course Details: Practical training for International Students in a Co-operative agreement with Industry or a Government Laboratory for 1 semester.

Max Credits: 1

Min Credits: 0

84.651 Selected Topics: Chemistry

Course ID: 7746

Course Details: Advanced topics in various fields of chemistry. Content may vary from year to year so that students may, by repeated enrollment, acquire a broad knowledge of contemporary chemistry.

Max Credits: 3

Min Credits: 3

84.652 Selected Topics: Chemistry

Course ID: 7747

Course Details:

Max Credits: 3

Min Credits: 3

84.653 Chemical Oceanography

Course ID: 7748

Course Details:

Max Credits: 3

Min Credits: 3

84.672 Surface and Colloid Chemistry

Course ID: 33615

Course Details: Surface and colloid chemistry describes the nanoscopic and mesoscopic regimes that connect molecular and macroscopic length scales. The course focuses on how phenomena at macroscopic surfaces and interfaces arise from molecular interactions. Intermolecular and surface forces discussed in detail include van der Waals and electrostatic forces, and how these together with steric interactions give rise to different molecular aggregates (self-assembled structures of surface active molecules and polymers) in bulk solution and in the vicinity of solid surfaces. Examples of modern experimental techniques for measurements of surface forces and for characterization of surfaces and aggregates are discussed and demonstrated.

Max Credits: 3

Min Credits: 3

84.705 Supervised Teaching Ch & Ps

Course ID: 7750

Course Details:

Max Credits: 0

Min Credits: 0

84.731 Graduate Project in Chemistry

Course ID: 35693

Course Details: Continued research project supplementing the research credits for a doctoral student. This course will require special permission from the Graduate Coordinator.

Max Credits: 1

Min Credits: 1

84.741 Master's Thesis - Chemistry

Course ID: 36421

Course Details: Master's Thesis - Chemistry

Max Credits: 1

Min Credits: 1

84.743 Master's Thesis - Chemistry

Course ID: 7754

Course Details:

Max Credits: 3

Min Credits: 3

84.746 Master's Thesis - Chemistry

Course ID: 7755

Course Details:

Max Credits: 6

Min Credits: 6

84.749 Master's Thesis - Chemistry

Course ID: 7756

Course Details:

Max Credits: 9

Min Credits: 9

84.751 Graduate Doctoral Research Credit

Course ID: 35659

Course Details:

Max Credits: 1

Min Credits: 1

84.753 Doctoral Dissertation/Chemistry

Course ID: 7757

Course Details:

Max Credits: 3

Min Credits: 3

84.756 Doctoral Dissertation/Chemistry

Course ID: 7758

Course Details:

Max Credits: 6

Min Credits: 6

84.759 Doctoral Dissertation /Chemistry

Course ID: 7759

Course Details:

Max Credits: 9

Min Credits: 9

84.763 Continued Graduate Research

Course ID: 7760

Course Details:

Max Credits: 3

Min Credits: 3

84.769 Continued Graduate Research

Course ID: 7762

Course Details:

Max Credits: 9

Min Credits: 9

85.501 Boundary Layer Meteorology

Course ID: 7796

Course Details: This course draws upon the equations of motion in the atmosphere to develop a theoretical understanding of the atmospheric boundary layer. This understanding is compared with real observations taken with the Department's rawinsonde equipment, as well as published data. The emphasis is on blending theory and practice to enhance the student's understanding of the behavior of the atmosphere.

Max Credits: 3

Min Credits: 3

85.502 Advanced Synoptic Meteorology

Course ID: 7797

Course Details: This course is designed for graduate students who have a strong background in mathematics and physics, but whose meteorology preparation is weak. The basic concepts of weather forecasting and analysis on synoptic scales are covered theoretically as well as in application to case studies and current weather. The coursework encourages the development of three - dimensional visualization techniques and an appreciation of the physics which controls weather systems.

Max Credits: 3

Min Credits: 3

85.503 Remote Sensing

Course ID: 7798

Course Details: This course is a survey of ground based, balloon, rocket probe, radar and satellite remote sensing techniques. Optical and radio frequency remote sensing techniques are surveyed. The focus is on the determination of physical, chemical and dynamical quantities by remote sensing measurements. The theory is presented used to interpret data obtained by remote sensing techniques. Various inversion methods are discussed used to obtain spatial discrete quantities from line - of - sight observations. Modeling and simulation techniques are described and practiced.

Max Credits: 3

Min Credits: 3

85.508 The Climate System

Course ID: 33556

Course Details: The main elements of the Climate Sstem are the atmosphere, ocean, biosphere, land surface, and the cryosphere; the primary input of energy is from the Sun. This course examines these elements, the ways in which they interact and how they can be modeled. The Global Energy Budget is examined and both natural and human-caused climae change are considered.

Max Credits: 3

Min Credits: 3

85.510 Regional Weather and Climate Modeling

Course ID: 37957

Course Details: Mesoscale atmospheric dynamics and regional climate dynamics. Application of regional weather and climate model to regional weather, climate modeling and forecast problems. Multi-scale physical processes, such as mesoscale and convective-scale phenomena, low-level jets, mountain waves and orographic precipitation, land/sea breezes, cyclones etc., will be discussed in order to understand the linkage between regional weather and climate.

Max Credits: 3

Min Credits: 3

85.513 Physical Meteorology

Course ID: 34585

Course Details: This course explores the essentials of cloud physics, beginning with the basic laws of thermodynamics of both dry and moist atmospheres. Condensation, nucleation, and drop growth are studied in detail at an advanced level.

Max Credits: 3

Min Credits: 3

85.515 Atmospheric Structure and Dynamics

Course ID: 7801

Course Details: The temperature, pressure and density structure of the atmosphere are reviewed, as well as the chemical composition. Topics include atmospheric and solar radiation, atmospheric heat budget and the hypsometric equation. Dynamics of the atmosphere explores the behavior of fluids on a rotating earth, global circulation, synoptic scale motions, perturbation theory of wave motions. Elements of climatic change and the effects of anthropogenic emissions on climate and weather will also be discussed.

Max Credits: 3

Min Credits: 3

85.518 Forecasting and Synoptic Techniques I

Course ID: 34590

Course Details: This is the first of a two-course sequence that provides graduate students a combined theoretical and applied understanding of synoptic-scale meteorology, with an emphasis on forecasting applications. The first course introduces the concepts of vorticity advection and the quasi-geostrophic approximation, and applies them synoptic-scale cyclones, including nor'easters. The graduate students will learn to use Gempak graphics and will be introduced to the National Weather Service Weather Event Simulator, a combined hardware and software package that simulates the NWS forecast environment.

Max Credits: 3

Min Credits: 3

85.519 Forecasting and Synoptic Techniques II

Course ID: 34914

Course Details: This is the second of a two-course sequence that provides graduate students a combined theoretical and applied understanding of synoptic-scale meteorology, with an emphasis on forecasting applications. This second course builds on the content of the first, extending quasi-geostrophic approximation to Q-vectors and isentropic potential vorticity. The National Weather Service Weather Event Simulator, a combined hardware and software package that simulates the NWS forecast environment will be used to study case studies that have been programmed for the Simulator. Together with 85.518, this two-course sequence satisfies the NWS certification requirements for analysis and prediction of weather systems.

Max Credits: 3

Min Credits: 3

85.524 Simple Atmospheric Models

Course ID: 35197

Course Details: The basic wave types and fundamental dynamics of atmospheric motion are considered through analytical and numerical modeling of the main simplifications (models) of the full equations of motion for the atmosphere. These models are derived by making assumptions that greatly simplify the full equations and which isolate individual wave types and specific physical mechanisms. Together, these models describe the basic aspects of atmospheric motion: the maintenance and structure of the jet stream, the genesis and propagation of synoptic storms, and the forced and internal contributions to seasonal patterns of midlatitude climate variability.

Max Credits: 3

Min Credits: 3

85.529 Advanced Forecasting

Course ID: 34915

Course Details: This course builds on the student's basic understanding of storm systems and extends their theoretical knowledge to particular weather patterns. Topics include nowcasting, long-range forecasting, snow squalls, sea breeze, and especially deep convection. Particular attention is paid to the structure and development of supercells. Students will also be required to write a special report on a topic assigned by the professor, and present this in class as a special lecture.

Max Credits: 3

Min Credits: 3

85.540 Tropical Meteorology

Course ID: 37879

Course Details: An introduction to the tropical atmosphere, including tropical climatology, structure and dynamics of easterly waves, tropical cyclones and monsoon circulation's.

Max Credits: 3

Min Credits: 3

85.550 Satellite and Rad Meteorology

Course ID: 7803

Course Details:

Max Credits: 3

Min Credits: 3

85.571 Air Pollution Phenomenology

Course ID: 7804

Course Details: The course centers on transport, dispersion and transformation of air pollutants in the atmosphere. Atmospheric structure and dynamics are reviewed. The atmospheric dispersion equation is developed for instantaneous and steady-state releases of pollutants, including the Gaussian Plume Equation for point, line and area sources. The sources and transport of particulate matter are discussed, including haze and visibility impairment. Other topics are photooxidants (ozone), acid deposition, stratospheric ozone depletion and the greenhouse effect.

Max Credits: 3

Min Credits: 3

85.581 Meteorology for Teachers

Course ID: 30388

Course Details: The purpose of this course is to provide the middle school teacher with: a thorough understanding of several key concepts and processes of meteorology; the ability to effectively present meteorology topics that are appropriate for the middle school science classroom; the tools necessary to develop inquiry based lessons for the classroom.

Max Credits: 3

Min Credits: 3

85.591 Directed Study

Course ID: 7808

Course Details:

Max Credits: 3

Min Credits: 3

85.701 Graduate Research Seminar

Course ID: 7813

Course Details:

Max Credits: 1

Min Credits: 1

85.732 Graduate Research

Course ID: 7814

Course Details:

Max Credits: 2

Min Credits: 2

85.733 Master's Research in Atmospheric Sciences

Course ID: 7815

Course Details:

Max Credits: 3

Min Credits: 1

85.743 Master's Thesis in Atmospheric Sciences

Course ID: 7817

Course Details:

Max Credits: 6

Min Credits: 1

85.753 Doctoral Dissertation in Atmospheric Sciences

Course ID: 7819

Course Details:

Max Credits: 8

Min Credits: 3

85.760 Continuing Graduate Research (PhD)

Course ID: 34591

Course Details: Continuing Graduate Research at the PhD level. May be taken for variable credit.

Max Credits: 9

Min Credits: 1

85.761 Continuing Graduate Research (PhD)

Course ID: 35270

Course Details: Research on dissertation or other research areas as required by the program and the student's advisor.

Max Credits: 1

Min Credits: 1

85.763 PhD Research in Atmospheric Sciences

Course ID: 7820

Course Details:

Max Credits: 2

Min Credits: 2

85.765 Doctoral Dissertation

Course ID: 33070

Course Details:

Max Credits: 8

Min Credits: 1

85.768 Doctoral Dissertation

Course ID: 32226

Course Details:

Max Credits: 8

Min Credits: 8

87.504 Geographic Information Systems

Course ID: 7867

Course Details: This course will cover most of the elements of a geographic information system commonly found in basic and mid-level GIS applications. Topics will include file organization, data entry including digitizing and image registration, geocoding, thematic mapping, Structured Query Language (SQL) applications, map algebra, raster operations, interpolative methods, distance mapping, density mapping, cost surfaces, and an introduction to modeling. This course will use the Arcview GIS platform.

Max Credits: 3

Min Credits: 3

87.520 Methods in Environmental Impact Assessment and Analysis

Course ID: 37684

Course Details: This course describes, and illustrates with case studies, environmental evaluation required to implement projects and policies potentially affecting the environment. Methods available to integrate technical impact predictions, prepare Environmental Statements, and make informed decisions regarding environmental effects will be covered. Incorporation of sustainability and permitting with environmental analyses will also be examined.

Max Credits: 3

Min Credits: 3

87.572 Energy and Environment

Course ID: 7869

Course Details: This course discusses the world and U.S. primary energy resources and consumption, including fossil, nuclear and renewable energy sources. Principles of thermodynamics are reviewed, especially in regard to energy usage efficiency improvement. A significant part of the course is devoted to electricity production, including site visits to fossil and nuclear power plants. The environmental effects are discussed of energy extraction and consumption, such as SO_x, NO_x and particulate matter emissions, acid deposition, the greenhouse effect, radioactive waste disposal. Also the risks of accidents are discussed in fossil and nuclear fuel usage.

Max Credits: 3

Min Credits: 3

89.501 Paleoclimatology

Course ID: 37512

Course Details: This course provides students with an overview of paleoclimatology by examining the use of proxy records, such as marine and lake sediment sequences, ice cores, tree rings, corals and historical data to reconstruct past climatic conditions. Dating methods will be introduced. Throughout, we will critically analyze our understanding of past climates and environments and identify directions for future research. Topics include: abrupt climate change, human evolution and climate, biosphere-climate interactions and paleoclimate modeling.

Max Credits: 3

Min Credits: 3

89.502 Quantitative Gemorphology

Course ID: 37733

Course Details: This course follows the path of material as it is weathered from bedrock, moved down hillslopes and transported via glaciers and rivers. Emphasis is on 1) quantifying erosion and sediment transport, 2) applying computer-based models and conservation of mass equations to earth surface processes and 3) understanding long-term landform evolution.

Max Credits: 3

Min Credits: 3

89.504 Igneous and Metamorphic Petrology

Course ID: 37892

Course Details: The origin and evolution of igneous and metamorphic rocks. Emphasis will be on physical and chemical processes, magma transport and crystallization, phase equilibria, development of metamorphic facies, open and closed system behavior, and the development of metamorphic fabric.

Max Credits: 3

Min Credits: 3

89.506 Igneous and Metamorphic Petrology Laboratory

Course ID: 37891

Course Details: Identification and classification of igneous and metamorphic rocks. Emphasis is on thin section identification and use of rock textures and compositions as guides to petrogenesis.

Max Credits: 1

Min Credits: 1

89.510 Glacial and Pleistocene Geology

Course ID: 7923

Course Details:

Max Credits: 3

Min Credits: 3

89.520 Structural Geology

Course ID: 37890

Course Details: An analysis of crustal deformation through detailed study of geologic structures with emphasis upon the response of geologic materials to stress and strain. Field techniques, tectonic principles, and geometrical analysis are employed.

Max Credits: 3

Min Credits: 3

89.522 Structural Geology Laboratory

Course ID: 37895

Course Details: A survey of the graphical techniques used to convert field measurement into the information needed in the construction of geologic maps, cross-sections, and crustal stress-strain histories.

Max Credits: 1

Min Credits: 1

89.524 Regional Hydrogeology

Course ID: 7925

Course Details: Concentrating on the storage and steady state flow of ground water at a basin-wide scale, the course studies flow nets, fluid potential, and numerical modeling of flow controlled by basin geometry and geology; water movement in the zone of aeration, the interaction of groundwater with surface water, the transport and dispersion of contaminants, and the use of modeling for groundwater management.

Max Credits: 3

Min Credits: 3

89.540 Mass Transit Modeling

Course ID: 7929

Course Details:

Max Credits: 3

Min Credits: 3

89.541 Environmental and Engineering Geology

Course ID: 37928

Course Details: Fundamentals of geology applied to environmental and engineering problems. Topics include minerals and rocks, soil properties, rock mechanics, active tectonics and earthquake hazards, slope stability and landslides, groundwater, rivers and flood hazards, coastal processes, and site assessment. Student project.

Max Credits: 3

Min Credits: 3

89.552 Sedimentation & Stratigraphy

Course ID: 37894

Course Details: Principles and processes of sedimentation: erosion, mechanics of transport, diagenesis and lithification, models for sedimentary environments. Development of the stratigraphic record, relative and absolute time, and seismic stratigraphy.

Max Credits: 3

Min Credits: 3

89.554 Sedimentation and Stratigraphy Laboratory

Course ID: 37893

Course Details: Determination of mass properties of sediments with emphasis on mechanical and statistical analysis, identification and description of sedimentary rocks, facies models and stratigraphic cross-sections.

Max Credits: 1

Min Credits: 1

89.556 Applied Geophysics

Course ID: 37897

Course Details: Application of geophysics to problems in geology and environmental science. Principles and techniques of gravity, magnetic, electrical, and seismic methods. Field projects and surveys.

Max Credits: 3

Min Credits: 3

89.558 Advanced Geochemistry

Course ID: 37896

Course Details: Application of chemical principles to geological and environmental problems. Topics include abundance and distribution of elements in the earth, Crystal chemistry, stable and radiogenic isotopes, radiogenic dating, isotopic and elemental tracers, water-rock interactions.

Max Credits: 3

Min Credits: 3

89.585 Oceanography for Teachers

Course ID: 37519

Course Details: This course will introduce students to basic oceanographic principles and processes. Content will be linked to National and State Science Standards. Students will create a number of oceanography-based lessons linked to the standards. Pedagogy will be modeled in relation to teacher instruction and student learning.

Max Credits: 3

Min Credits: 3

89.599 Advanced Rocks

Course ID: 7931

Course Details:

Max Credits: 3

Min Credits: 3

89.702 Graduate Seminar Biology

Course ID: 7932

Course Details:

Max Credits: 3

Min Credits: 3

89.731 Master's Research in Environmental Geoscience

Course ID: 37926

Course Details:

Max Credits: 6

Min Credits: 1

89.741 Master's Thesis in Environmental Geoscience

Course ID: 37925

Course Details:

Max Credits: 6

Min Credits: 1

91.500 Fundamental of Computer Science

Course ID: 8132

Course Details: Mathematical topics necessary for graduate study in computer science in the areas of discrete mathematics, probability, linear algebra and proof techniques. Material may include topics such as: summations, sets, relations, functions, recurrences, graphs, trees, elementary combinatorics, basic axioms and laws of probability, discrete random variables, probability distributions, matrices, Boolean algebra, logarithms.

Max Credits: 3

Min Credits: 3

91.502 Foundations of Computer Science

Course ID: 8134

Course Details: An advanced introduction to theoretical computer science. This course will cover the fundamentals of automata, formal languages, and computability theory.

Max Credits: 3

Min Credits: 3

91.503 Algorithms

Course ID: 8135

Course Details: Advanced algorithms and complexity analysis. Dynamic programming; greedy algorithms; amortized analysis; shortest path and network flow graph algorithms; NP-completeness; approximation algorithms; number-theoretic algorithms; string matching; computational geometry. Additional topics may include linear programming, parallel algorithms, fast Fourier transforms, polynomial, integer, and matrix algorithms. Readings may include conference and journal papers from the algorithms literature. Abstract types, lists,

trees, graphs, sets; relevant algorithms and their worst and average case analyses; fast transforms; polynomial, integer, and matrix algorithms; NP-completeness.

Max Credits: 3

Min Credits: 3

91.504 Advanced Algorithms: Computational Geometry

Course ID: 8136

Course Details: Advanced algorithms topics, such as design and analysis of geometric and combinatorial algorithms, computability and complexity.

Max Credits: 3

Min Credits: 3

91.508 Analysis Of Algorithms

Course ID: 8138

Course Details: Topics in algorithm design and analysis; mapping and modeling; issues in complexity, lower bounds; models of parallel computation.

Max Credits: 3

Min Credits: 3

91.510 Computational Complexity Theory

Course ID: 8139

Course Details: This course covers polynomial-time hierarchy and polynomial space, circuit complexity, structure of NP, probabilistic machines and complexity classes, complexity of counting, interactive proof systems, probabilistically checkable proofs, complexity of approximation problems, and average-case NP-completeness.

Max Credits: 3

Min Credits: 3

91.513 Internet And Web Systems I

Course ID: 8142

Course Details: This course is a survey of Web programming technologies. It begins with a discussion of what Web servers and clients are, how they interact, and how one sets them up. We then explore a wide variety of Web technologies including HTML, JavaScript, JavaServer Pages, Java Servlets, and XML and its many related technologies. Our goal in this course is to provide the basic understanding and knowledge of how the Internet and World Wide Web operate and the technical knowledge required to establish and maintain an Internet/Web site and to develop and introduce new capabilities and features on such sites.

Max Credits: 3

Min Credits: 3

91.514 Internet & Web Systems II

Course ID: 8143

Course Details: A continuation of 91.513 with a focus on current topics and topics of special interest. Examples of recent topics include: The semantic Web and ontologies, Web services, Peer-to-peer networks, Information Search and Retrieval, Autonomous intelligent agents and Multi-modal presentations.

Max Credits: 3

Min Credits: 3

91.515 Operating Systems I

Course ID: 8144

Course Details: This course provides insight into multiprocessing operating systems including processor memory, peripheral, and file systems management in batch, timesharing, real time, and distributed systems targeted for various hardware. Particular emphasis will be placed on techniques of virtual memory as well as the problems of concurrency in both centralized and distributed systems. An OS simulation is a required programming project. Some topics to be covered are process synchronization; high-Level mechanisms for concurrency; processor scheduling and system analysis; deadlock; virtual memory; distributed systems; computer security.

Max Credits: 3

Min Credits: 3

91.516 Operating Systems II

Course ID: 8145

Course Details: The design and implementation of an interactive multiprocessing operating system to run on a bare hardware system. Separate teams manage the major subsystems with in-class design reviews to coordinate system integration. A functioning system is a class requirement.

Max Credits: 3

Min Credits: 3

91.520 Digital Storage Architectures

Course ID: 8149

Course Details: This course will focus on existing and proposed technologies for storing digital information. Both hardware and software issues will be examined, beginning with device and controller organization and proceeding through aggregation techniques, interconnect architectures and host consideration. At each level, specific components will be evaluated with respect to critical storage criteria, such as bandwidth and latency, fault tolerance, infrastructure requirements and cost.

Max Credits: 3

Min Credits: 3

91.522 Object Oriented Analysis

Course ID: 8151

Course Details: Object-oriented techniques for analysis, specification, and design. Static information models and state-based dynamic behavior models applied to rapid prototyping projects that both use and implement object-oriented CASE tools.

Max Credits: 3

Min Credits: 3

91.527 Human Computer Interaction

Course ID: 8155

Course Details: The purpose of this class is to ground students in the basics of how humans interact with technology, and make students aware of the breadth of topic areas related to human-computer interaction (HCI). This course emphasizes theoretical constructs such as the Model-Human Processor, and includes seminal readings by the original researchers. Further, the course emphasizes techniques for understanding users' tasks, formulating users' requirements, and assessing proposed designs using heuristic evaluation. As part of understanding users' needs, students will consider social, organizational, and ethical perspectives on information technology. Students are also exposed to specialty topics in human-computer interaction such as multi-user computing, universal access to computer applications, and internationalizing interfaces. This course includes a project to design, develop, document, and orally present a prototype interface. At the end of the course students will be able to cite basic principles of human interaction and devise and carry out a usability engineering plan to aid in developing new human interfaces.

Max Credits: 3

Min Credits: 3

91.528 Evaluation of Human-Computer Interaction

Course ID: 30391

Course Details: This course is an introduction to methods used to evaluate the design of human-computer interaction (HCI). Students will apply examples of all three of the major types of HCI evaluation techniques: inspection, analytical, and empirical techniques. The course also covers HCI experiment design and data analysis, including threats to experimental validity. The course project consists of a formal

usability test. This project requires students to learn principles of ethical treatment of human subjects, complete the University's Institutional Review Board applications and training for human-subject testing, conduct testing sessions, analyze data, recommend design changes, and document results in a professional manner. At course completion, students will have demonstrated skills for assessing the effectiveness of interface designs and will understand how evaluation fits into computer products' lifecycles.

Max Credits: 3

Min Credits: 3

91.530 Special Topics

Course ID: 8156

Course Details: Topics of mutual interest to the instructor and student(s).

Max Credits: 3

Min Credits: 3

91.531 Design of Program Languages

Course ID: 8157

Course Details: A one-semester course designed to provide students with hands-on understanding of the underlying concepts of programming languages, the principles of their design, and the fundamental methods for their implementation. An executable metalanguage such as Scheme or SML is used throughout the course, facilitating the design of high-level, concise interpreters that are easy to comprehend. The approach is analytical because the salient features of the imperative, functional, object-oriented, and logic programming paradigms are described in the executable meta-language.

Max Credits: 3

Min Credits: 3

91.534 Compiler Construction I

Course ID: 8160

Course Details: This course implements a compiler for a complete language. Topics include grammars, syntax, elements of parsing and recursive descent, semantics, basic code generation, fast compilation runtime support. Programming project required.

Max Credits: 3

Min Credits: 3

91.540 Visual Analytics

Course ID: 8164

Course Details: This course covers the basic topics for the interdisciplinary field of visual analytics. This course is not just for computer science students but also for analysts and scientists in different disciplines. The topics include visual analytics science and technology, perception, cognitive processes and human tasks and reasoning, data and knowledge representation, visualization and interaction, statistical and analytic methods, data mining and knowledge discovery, and evaluation and usability. Numerous examples of systems, tools and applications will be presented.

Max Credits: 3

Min Credits: 3

91.541 Data Visualization

Course ID: 8165

Course Details: This course looks at classical and novel methodologies for the visualization of large and complex data sets. The course covers both scientific and information visualization starting with data modeling, human perception and cognition, basic and advanced techniques, interaction, formal models, real time systems, and frameworks for integrated analysis and visualization. Examples used come from numerous areas including the biomedical literature and security.

Max Credits: 3

Min Credits: 3

91.543 Artificial Intelligence

Course ID: 8167

Course Details: Search and games, knowledge representation paradigms, natural language understanding, planning, perception. Use of the LISP language for one or more programming projects.

Max Credits: 3

Min Credits: 3

91.544 Data Mining

Course ID: 8168

Course Details: This introductory data mining course will give an overview of the models and algorithms used in data mining, including association rules, classification, clustering, etc. The course will teach the theory of these algorithms and students will learn how and why the algorithms work through computer labs.

Max Credits: 3

Min Credits: 3

91.545 Machine Learning

Course ID: 8169

Course Details: This introductory course gives an overview of machine learning techniques used in data mining and pattern recognition applications. Topics include: foundations of machine learning, including statistical and structural methods; feature discovery and selection; parametric and non-parametric classification; supervised and unsupervised learning; use of contextual evidence; clustering, recognition with strings; small sample-size problems and applications to large datasets.

Max Credits: 3

Min Credits: 3

91.546 Computer Graphics I

Course ID: 8170

Course Details: Introduction to the hardware, software and mathematics of 2- and 3-dimensional interactive computer graphics systems, including standards, modeling, transformations, hidden-surface removal, shading, and realism.

Max Credits: 3

Min Credits: 3

91.547 Computer Graphics II

Course ID: 8171

Course Details: Lighting models, photo-realism, animation, constructive solid geometry, and distributed graphics.

Max Credits: 3

Min Credits: 3

91.548 Robot Design

Course ID: 8172

Course Details: A broad interpretation of robotics to mean systems that interact with people, each other, and the world around them, using sensors, actuators, communications, and a control program. Project- and lab-based course that involves electronics, embedded coding, mechanical design, and research.

Max Credits: 3

Min Credits: 3

91.550 Topics

Course ID: 8174

Course Details: Topics of mutual interest to the instructor and student(s).

Max Credits: 3

Min Credits: 3

91.553 Parallel Processing

Course ID: 8177

Course Details: A survey of parallel computer architectures, parallel programming languages, and parallel algorithms, with emphasis on solving practical problems with parallel computers. A final project, typically a substantial parallel program, is required. Usually offered during the Spring semester.

Max Credits: 3

Min Credits: 3

91.561 Computer & Network Security I

Course ID: 8183

Course Details: Basic concepts and techniques of computer network security; data encryption algorithms; public-key cryptography and key management; data authentication; network security protocols in practice; wireless network security; network perimeter security; the art of anti malicious software; the art of intrusion detection. Students will implement encryption and authentication algorithms as network applications.

Max Credits: 3

Min Credits: 3

91.563 Data Communications I

Course ID: 8185

Course Details: Resource sharing; computer traffic characterizations; multiplexing; network structure; packet switching and other switching techniques; design and optimization; protocols; routing and flow control; simulation and measurement; communications processors.

Max Credits: 3

Min Credits: 3

91.564 Data Communications II

Course ID: 8186

Course Details: Continuation of 91.563

Max Credits: 3

Min Credits: 3

91.568 Seminar in Human-Computer Interaction

Course ID: 8189

Course Details: The two main purposes of this seminar course are to involve students in current human-computer interaction (HCI) research and to learn to critique others' HCI research. Each offering of the seminar will center on a theme of applying HCI techniques to a particular type of interaction such as human interfaces for robots, pervasive computing, or social media. Students will be expected to read and critique a number of papers from the current literature in the designated topic area. Further, class members will form a research team (led by the course instructor) to perform original research in the topic area. Class members will co-author a paper based on their research results with the goal of submitting it to a conference. By the end of the course, students will be able to describe the state-of-the-art in the course topic, recognize examples of good and poor research techniques, document research to high academic standards, and become productive members of HCI research teams.

Max Credits: 3

Min Credits: 3

91.570 Topics

Course ID: 8190

Course Details: Topics of mutual interest to the instructor and student(s).

Max Credits: 3

Min Credits: 3

91.573 Data Base I

Course ID: 8192

Course Details: Study of various database models including hierarchical, network, relational, entity-relationship, and object-oriented models. This course also covers data design, integrity, security, concurrency, recovery, query processing, and distribution.

Max Credits: 3

Min Credits: 3

91.574 Data Base II

Course ID: 8193

Course Details: Continuation of Data Base I. Various issues in the implementation of database systems will be covered.

Max Credits: 3

Min Credits: 3

91.580 Topics in Computer Science

Course ID: 8194

Course Details: Topics of mutual interest to the instructor and student(s).

Max Credits: 3

Min Credits: 3

91.592 Special Topics: Computer Science

Course ID: 8203

Course Details:

Max Credits: 3

Min Credits: 3

91.593 Cooperative Education

Course ID: 8204

Course Details:

Max Credits: 1

Min Credits: 0

91.604 Network Optimization

Course ID: 35779

Course Details: This course covers advanced topics in network optimization on continuous and discrete models, including the max-flow problem, the min-cost flow problem, simplex methods for min-cost flow, dual ascent methods for min-cost flow, auction algorithms for min-cost flow, nonlinear network optimization, convex separable network problems, and network problems with integer constraints.

Max Credits: 3

Min Credits: 3

91.613 Advanced Topics in Information Retrieval and Mining

Course ID: 34993

Course Details: This is a proposed new 600-level course. The topics are advanced topics in Information Retrieval and Mining, including (but not limited to) Search and Information Retrieval, Visual Text Mining, Document Retrieval and Analysis, Non-textual Retrieval (including Image-, Sound, Video-Retrieval). The course's format is a seminar: (advanced, doctoral) students will be reading and presenting the current state-of-the-art literature. Course requirements include weekly bibliography reports (at least 2 new entries each week) class presentations, two term papers, and a term project.

Max Credits: 3

Min Credits: 3

91.640 Advanced Research Topics in Data Visualization

Course ID: 34857

Course Details: This course will cover modern information visualization research. Student will read and summarize current research and published papers. If a student already has a thesis topic or is already doing research, the student will participate in the development of a proposal for external funding related to their thesis topic or research. If a student does not have a thesis topic, the student will develop their thesis proposal.

Max Credits: 3

Min Credits: 3

91.641 Advanced Topics in Visualization

Course ID: 35415

Course Details: This course covers advanced topics in data visualization. Coverage will be topical and may include advanced graph & text visualization, modern coordinated visualizations, collaborative visualization knowledge visualizations, security visualization, web-based visualization, and high-performance visualization. Theory will also be covered.

Max Credits: 3

Min Credits: 3

91.644 Topics in Data Mining

Course ID: 37056

Course Details: This course continues with 91.421/91.544 Data Mining and explores the state of the art research advances in mining large amount of data especially algorithms in association classification, clustering, and applications such as web mining and spatio-temporal data mining.

Max Credits: 3

Min Credits: 3

91.650 Advanced Research Topics in Wireless Networks

Course ID: 34770

Course Details: This course will cover state-of-art wireless networking research topics, including communications, management, security, sensors, and mobile applications. Students will read and summarize current research and published papers, and do experimental projects. This course allows subtitle (topics), and students can take this course multiple times with different subtitle (topics). The subtitle (topic) of this course is to be determined when the course is offered.

Max Credits: 3

Min Credits: 3

91.661 Advanced Topics in Network Security

Course ID: 34625

Course Details: This is a topic course, with a subtitle to be determined by the instructor. It covers advanced topics in network security of mutual interests to the faculty and students.

Max Credits: 3

Min Credits: 3

91.673 Advanced Database Systems

Course ID: 35041

Course Details: This course covers advanced topics in database management systems, including query processing and optimization, indexing, transaction management, data warehousing, data mining, etc. It also covers spatio-temporal databases, search engines, stream and sensor databases, and open problems for research.

Max Credits: 3

Min Credits: 3

91.691 International Finance

Course ID: 8211

Course Details:

Max Credits: 3

Min Credits: 3

91.701 Computer Science Research

Course ID: 8212

Course Details:

Max Credits: 3

Min Credits: 3

91.702 Computer Science Research

Course ID: 8213

Course Details:

Max Credits: 6

Min Credits: 6

91.703 Computer Science Research

Course ID: 8214

Course Details:

Max Credits: 3

Min Credits: 3

91.706 Directed Research

Course ID: 8217

Course Details:

Max Credits: 6

Min Credits: 6

91.710 Approximation Algorithms

Course ID: 36940

Course Details: This course covers advanced topics in approximation algorithms for NP-hard problems, including combinatorial algorithms and LP-based algorithms for set cover, k-cut, k-center, feedback vertex set, shortest superstring, knapsack, bin packing, maximum satisfiability, scheduling, Steiner tree, Steiner Forest, Steiner network, facility location, k-median, semidefinite programming. It also covers counting problems, shortest vector, hardness of approximation, and open problems for research.

Max Credits: 3

Min Credits: 3

91.711 Combinatorial Optimization

Course ID: 36941

Course Details: This covers advanced topics in computational combinatorial optimization. Topics will be drawn from practical applications in various areas, including wireless sensor networks, different types of complex networks, online social networks, bioinformatics, and computational medicine.

Max Credits: 3

Min Credits: 3

91.741 Thesis Review

Course ID: 35269

Course Details:

Max Credits: 1

Min Credits: 1

91.743 Master's Thesis - Computer Science

Course ID: 8223

Course Details:

Max Credits: 3

Min Credits: 3

91.746 Master's Thesis - Computer Science

Course ID: 8226

Course Details:

Max Credits: 6

Min Credits: 6

91.749 Master's Thesis - Computer Science

Course ID: 8227

Course Details:

Max Credits: 9

Min Credits: 9

91.751 Doctoral Thesis Research

Course ID: 8228

Course Details:

Max Credits: 3

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Min Credits: 1

91.753 Doctoral Dissertation/Computer Science

Course ID: 8229

Course Details:

Max Credits: 3

Min Credits: 3

91.756 Doctoral Dissertation/Computer Science

Course ID: 8231

Course Details:

Max Credits: 6

Min Credits: 6

91.757 Doctoral Thesis Research

Course ID: 8232

Course Details:

Max Credits: 12

Min Credits: 12

91.759 Doctoral Dissertation/Computer Science

Course ID: 8233

Course Details:

Max Credits: 9

Min Credits: 9

91.769 Continued Graduate Research

Course ID: 8236

Course Details:

Max Credits: 9

Min Credits: 9

92.500 Discrete Structures

Course ID: 8402

Course Details: An introduction to discrete mathematics, including combinatorics and graph theory. The necessary background tools in set theory, logic, recursion, relations, and functions are also included. Masters degree credit for Teacher Option Only.

Max Credits: 3

Min Credits: 3

92.501 Real Analysis

Course ID: 8403

Course Details: The class is aimed to give rigorous foundations to the basic concepts of Calculus such as limits of sequences and functions, continuity, Riemann integration. The main focus is given to rigorous proofs rather than computations. Tentative topics are: Real numbers (algebraic, order and distance structures); Archimedean property; Sequences and their limits. Bolzano-Weierstrass theorem;

Cauchy sequences and completeness; Limit of a function; Continuity of a function at a point and on a set; Uniform continuity; Open and closed sets, idea of compactness, compactness of a closed interval; Sequences of functions, uniform convergence; Riemann integration. Prerequisites: Calculus I-III or equivalent, Discrete Structures or equivalent.

Max Credits: 3

Min Credits: 3

92.503 Mathematical Analysis

Course ID: 8405

Course Details: Development of number systems, including axiomatic and constructive treatment of the integers and the reals; sequences and series; functions of a real variable and their properties, including continuity, derivatives and integrals; functions of several real variables, including partial derivatives and multiple integration; differential equations and applications; metric spaces. Masters degree credit for the Teacher Option only.

Max Credits: 3

Min Credits: 3

92.507 Applied Functional Analysis I

Course ID: 8408

Course Details: Vector, metric, normed, Banach and Hilbert spaces. Spectral theory of linear, compact, and unbounded linear operators. Integral and differential equations, approximation theory, and quantum mechanics.

Max Credits: 3

Min Credits: 3

92.509 Probability and Mathematical Statistics

Course ID: 8409

Course Details: This course provides a solid basis for further study in statistics and data analysis or in pattern recognition and operations research. It is especially appropriate for students with an undergraduate science or engineering major who have not had a rigorous calculus-based probability and statistics course. The course covers the topics in probability models, random variables, expected values, important discrete and continuous distributions, limit theorems, and basic problems of statistical inference: estimation and testing.

Max Credits: 3

Min Credits: 3

92.510 Computers and Calculators in Classroom

Course ID: 8410

Course Details: Explores the roles of computers and calculators in instruction, examines some of the available software, and considers their use in a variety of areas of school mathematics, such as algebra, geometry (Euclidean and analytic) probability and statistics, and introductory calculus. Mathematics Masters degree credit for Teacher Option Only.

Max Credits: 3

Min Credits: 3

92.511 Complex Variables I

Course ID: 1227

Course Details: Discusses complex numbers, functions of a complex variable, mappings, derivatives, analytic functions, elementary functions. Laurent series, residues and poles, contour integration.

Max Credits: 3

Min Credits: 3

92.513 Number Theory

Course ID: 8412

Course Details: Study of primes, congruences, number-theoretic functions, Diophantine approximation, quadratic forms and quadratic number fields. Additional topics as time permits.

Max Credits: 3

Min Credits: 3

92.519 Introduction to Probability and Statistics II

Course ID: 30831

Course Details: The course combines theory with applications and covers both fundamental topics in statistical inference and their applications in data analysis. Discussions of the theoretical topics of statistical estimation and hypotheses testing will be complemented by analyzing simulated and real data sets. The course is taught at the computer lab equipped with MINITAB, SAS and other packages. Students will learn how statistical theory helps using statistical software, how to choose the right tool for the problem at hand and how to interpret the output. Topics to be covered include point and interval estimation, hypotheses testing, maximum likelihood estimation, likelihood ratio and related tests, applications of statistical inference to commonly used statistical models, such as one-sample, two-sample and many-sample (ANOVA) models, linear regression models, goodness-of-fit tests and contingency tables, and elements of statistical quality control and experimental design. Time permitting, topics in nonparametric and robust statistics will also be covered. Pre-requisite; 92.386, 92.509 or equivalent.

Max Credits: 3

Min Credits: 3

92.520 Mathematical Problem Solving

Course ID: 1226

Course Details: Focuses on: mathematical resources, ability to use heuristics, the student's beliefs about the use of mathematics to solve problems, and the student's self-confidence as a problem solver. Effective strategies for incorporating problem solving in the curriculum will also be discussed.

Max Credits: 3

Min Credits: 3

92.521 Abstract Algebra I

Course ID: 1225

Course Details: Elementary group theory, groups, cosets, normal subgroups, quotient groups, isomorphisms, homomorphisms, applications.

Max Credits: 3

Min Credits: 3

92.523 Linear Algebra

Course ID: 8418

Course Details: Sets and maps; vector spaces and linear maps, matrix of linear maps, solving systems of equations, scalar products and orthogonality, eigenvalues and applications. Masters degree credit for Teachers Option Only.

Max Credits: 3

Min Credits: 3

92.526 Topology

Course ID: 33480

Course Details: Metric spaces, topological spaces, connectedness, compactness, the fundamental group, classifications of surfaces, Brouwer's fixed point theorem.

Max Credits: 3

Min Credits: 3

92.527 Geometry

Course ID: 1224

Course Details: This course is designed for current and prospective geometry teachers. In addition to the development of Euclidean geometry, students will become familiar with geometry applications in Geometer's Sketchpad software, and to a lesser degree with other geometry software applications including Geogebra, Cabri, Maple and/or Mathematica. There will be an introduction to spherical and hyperbolic geometry and triangle measurements will be computed for each. Calculus based derivations of area and volume for surfaces and solids will be generated and related to Euclidean geometry topics.

Max Credits: 3

Min Credits: 3

92.529 Differential Geometry

Course ID: 8421

Course Details: Differential geometry involving curves and surfaces in 3-space. Curvature, torsion, Frenet equations, intrinsic equations, involutes and evolutes.

Max Credits: 3

Min Credits: 3

92.530 Applied Mathematics I

Course ID: 8422

Course Details: Ordinary and partial differential equations; Fourier series and Fourier integrals; Laplace transform; matrix theory.

Max Credits: 3

Min Credits: 3

92.531 Applied Mathematics II

Course ID: 8423

Course Details: Vector analysis and vector calculus; Gauss, Green, and Stokes theorems; complex analysis; calculus of variations; special functions; orthogonal functions.

Max Credits: 3

Min Credits: 3

92.532 Advanced Geometry

Course ID: 38483

Course Details: Historical perspectives: Euclid's synthetic geometry, Descartes' analytic geometry, attempts to prove parallel postulate, emergence of non-Euclidean geometry's, axiomatic development of geometry, Klein's Erlanger Programm; projective, affine, and metric geometries; non-Euclidean geometry's; foundations of geometry; algebraic geometry; finite geometry. Requires knowledge of linear algebra, abstract algebra for groups and fields including Galois fields, some familiarity with propositions and set-theoretic topology as covered in a course on Discrete Mathematics.

Max Credits: 3

Min Credits: 3

92.535 History of Mathematics

Course ID: 1223

Course Details: Examines ancient numeral systems, Babylonian and Egyptian mathematics, Pythagorean mathematics, duplication, trisection, and quadrature, Euclid's elements and Greek mathematics after Euclid, Hindu and Arabian mathematics, European mathematics from 500 to 1600, origins of modern mathematics, analytic geometry, the history of calculus. Also covers the transition to the twentieth century and contemporary perspectives.

Max Credits: 3

Min Credits: 3

92.548 Mathematics Of Signal Processing

Course ID: 8430

Course Details: Representation of signals: Fourier analysis, fast Fourier transforms, orthogonal expansions. Transformation of signals: linear filters, modulation; band-limited signals; sampling; uncertainty principle; Windows and extrapolation.

Max Credits: 3

Min Credits: 3

92.550 Mathematical Modeling

Course ID: 8431

Course Details: Applications of mathematics to real life problems. Topics include dimensional analysis, population dynamics wave and heat propagation, traffic flow. Pre-requisite: 92.132 Calculus II.

Max Credits: 3

Min Credits: 3

92.551 Calculus of Variations

Course ID: 8432

Course Details: The first variational problem, necessary conditions. Euler's equation. Generalization to dependent and independent variables. Constraints and Lagrange multipliers. Application to dynamics and elasticity. Direct methods.

Max Credits: 3

Min Credits: 3

92.552 Wavelet Analysis

Course ID: 8433

Course Details: Introduction to time-frequency localization of signals; frames; windowed Fourier transforms; continuous and discrete wavelet transforms; time frequency sampling theorems; orthonormal bases of wavelets; algebraic wavelet theory; applications to electrodynamics and optics.

Max Credits: 3

Min Credits: 3

92.555 Applied Math for Life Scientists

Course ID: 8436

Course Details: The objective of this course is to give students an opportunity to learn how to use a computer algebra system in the context of reviewing some of the key mathematical topics that are used in the life sciences. The first half of the course includes a review of mathematical topics ranging from trigonometry through differential equations. A parallel introduction to a computer algebra system is also included in the first half. In the second half, students will study a mathematical topic such as pattern recognition or models for growth and complete a project using the computer algebra system. (UMassOnline).

Max Credits: 3

Min Credits: 3

92.563 Computational Mathematics

Course ID: 8439

Course Details: Introduction and review of Taylor series. Finding roots of $F(x)=0$. Numerical interpolation and extrapolation. Curve fitting and nonlinear best fits. Numerical differentiation and integration. Differential equations, initial and boundary value problems.

Max Credits: 3

Min Credits: 3

92.564 Applied Linear Algebra

Course ID: 8440

Course Details: Use of iterative algorithms to find exact or approximate constrained solutions to large, and often sparse, systems of linear equations, and on applications, such as medical imaging, in which such problems arise. Maximization of likelihood and entropy. Emphasis on exploiting sparseness, accelerating convergence, and stabilizing calculations in the presence of noise. Block-iterative methods and bounds for singular values will be included. Basic results in matrix theory presented as needed.

Max Credits: 3

Min Credits: 3

92.568 Approximation Theory

Course ID: 31893

Course Details:

Max Credits: 3

Min Credits: 3

92.570 Probability and Statistics

Course ID: 8444

Course Details: Overview of descriptive statistics, data analysis, probability of events, discrete random variables, continuous random variables, normal, binomial and other probability distributions, central limit theorem, survey sampling, estimation, hypothesis testing, regression, experimental design, analysis of categorical data, nonparametric statistics. Masters degree credit for Teachers Option Only.

Max Credits: 3

Min Credits: 3

92.572 Optimization

Course ID: 8446

Course Details: Optimization without calculus; geometric programming; convex sets and convex functions; review of linear algebra; linear programming and the simplex method; convex programming; iterative barrier-function methods; iterative penalty-function methods; iterative least-squares algorithms; iterative methods with positivity constraints; calculus of variations; applications to signal processing, medical imaging, game theory.

Max Credits: 3

Min Credits: 3

92.576 Statistical Programming using SAS

Course ID: 8449

Course Details: An introduction to creation and manipulation of databases and statistical analysis using SAS software. SAS is widely used in the pharmaceutical industry, medical research and other areas.

Max Credits: 3

Min Credits: 3

92.578 Statistical Inference and Data Mining

Course ID: 31943

Course Details: Topics in nonasymptotic direct computational methods for statistical inference in data mining. Background in probability and statistics required.

Max Credits: 3

Min Credits: 3

92.582 Time Series Analysis

Course ID: 8454

Course Details: Building models for discrete time series and dynamic systems and their use in forecasting and control. Stationary and non-stationary time series models. Box-Jenkins (ARMA) and other techniques.

Max Credits: 3

Min Credits: 3

92.584 Stochastic Process

Course ID: 8456

Course Details: Markov chains and processes, random walks, stationary, independent increments, and Poisson processes. Ergodicity. Examples (e.g., diffusion, queuing theory, etc.).

Max Credits: 3

Min Credits: 3

92.587 Probability Theory

Course ID: 8459

Course Details: This is a course in mathematical probability that gives rigorous proofs to various limit theorems in probability (zero-one laws, laws of large numbers, central limit theorems) that, in particular, constitute a basis for most of the statistical techniques. Tentative topics are: Sigma-algebras of random events, probability measures; Random variables and their distributions, moments; Independent events and sigma-algebras, independent random variables; infinite products of probability spaces; Zero-One Laws and Laws of Large Numbers; Characteristic functions and their properties; Weak convergence of measures and central Limit Theorem; Radon-Nikodim theorem and conditional expectations. Prerequisites: 92.502 Measure and Integration or equivalent

Max Credits: 3

Min Credits: 3

92.588 Mathematical Statistics

Course ID: 8460

Course Details: Random variables, densities, joint and conditional distributions, expectations, variance, estimation, sufficiency and completeness, hypothesis testing, limiting distributions.

Max Credits: 3

Min Credits: 3

92.591 Linear Statistics Modeling and Regression

Course ID: 8463

Course Details: Model building via linear regression models. Method of least squares, theory and practice. Checking for adequacy of a model, examination of residuals, checking outliers. Practical hand on experience in linear model building on real data sets. Prerequisite: Probability, Biostatistics, or Statistics for Engineering and Science.

Max Credits: 3

Min Credits: 3

92.592 Multivariate Statistics

Course ID: 8464

Course Details: Nonlinear model building via the method of least squares. Discriminant and factor analysis, principal components, profile analysis, canonical correlation, cluster analysis. Experience on real data sets.

Max Credits: 3

Min Credits: 3

92.593 Experimental Design

Course ID: 8465

Course Details: How to design, carry out, and analyze experiments. Randomized block designs, randomization, blocking, matching, analysis of variance and covariance, control of extraneous variables.

Max Credits: 3

Min Credits: 3

92.651 Selected Topics in Mathematics

Course ID: 8467

Course Details: Intended to satisfy individual student needs. Topics include various fields of mathematics.

Max Credits: 3

Min Credits: 3

92.653 Selected Topics

Course ID: 8469

Course Details: Advanced topics in various fields of mathematics and related fields. Since topical coverage varies from term to term, a student may be allowed to receive credit more than once for this course.

Max Credits: 3

Min Credits: 3

92.742 Thesis Review

Course ID: 35257

Course Details:

Max Credits: 1

Min Credits: 1

92.965 Introduction To Pascal

Course ID: 11633

Course Details:

Max Credits: 3

Min Credits: 3

94.511 Network and Systems Administration

Course ID: 35873

Course Details: This course introduces the concepts and techniques of systems and network administration. The course covers topics in a wide range from host management, network management, host and network security to automating system administration. In this course learners will be installing and configuring various popular network based services in a Linux environment.

Max Credits: 3

Min Credits: 3

94.514 Systems Security and Auditing

Course ID: 37843

Course Details: This course examines the strategies for deploying and auditing secure systems. IT auditors primarily study computer

systems and networks form the point of view of examining the effectiveness of their technical and procedural controls to minimize risks. Risk analysis and the implementation of corresponding best practice control objectives will be studied. The material will include methodologies that help auditors to: Discover what's really going on at a point in time., Find out about potential problems, before it's too late to fix them., Evaluate business situations objectively., Make informed, if difficult decisions., Implement corrective actions, changes and improvements where needed.

Max Credits: 3

Min Credits: 3

94.517 Operating Systems Foundations

Course ID: 35776

Course Details: This course investigates the organization and deployment of contemporary operating systems. The process model is examined both generically and in the context of the current Linux/Unix and Windows implementations. Process attributes such as address spaces, threads, channels and handles, access rights, scheduling behaviour and states and state transitions will be studied. Memory management, deadlock management and the file system development are also evaluated. A subsystem of system configuration options will be considered during the course in order to highlight the functional deployment of the core OS issues discussed. Pre-req: BS in IT or equivalent. Cannot be used toward MS or PhD in Computer Science.

Max Credits: 3

Min Credits: 3

94.518 Large Scale application Deployment

Course ID: 35874

Course Details: This course will develop a systematic framework for the life cycle management of large scale applications. Beginning with requirements assessments, and impact analysis, and continuing through regulatory compliance, lifetime maintenance, scalability concerns, and end-of-life evolution, the material in this course will characterize the stages and transitions of large scale applications. Deployment and management tools will be examined in the context of live applications, with an emphasis on convergent analysis and configuration. Several case studies will be considered, including operating systems, database applications, mailing systems and collaboration systems.

Max Credits: 3

Min Credits: 3

94.519 Virtual Systems

Course ID: 35875

Course Details: This course will investigate the current state of virtualization in computing systems. Virtualization at both the hardware and software levels will be examined, with emphasis on the hypervisor configurations of systems such as VMware, Xen and Hyper-V. The features and limitations of virtual environments will be considered, along with several case studies used to demonstrate the configuration and management of such systems. Para-virtualized software components will be analyzed and their pros and cons discussed. Processor and peripheral support for virtualization will also be examined, with a focus on emerging hardware features and the future of virtualization.

Max Credits: 3

Min Credits: 3

94.531 Project Management

Course ID: 37828

Course Details: This course explores the application of knowledge, skills, tools, and techniques that project managers use when managing information technology projects as well as the current IT factors that affect IT project management decision making. Special emphasis will be placed on learning the best practices currently used by organizations and practitioners to ensure the best chance for project success by learning and applying the concepts of managing scope, risk, budget, time, expectations, quality, people, communications, procurement, and externally provided services. Students will be expected to perform research in the above areas as well as using tools such as Microsoft Project to solve project management related problems. Special attention will also be placed on the issues affecting project managers today such as PMOs, virtualization, green IT, and out sourcing. Practical examples will be used to demonstrate the concepts and techniques, plus you will receive hands on experience by working on a case study.

Max Credits: 3

Min Credits: 3

94.532 Managing and Mining Large Data Sets

Course ID: 37827

Course Details: The amount of data generated by businesses, science, Web, and social networks is growing at a very fast rate. This course will cover the algorithms and database techniques required to extract useful information from this flood of data. Data mining, which is the automatic discovery of interesting patterns and relationships in data, is a central focus of the course. Topics covered in data mining include association discovery, clustering, classification, and anomaly detection. Special emphasis will be given to techniques for data warehousing where extremely large datasets (e.g., many terabytes) are processed. The course also covers Web mining. Topics covered include analysis of Web pages and links (like Google) and analysis of large social networks (like Facebook).

Max Credits: 3

Min Credits: 3

94.535 Agile and Iterative Project Management

Course ID: 38319

Course Details: This course explores the differences between the Traditional Project management and the Agile management approaches, introduces the principles of Agile Development through applications within each major Project Management process: Project Initiation, Project Planning, Project Execution, and Project Closing. The project will be developed in a timely manner, using Agile techniques that encourage frequent adaptation, self-organization, accountability and with a focus towards rapid delivery. Upon completion, students will understand how to apply Agile principles and practices, recognize ways to increase team performance through better communication and close involvement of stake holders, and recognize the key success criteria for implementing Agile Projects.

Max Credits: 3

Min Credits: 3

94.541 Information Security, Privacy and Regulatory Compliance

Course ID: 37842

Course Details: this course focuses on enterprise-level information security risk management, It audit, and regulatory compliance, and on developing the skills required for creating a new culture of information management compliance (IMC) by incorporating and IMS philosophy into a corporate governance structure. Expert advice and insight reveals the proven methodology that adopts the principles, controls, and discipline upon which many corporate compliance programs are built and explains how to apply this methodology to develop and implement IMC programs that anticipate problems and take advantage of opportunities. You'll learn how to measure information management compliance through the use of auditing and monitoring, following the proper delegation of program roles and components, and creating a culture of information management awareness.

Max Credits: 3

Min Credits: 3

94.543 Intrusion Detection Systems

Course ID: 37841

Course Details: Intrusion Detection Systems is a survey of the hardware and software techniques that are applied to the detection, identification, classification and remediation of compromised information systems. From this introduction to intrusion detection systems, students will develop a solid foundation for understanding IDS and how they function. This course will give students a background in the technology of detection network attacks. It will introduce all the concepts and procedures used for IDS (intrusion Detection Systems) and IPS (intrusion Prevention Systems). Students will have hands-on experience with implementing and configuring software and hardware based IDS in a network infrastructure. This course is designed with a network administrator in mind.

Max Credits: 3

Min Credits: 3

94.560 Network Infrastructures

Course ID: 35876

Course Details: This course provides an introduction to the fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications. Topics to be covered include: an overview of network architectures, applications, network programming interfaces (e.g. sockets), transport, congestion, routing, and data link protocols, addressing, local area networks, network management, and emerging network technologies. Cannot be used toward MS or D.Sc. in Computer Science.

Max Credits: 3

Min Credits: 3

94.561 Computer Network Security

Course ID: 35785

Course Details: This course is aimed to provide students with a solid understanding of key concepts of computer network security and practical solutions to network security threats. Topics to be covered include common network security attacks, basic security models, data encryption algorithms, public-key cryptography and key management, data authentication, network security protocols in practice, wireless network security, network perimeter security and firewall technology, the art of anti-malicious software, and the art of intrusion detection. Pre-Req: BS in IT or Equivalent. Cannot be used toward MS or D.Sc. in Computer Science.

Max Credits: 3

Min Credits: 3

94.562 Digital Forensics

Course ID: 35877

Course Details: Identifying, preserving and extracting electronic evidence. Students learn how to examine and recover data from operating systems, core forensic procedures for any operating or file system, understanding technical issues in acquiring computer evidence and how to conduct forensically sound examinations to preserve evidence for admission and use in legal proceedings.

Max Credits: 3

Min Credits: 3

94.563 Secure Mobile Networks

Course ID: 35878

Course Details: This course covers principles and practices of wireless networks, including cellular networks, wireless LANs, ad hoc mesh networks, and sensor networks. The potential attacks against these wireless networks and the security mechanisms to defend these networks will be discussed. Topics to be covered include cellular network architecture, wide-area mobile services, wireless LANs and MACs, introduction to emerging wireless networks, survey of malicious behaviors in wireless networks, securing wireless WANs and LANs, securing wireless routing, securing mobile applications, wireless intrusion detection and prevention, challenges in securing next-generation wireless networks, and privacy issues in wireless networks.

Max Credits: 3

Min Credits: 3

94.565 Cloud Computing

Course ID: 37437

Course Details: This course starts with an overview of modern distributed models, exposing the design principles, systems architecture, and innovative applications of parallel, distributed, and cloud computing systems. The course will focus on the creation and maintenance of high-performance, scalable, reliable systems, providing comprehensive coverage of distributed and cloud computing, including: Facilitating management, debugging, migration, and disaster recovery through virtualization. Clustered systems for research or ecommerce applications. Designing systems as web services. Principles of cloud computing using examples from open-source and commercial applications.

Max Credits: 3

Min Credits: 3

94.566 Advanced Cloud Computing

Course ID: 38140

Course Details: This course is a continuation of the 94.565 Cloud Computing course and will cover in further detail such topics as Cloud Based Storage, Virtualization, Service Oriented Architecture (SOA), High Availability, Scaling, and Mobile Devices. The course will also study the role of Open Source cloud software such as Hadoop, OpenStack and others. Similar to the first course where hands-on projects included the use of Cloud Services such as Amazon Web Services (AWS), Google Apps and App Engine, and Windows Azure, this course will continue with those services and add others such as Rackspace and VMware. Current articles and publications in this fast moving field of Cloud Computing will also be followed.

Max Credits: 3

Min Credits: 3

95.501 Energy, Force and Motion

Course ID: 30760

Course Details: An introduction to the most fundamental area of physics: the nature of motion, what affects it, and how it is measured. We examine Newton's laws, including the law of gravity, and how forces produce acceleration. The course also examines the nature of energy - potential and kinetic - and how it relates to motion and forces. We will concentrate on how to analyze physical situations and solve the basic equations of motion. This course is intended to help teachers develop their understanding of the physics of motion.

Max Credits: 3

Min Credits: 3

95.513 Mechanics

Course ID: 1221

Course Details: Newton's laws of motion. Momentum and angular momentum. Energy. Oscillations. Variational principles. Central forces and planetary motion. Non-inertial systems of reference. Rotations of rigid bodies, tensors of inertia. Normal modes of oscillation.

Max Credits: 3

Min Credits: 3

95.521 Statistical Thermodynamics

Course ID: 1220

Course Details: An integrated study of the thermodynamics and statistical mechanics, review of the experimental foundations and historical development of classical thermodynamics; probability and statistical methods of studying macroscopic systems; atomic basis of the laws of thermodynamics and microscopic definitions of thermodynamics quantities using the method of ensembles; entropy and related quantities; TdS equations, Maxwell relations, equation of state, and applications: canonical and grand canonical ensembles; phase transitions; quantum statistics; application to radiation, magnetism, specific heats. (offered as 95.521 for graduate credit)

Max Credits: 3

Min Credits: 3

95.535 Introductory Quantum Mechanics I

Course ID: 1219

Course Details: De Broglie waves, the Schrodinger equation, wave functions, wave packets, Heisenberg uncertainty principle, expectation values, particle in a box, the simple harmonic oscillator, free particles, step barrier, barrier penetration, square well potential, time independent perturbation theory. (offered as 95.535 for graduate credit)

Max Credits: 3

Min Credits: 3

95.536 Introductory Quantum Mechanics II

Course ID: 8589

Course Details: The three dimensional Schrodinger equation, the deuteron nucleus, angular momentum, spin, the hydrogen atom, spin-orbit interaction, Zeeman effect, Pauli exclusion principle, atomic structure, multi-electron atoms, the Fermi gas, X-rays.

Max Credits: 3

Min Credits: 3

95.538 Physical Optics and Waves

Course ID: 8591

Course Details: Wave nature of light, mathematics of wave motion, electro-magnetic theory of light propagation, reflection and refraction, Fresnel coefficients, polarization, interference, Young's experiment, fringe visibility and coherence, various interferometers, Newton's

rings and applications, Fraunhofer diffraction by single and multiple apertures and diffraction gratings, Fresnel diffraction.

Max Credits: 3

Min Credits: 3

95.539 Electro-Optics

Course ID: 1218

Course Details: Optical properties of materials, including dispersion, absorption, reflection and refraction at the boundary of two media. Crystal optics and induced birefringence and optical activity. Polarization states and Jones matrices. Applications to electro-optic devices. Experiments and projects involving the study of optical sources and detectors, spectroscopy, polarization, birefringence, Pockels' effect, optical fibers, and optical communication. (offered as 95.539 for graduate credit)

Max Credits: 3

Min Credits: 3

95.540 Image Processing

Course ID: 8592

Course Details: Basic physics of television and other imaging systems: representation and manipulation of images in digital form; Fourier analysis and filtering of images: detection of image features such as edges and regions, pattern recognition, three-dimensional visual perception in man and machine, examples of image processing tasks from such areas as medicine, industrial inspection and robotics. Ability to program a computer is required.

Max Credits: 3

Min Credits: 3

95.547 Laser Physics and Applications

Course ID: 1217

Course Details: Spontaneous and stimulated emission line broadening processing, rate equations, laser oscillation condition, spectral output of lasers. Gaussian beam propagation and resonator design parameters. Key features of ultraviolet through far infrared laser systems. Application to spectroscopy, radar, welding. (offered as 95.547 for graduate credit)

Max Credits: 3

Min Credits: 3

95.552 Contemporary Physics

Course ID: 8593

Course Details:

Max Credits: 3

Min Credits: 3

95.553 Electromagnetism I

Course ID: 1216

Course Details: The theory of electromagnetic fields using vector analysis: electrostatic fields and potentials in vacuum, conductors, and dielectric media, magnetic effects of steady currents in nonmagnetic media, magnetic induction and time varying currents and fields. (offered as 95.553 for graduate credit)

Max Credits: 3

Min Credits: 3

95.554 Electromagnetism II

Course ID: 1215

Course Details: Magnetic materials, electric multipoles, solutions to Laplace's equation, boundary conditions, image charge problems,

Maxwell's equations; propagation of electromagnetic waves in vacuum, conductors and dielectrics; reflection and refraction of electromagnetic waves; radiation from dipoles and antennas. (offered as 95.554 for graduate credit).

Max Credits: 3

Min Credits: 3

95.555 Introduction to Space Physics

Course ID: 33625

Course Details: The course introduces the present knowledge of space phenomena and the physical understanding of the plasma environment from the sun to the earth's ionosphere and in the heliosphere. Regions in space to be discussed include the solar surface, solar wind, bow shock, magnetosheath, magnetosphere, magnetotail, radiation belts, ring currents, and the ionosphere. Among space plasma physics theories, single particle theory, kinetic theory, and magnetohydrodynamics, which describe charged particle motion in electromagnetic fields and its consequences, are introduced and applied to the space environment.

Max Credits: 3

Min Credits: 3

95.557 Electromagnetic Theory I

Course ID: 8594

Course Details:

Max Credits: 4

Min Credits: 4

95.561 Nuclear Physics I

Course ID: 1214

Course Details: Nuclear properties including size, mass, binding energy, electromagnetic moments, parity and statistics; nuclear shell model, collective structure, deformed shell model, radioactive decay law and the Bateman equations, radioactive dating, counting statistics, energy resolution, coincidence measurements and time resolution, lifetime measurements; nuclear barrier penetration; angular momentum, Coulomb barrier, alpha decay and systematics, fission. (offered as 95.561 for graduate credit).

Max Credits: 3

Min Credits: 3

95.572 Solid State Physics

Course ID: 1213

Course Details: Crystal structures, x-ray diffraction, crystal binding, lattice vibrations, free electron and band models of metals. (offered as 95.572 for graduate credit).

Max Credits: 3

Min Credits: 3

95.577 Solid State Electronic and Optoelectronic Devices

Course ID: 1212

Course Details: This course is an introduction to solid state electronic and optoelectronic devices for undergraduate science students (i.e. biology, chemistry, mechanical engineering, electrical engineering, physics, etc.) graduate students just entering a scientific endeavor which utilizes solid state devices, and practical engineers and scientists whose understanding of modern electronics and optoelectronics needs updating. The course is organized to bring students with a background in sophomore physics to a level of understanding which will allow them to read much of the current literature on new devices and applications. The course will cover fundamental crystal properties, atoms and electrons, energy bands and charge carriers, excess carriers, junctions and p-n junction diodes (includes photodiodes and light-emitting diodes). Three or four practical demonstrations will also be performed with the analysis of the generated data assigned as homework. (offered as 95.577 for graduate credit)

Max Credits: 3

Min Credits: 3

95.578 Intergrated Optics: Wave Guides and Lasers

Course ID: 1211

Course Details: This course is a continuation of 95.477 and serves as an introduction to solid state electronic and optoelectronic devices. The course will cover bipolar junction transistors, field effect transistors, integrated circuits, lasers, switching devices, and negative conductance microwave devices. Three or four practical demonstrations will also be performed with the analysis of the generated data assigned as homework. (offered as 95.548 for graduate credit)

Max Credits: 3

Min Credits: 3

95.583 Astronomy and Astrophysics I

Course ID: 8599

Course Details: Physics based introduction to modern Astronomy and Astrophysics. Aimed at students who have already studied E&M, Modern Physics, and Calculus. Focus on fundamentals of Stellar Astrophysics and Galactic Astronomy.

Max Credits: 3

Min Credits: 3

95.587 Cloud Physics

Course ID: 38461

Course Details: This course explores the essentials of cloud physics, beginning with the basic laws of thermodynamics of both dry and moist atmospheres. Condensation, nucleation, and drop growth are studied in detail at an advanced level.

Max Credits: 3

Min Credits: 3

95.605 Mathematical Methods of Physics I

Course ID: 8606

Course Details: Vector analysis; matrices and determinants; theory of analytical functions; differential equations, Fourier series, Laplace transforms, distributions, Fourier transforms.

Max Credits: 3

Min Credits: 3

95.606 Mathematical Methods of Physics II

Course ID: 8607

Course Details: Partial differential equations, boundary value problems, and special functions; linear vector spaces; Green's functions; selected additional topics; numerical analysis.

Max Credits: 3

Min Credits: 3

95.611 Classical Mechanics

Course ID: 8611

Course Details: Knowledge of Lagrangian mechanics assumed. Central force problem, scattering, rigid-body mechanics, normal modes and special relativity. Hamiltonian dynamics, canonical transformations, Hamilton-Jacobi theory and action-angle variables. Continuous systems and fields. Symplectic formulation, stochastic processes, and chaos theory.

Max Credits: 3

Min Credits: 3

95.615 Quantum Mechanics I

Course ID: 8613

Course Details: The representation of quantum states as abstract vectors. Superposition of states. Quantum operators and their matrix representations. Angular momentum operator as the generator of rotations. Eigenvalues and eigenstates of angular momentum. The uncertainty principle. Spin one-half and spin one as examples. Addition of angular momentum. The Hamiltonian operator and the Schrodinger equation. One dimensional examples. The momentum operator, eigenstates of position. Operator solution of the harmonic oscillator. (3,0) Quantum Mechanics I The representation of quantum states as abstract vectors. Superposition of states. Quantum operators and their matrix representations. Angular momentum operator as the generator of rotations. Eigenvalues and eigenstates of angular momentum. The uncertainty principle. Spin one-half and spin one as examples. Addition of angular momentum. The Hamiltonian operator and the Schrodinger equation. One dimensional examples. The momentum operator, eigenstates of position. Operator solution of the harmonic oscillator.

Max Credits: 3

Min Credits: 3

95.616 Quantum Mechanics II

Course ID: 8614

Course Details: Quantum mechanics in three dimensions. translational and rotational invariance and conservation of linear and angular momentum, center-of-mass coordinates. Position-space representation of the angular momentum operator, orbital angular momentum eigenfunctions. Bound states of central potentials, including the Coulomb potential and the hydrogen atom. Approximation methods: time-independent perturbations, applications to the Stark effect, the Zeeman effect, spin-orbit coupling in hydrogen. The variational method. Time dependent perturbations. Indistinguishable particles: multielectron atoms, covalent bonding. Scattering. Electromagnetic interactions: emission and absorption of radiation.

Max Credits: 3

Min Credits: 3

95.617 Advanced Quantum Mechanics I

Course ID: 8615

Course Details: Dirac equation as a single particle wave equation, free particle spinors and plane waves, matrices and relativistic covariance, nonrelativistic approximation and the fine-structure of the H atom. Quantization of the e.m. field in the coulomb gauge; interaction of an atom with the quantized radiation field; radiative transitions in atoms; Thomson scattering; classical and quantized Lagrangian field theory; symmetries and conservation laws; quantization of the real and complex Klein-Gordon field; Dirac Field and the covariant quantization of the e.m. field; Feynman propagators; the interaction picture and the S-matrix expansion in perturbation theory and the Wick's Rule. Feynman diagrams and rules for calculating S-matrix elements in QED; formulas for cross-section and spin and photon polarization sums; calculation of cross-sections for (1) $e^+e^- \rightarrow e^+e^-$ (2) $e^+e^- \rightarrow e^+e^-$ (3) Compton scattering and (4) scattering of electrons by an external e.m. field.

Max Credits: 3

Min Credits: 3

95.631 Nonlinear Optics

Course ID: 8617

Course Details: Wave propagation in a linear anisotropic medium; Wave propagation in a nonlinear optical medium. Classical model for the origin of nonlinear optical effects; Second order nonlinear optical effects - second harmonic generation, sum and difference frequency generation, linear electro-optical effect; Third order nonlinear optical effects, Kerr effect and intensity dependent nonlinear index of refraction, stimulated Raman and Brillouin scattering; Photorefraction; Nonlinear optical devices.

Max Credits: 3

Min Credits: 3

95.657 Electromagnetic Theory I

Course ID: 8625

Course Details: Electrostatics and magnetostatics with special attention to boundary value problems. Quasistatic fields and displacement currents. Maxwell's equations, special relativity, wave-guides, scattering, radiation from accelerated charges, propagation in material media and plasmas, Kramers-Kronig relations.

Max Credits: 3

Min Credits: 3

95.658 Electromagnetic Theory II

Course ID: 8626

Course Details: Electrostatics and magnetostatics with special attention to boundary value problems. Quasistatic fields and displacement currents. Maxwell's equations, special relativity, waveguides, scattering, radiation from accelerated charges; propagation in material media and plasmas, Kramers-Kronig relations.

Max Credits: 3

Min Credits: 3

95.662 Nuclear Physics II

Course ID: 8629

Course Details: The nucleon-nucleon force; nuclear models; nuclear reaction theory and partial wave analysis of scattering; fast neutron physics.

Max Credits: 3

Min Credits: 3

95.665 Space Physics

Course ID: 37731

Course Details: This course provides in depth knowledge of space phenomena and physical understanding of the plasma environment from the sun to the earth's ionosphere and in the heliosphere. Regions in space include solar surface, solar wind, bow shock, magnetosheath, magnetosphere, magnetotail, radiation belts, ring currents, and upper ionosphere. Among space plasma physics theories, single particle theory and magnetohydrodynamics are discussed in depth.

Max Credits: 3

Min Credits: 3

95.701 Physics Colloquium

Course ID: 8632

Course Details: A series of invited lectures on current research topics in Physics.

Max Credits: 1

Min Credits: 0

95.702 Physics Colloquium

Course ID: 8633

Course Details: A series of invited lectures on current research topics in Physics.

Max Credits: 1

Min Credits: 0

95.704 Seminar in Nuclear Physics

Course ID: 8635

Course Details: involve presentations by students, faculty members, and visiting scientists of advanced topics, original research or journal articles.

Max Credits: 1

Min Credits: 0

95.705 Seminar in Solid State/Optics

Course ID: 8636

Course Details: involve presentations by students, faculty members, and visiting scientists of advanced topics, original research or journal articles.

Max Credits: 1

Min Credits: 0

95.706 Seminar in Solid State/Optics

Course ID: 8637

Course Details: involve presentations by students, faculty members, and visiting scientists of advanced topics, original research or journal articles.

Max Credits: 1

Min Credits: 0

95.709 Seminar in Accelerator Physics

Course ID: 8640

Course Details: A weekly series of presentations and discussions by students and faculty concerning research in progress and planned research at the 5.5 MV Van de Graaff Accelerator. Enrollment in the course is limited to students whose research projects involve the Van de Graaff accelerator.

Max Credits: 1

Min Credits: 0

95.710 Seminar in Experimental Optics

Course ID: 8641

Course Details: A weekly series of presentations and discussions concerning experimental optics research in the University of Massachusetts Lowell Department of Physics and Applied Physics.

Max Credits: 1

Min Credits: 0

95.711 Graduate Seminar in Physics

Course ID: 8642

Course Details: Presentations by students of progress in their research projects.

Max Credits: 1

Min Credits: 0

95.712 Graduate Seminar in Physics

Course ID: 8643

Course Details: Presentations by students of progress in their research projects.

Max Credits: 1

Min Credits: 0

95.713 Seminar in Theoretical Research

Course ID: 8644

Course Details:

Max Credits: 1

Min Credits: 0

95.714 Seminar in Experimental Research

Course ID: 8645

Course Details:

Max Credits: 1

Min Credits: 0

95.715 Seminar in Terahertz Technology

Course ID: 33227

Course Details: Course involves presentations by students, faculty members, and visiting scientists of advanced topics, original research for journal articles relevant to technologies at terahertz frequencies.

Max Credits: 1

Min Credits: 0

95.716 Seminar in Biomedical Optics

Course ID: 36767

Course Details: Seminar in Biomedical Optics, offered at the Advanced Biophotonics Laboratory by Dr. Anna N. Yaroslavsky, covers topics related to recent advances in biomedical optics. Examples include, but are not limited to, the development of individualized, image-based methods of light dosimetry and planning for cancer treatments, concepts and implementation of full inverse Monte Carlo technique for reconstruction of tissue optical properties, investigation of light scattering by complex biological structures and live tissues, development of steady-state and time-resolved polarization, fluorescence and elastic scattering methods for diagnostics and treatment of pathology.

Max Credits: 1

Min Credits: 0

95.717 Seminar in Heavy Ion Physics

Course ID: 33691

Course Details: Involves presentations by students, faculty members, and research scientists on advanced topics in heavy-ion spectroscopy, including both original research and journal articles.

Max Credits: 1

Min Credits: 0

95.718 Seminar in Space Physics

Course ID: 37671

Course Details: This course is a weekly seminar covering the areas of conventional "space physics" and extending to "astrophysics" and "Upper atmospheric physics". Each seminar is focused on a topic that is currently at the cutting edge in these fields while an extended introduction will be given based on diverse background knowledge at graduate level in physics and engineering.

Max Credits: 1

Min Credits: 0

95.719 Seminar in Nanoscale Physics and Technology

Course ID: 8647

Course Details: Students will study the scientific literature on topics and concepts in nanoscale physics and technology, including nanoscale thermal properties, micro- and nano-fluidity, nano-optics, quantum confinement to electronic states, and other phenomena. Students will make presentations and lead discussions on these studies at the frontiers of the field. The presentations will help them to generate new ideas for their own graduate research. Every student will have the opportunity to lead more than one discussion session.

Max Credits: 1

Min Credits: 0

95.721 Selected Topics in Physics

Course ID: 8648

Course Details: Selected topics courses cover recent advances and more advanced topics, not covered in the regular courses in these areas. Subject matter varies, depending on the interests of the instructor and the needs of the students. Subject matter varies sufficiently that these courses may be taken more than once for credit without repeating topics.

Max Credits: 3

Min Credits: 3

95.723 Selected Topics in Nuclear Physics

Course ID: 8650

Course Details: Selected topics courses cover recent advances and more advanced topics, not covered in the regular courses in these areas. Subject matter varies, depending on the interests of the instructor and the needs of the students. Subject matter varies sufficiently that these courses may be taken more than once for credit without repeating topics.

Max Credits: 3

Min Credits: 3

95.725 Selected Topics in Solid State

Course ID: 8652

Course Details: Selected topics courses cover recent advances and more advanced topics, not covered in the regular courses in these areas. Subject matter varies, depending on the interests of the instructor and the needs of the students. Subject matter varies sufficiently that these courses may be taken more than once for credit without repeating topics.

Max Credits: 3

Min Credits: 3

95.727 Selected Topics in Theoretical Physics

Course ID: 8654

Course Details: Selected topics courses cover recent advances and more advanced topics, not covered in the regular courses in these areas. Subject matter varies, depending on the interests of the instructor and the needs of the students. Subject matter varies sufficiently that these courses may be taken more than once for credit without repeating topics.

Max Credits: 3

Min Credits: 3

95.771 Physics Systems Analysis I

Course ID: 8663

Course Details:

Max Credits: 3

Min Credits: 3

95.772 Physics Systems Analysis II

Course ID: 8664

Course Details:

Max Credits: 3

Min Credits: 3

95.773 Physics Systems Analysis III

Course ID: 8665

Course Details:

Max Credits: 3

Min Credits: 3

96.545 Characterization of Materials

Course ID: 35486

Course Details: A one-semester course designed to teach the student several of the important techniques for characterizing the structural, optical, and electronic properties of materials. Experiments will include x-ray diffractometry, hardness measurements, ellipsometry, visible and near infrared spectroscopy, far infrared spectroscopy, and raman spectroscopy.

Max Credits: 2

Min Credits: 2

96.567 Automation Techniques

Course ID: 8724

Course Details:

Max Credits: 3

Min Credits: 3

96.593 Graduate Physics Laboratory

Course ID: 8726

Course Details: Experiments in various branches of physics including optics, atomic physics, solid state physics and nuclear physics.

Max Credits: 2

Min Credits: 2

96.705 Supervised Teaching - Physics

Course ID: 8728

Course Details:

Max Credits: 0

Min Credits: 0

96.716 Special Problems In Physics

Course ID: 8732

Course Details: Reading in preparation for research, or research not for thesis. If results of the research are to be subsequently incorporated into a thesis, credits earned in this course may be used to satisfy thesis credit requirements in M.S. or Ph.D. Thesis Research with the written permission of the thesis supervisor, provided such permission is granted at the time of registration for this course. If the results are incorporated in an M.S. project, not more than 3 credits are allowed.

Max Credits: 9

Min Credits: 1

96.731 Advanced Projects In Physics I

Course ID: 8734

Course Details: Research project leading to the Graduate Research Admission Examination (for Ph.D. candidates only.)

Max Credits: 3

Min Credits: 3

96.732 Advanced Projects In Physics II

Course ID: 8735

Course Details: Research project leading to the Graduate Research Admission Examination (for Ph.D. candidates only.)

Max Credits: 3

Min Credits: 3

96.733 Graduate Project - Physics

Course ID: 8736

Course Details:

Max Credits: 3

Min Credits: 3

96.746 Master's Thesis Research Physics

Course ID: 8742

Course Details:

Max Credits: 9

Min Credits: 1

96.756 Doctoral Dissertation/Physics

Course ID: 8747

Course Details: Note: Courses with 98 prefix are described in the Radiological Sciences and Protection section of this catalog.

Max Credits: 9

Min Credits: 1

96.800 Cooperative Education in Physics

Course ID: 35615

Course Details: Cooperative Education in Physics

Max Credits: 1

Min Credits: 0

97.503 Polymer Science I

Course ID: 8752

Course Details: A study of the principles of condensation, free radical, ionic, coordination and ring opening polymerization. The topics include the effect of polymerization techniques on reaction kinetics and molecular weight, and the evaluation of reactivity ratios in copolymerization reactions.

Max Credits: 3

Min Credits: 3

97.504 Polymer Science II

Course ID: 8753

Course Details: Introduction to chain statistics and thermodynamics of macromolecular solutions, methods of study of molecular weight and chain conformation, and the properties of polymers in bulk including viscoelasticity and crystallinity.

Max Credits: 3

Min Credits: 3

97.511 Biopolymers

Course ID: 8756

Course Details: Topics include conformation and configuration of vinyl polymers and polypeptides, energetics of chain folding and examination of the forces dictating ordered structures, helix to coil transitions in biopolymers with emphasis on polypeptide structures, instrumental analysis of biopolymer conformation, synthesis of biopolymers including polypeptides, polysaccharides and polynucleotides, and examination of relationships between synthetic polymers and naturally occurring polymers.

Max Credits: 3

Min Credits: 3

97.553 Macromolecules Organic Chemistry

Course ID: 8759

Course Details: An advanced study in polymer science concerned with the synthesis of macromolecules and their mechanisms of formation.

Max Credits: 3

Min Credits: 3

97.601 Polymer Science Seminar

Course ID: 8760

Course Details: Required of all Polymer Science graduate students. Presentation of current topics in polymer science by graduate students.

Max Credits: 2

Min Credits: 2

97.602 Seminar in Polymer Science

Course ID: 8761

Course Details: Required of all Polymer Science graduate students. Presentation of current topics in polymer science by graduate students.

Max Credits: 2

Min Credits: 2

97.603 Polymer Science Colloquium

Course ID: 8762

Course Details: Required of all Polymer Science graduate students. Presentation of current topics in polymer science by visiting scientists and staff.

Max Credits: 1

Min Credits: 1

97.604 Polymer Science Colloquium

Course ID: 8763

Course Details: Required of all Polymer Science graduate students. Presentation of current topics in polymer science by visiting scientists and staff.

Max Credits: 1

Min Credits: 1

97.649 Introduction to Conjugated Polymers

Course ID: 8764

Course Details: This course is an introduction to the fundamental science and potential applications of conjugated polymers in optical and electronic technologies. The topics covered include history, synthesis and molecular structure, including solid state polymerization; crystallinity and morphology, including assembly methods; electronic structure including energy bands, conjugation defects and photoelectron spectroscopy; properties of the insulating forms including light absorption and emission, thermochromism, carrier transport, electroluminescence and nonlinear optical properties; properties of the conducting forms, including "doping"; some specific devices.

Max Credits: 3

Min Credits: 3

97.705 Supervised Teaching in Polymer Science

Course ID: 8767

Course Details:

Max Credits: 0

Min Credits: 0

97.743 Master's Thesis in Polymer Science

Course ID: 8771

Course Details:

Max Credits: 3

Min Credits: 3

97.746 Master's Thesis in Polymer Science

Course ID: 8772

Course Details:

Max Credits: 6

Min Credits: 6

97.749 Master's Thesis in Polymer Science

Course ID: 8773

Course Details:

Max Credits: 9

Min Credits: 9

97.751 Thesis Review

Course ID: 35642

Course Details: This is a one credit thesis review course.

Max Credits: 1

Min Credits: 1

97.753 Doctoral Dissertation in Polymer Science

Course ID: 8774

Course Details:

Max Credits: 3

Min Credits: 3

97.756 Doctoral Dissertation in Polymer Science

Course ID: 8775

Course Details:

Max Credits: 6

Min Credits: 6

97.759 Doctoral Dissertation in Polymer Science

Course ID: 8776

Course Details:

Max Credits: 9

Min Credits: 1

97.769 Continued Graduate Research

Course ID: 8779

Course Details:

Max Credits: 9

Min Credits: 9

98.500 Introduction to Radiological Sciences

Course ID: 36770

Course Details: This course is designed to introduce students to the working practices encountered in the health physics and medical physics profession. This is accomplished through field trips to local facilities that use radioactive materials, use and calibrations of radiological instrumentation, laboratory exercises, and class discussions. This class exposes the student to basic health and medical physics procedures, vocabulary, and equipment.

Max Credits: 3

Min Credits: 3

98.501 Radiation Safety and Control I

Course ID: 1209

Course Details: This course provides a theoretical basis for radiological sciences and protection, with a rigorous review of the fundamentals of radiation physics including nuclear reactions, radioactivity and the kinetics of radioactive decay, natural and man-made radiation sources, the characteristics of ionizing radiation, radioactivity analysis, radiation dose quantities and measurement, external and internal radiation dosimetry, and radiation protection techniques.

Max Credits: 4

Min Credits: 3

98.502 Radiation Safety and Control II

Course ID: 8802

Course Details: This course provides a continuation of the theoretical and practical aspects of radiation protection provided in Radiation Safety and Control I (98.501). Topics include the statistical analyses and data reduction techniques that are used to analyze radiation measurements pertaining to the field of radiation protection. Laboratory sessions on alpha and gamma radiation measurements and air

sampling will reinforce class lectures. Students also will experience applied radiation protection and dose assessment through a contamination control exercise that involves the use of protective clothing and respiratory protection.

Max Credits: 4

Min Credits: 3

98.506 Nuclear Instrumentation

Course ID: 8806

Course Details: This course provides the operating principles and applications of nuclear radiation detection systems, including detector theory, electronic signal processing, and measurement and data reduction techniques. The systems covered include gas-filled detectors (ion chambers, proportional counters, and Geiger-Mueller counters), inorganic and organic scintillators, and high-purity germanium detectors, for the detection of alpha, beta, gamma, and neutron radiation. This course also covers hypothesis testing, detection limits, and detector dead time.

Max Credits: 4

Min Credits: 4

98.509 Nuclear Instrumentation

Course ID: 37351

Course Details: This course provides the operating principles and applications of nuclear radiation detection systems, including detector theory, electronic signal processing, and measurement and data reduction techniques. The systems covered include gas-filled detectors (ion chambers, proportional counters, and Geiger_Mueller counters), inorganic and organic scintillators, and high-purity germanium detectors, for the detection of alpha, beta, gamma, and neutron radiation. This course also covers hypothesis testing, detection limits, and detector dead time. This course is adapted for Nuclear Engineering and Medical Physics majors. (offered as 98.509 for graduate credit).

Max Credits: 3

Min Credits: 3

98.522 Environmental Radiation and Nuclear Site Criteria

Course ID: 8815

Course Details: This course provides an overview of the sources, distribution, environmental transport, dose projections, and environmental impact of radiations associated with the nuclear fuel cycle.

Max Credits: 3

Min Credits: 3

98.523 Air Resource Management

Course ID: 8816

Course Details:

Max Credits: 3

Min Credits: 3

98.524 Environmental Health Physics

Course ID: 37592

Course Details: Natural and man-made sources of environmental radioactivity and radiation; environmental transport in air, water, and soil; exposure pathways; environmental standards and regulations; environmental monitoring and surveys (MARSSIM); contaminated site characterization, and site remediation; environmental radiological impact of industry, accidents, and natural and man-made disasters.

Max Credits: 3

Min Credits: 3

98.533 External Dosimetry and Shieldng

Course ID: 8822

Course Details: This course provides the theory and application of dosimetry and shielding for ionizing radiation sources outside the human body. Differential cross-sections, energy transfer and absorption coefficients, kerma, attenuation, and buildup are discussed for photons. Cross-sections, kerma factors, removal coefficients, diffusion, and point-source dose functions for fissioning sources are discussed for neutrons. Beta dosimetry concepts include stopping power, point-source dose functions, and the effects of attenuating materials. Heat generation and temperature profiles are discussed for irradiated materials and radioactive substances. Dosimetry concepts and barrier requirements also are described for particle accelerators, radiotherapy facilities, and medical x-ray imaging facilities.

Max Credits: 3

Min Credits: 3

98.534 Internal Dosimetry and Bioassay

Course ID: 8823

Course Details:

Max Credits: 3

Min Credits: 3

98.541 Radiochemistry

Course ID: 8824

Course Details: This course provides the theory and application of several analytical techniques, including precipitation, solvent extraction, ion exchange chromatography, and electrodeposition, to the separation and analysis of radioactive substances in various samples. This course also covers some common radiation detection systems, measurement and data reduction techniques, radiotracer and isotope dilution techniques, neutron activation analysis, and radio-immunoassay.

Max Credits: 3

Min Credits: 3

98.562 Radiation Biology

Course ID: 8833

Course Details: Effects of ionizing radiation on cellular, molecular and organ systems levels of biological organization; Study of x-rays, gamma rays, accelerator beams, and neutrons in interaction with living systems; Cohesive treatment of radiation biophysics with applications in health physics and radiation oncology. (offered as 98.562 for graduate credit)

Max Credits: 3

Min Credits: 3

98.565 Introduction to Radiation Therapy Physics

Course ID: 33398

Course Details: Introduction to the fundamental physics of radiation therapy, with emphasis on external beam photon and electron therapy and on brachytherapy. For these modalities, the basic operation of delivery equipment, treatment planning principles, methods of dose calculations, determination of time of irradiation from dose prescription, dose measurements, and quality assurance will be studied. This knowledge will prepare the student for an introduction to the practice of clinical physics in radiation therapy, for advanced radiation therapy physics, and research in radiation therapy physics.

Max Credits: 3

Min Credits: 3

98.575 Certification Preparation in Radiological Sciences

Course ID: 33038

Course Details: Advanced problem solving in radiological sciences including strategies for preparing for and taking professional

certification examinations.

Max Credits: 3

Min Credits: 3

98.581 Mathematical Methods of Radiological Sciences

Course ID: 1207

Course Details: This course provides an overview of applied mathematical concepts that are useful in radiological sciences and protection, including special techniques for radiation physics, radiation dosimetry, and radiation shielding, with emphasis on computer applications.

Max Credits: 3

Min Credits: 3

98.582 Numerical Methods In Radiological Sciences

Course ID: 8836

Course Details: This course provides a more advanced mathematical treatment of the topics covered in 98.481, with extensive application of computer techniques to numerical problem solving that is applicable to radiological sciences and protection.

Max Credits: 3

Min Credits: 3

98.598 Introduction to Medical Imaging

Course ID: 36752

Course Details: Key topics of modern medical imaging: principles of medical imaging, image formation, Fourier analysis, image reconstruction, digital image processing with applications in computed tomography, radioisotope imaging, magnetic resonance imaging, positron emission tomography, ultrasound imaging, and optical imaging. Strengths and limitations of imaging modalities.

Max Credits: 3

Min Credits: 3

98.599 Advanced Medical Imaging

Course ID: 37216

Course Details: Advanced Medical Imaging course presents the key topics of modern medical imaging in a systematic program structured as follows: principles of medical imaging, computer tomography, radioactive traces imaging, magnetic resonance imaging, ultrasound imaging, and optical imaging. The purpose of this course is to outline the breadth and depth of scientific knowledge underlying Medical Imaging. It describes the core physics related to medical imaging that a physicist should know when graduating from an accredited Medical Physics program. The course will aid him/her in understanding the strengths and limitations of the available medical imaging tools.

Max Credits: 3

Min Credits: 3

98.605 Radiation Interactions and Transport

Course ID: 8841

Course Details: Photon, neutron, and electron interactions and energy deposition; the Boltzmann equation, elementary analytical solutions; deterministic computational methods, including spherical harmonics and discrete ordinates techniques; continuous slowing down and Fokker Planck approximations.

Max Credits: 3

Min Credits: 3

98.606 Monte Carlo Simulation of Radiation Transport

Course ID: 36753

Course Details: Radiation transport simulation by the Monte Carlo method: phase space tracking, dose response estimators, biasing methods; integral form of the Boltzmann equation; condensed history method for charged particles; neutron, photon, and electron transport calculations for medical physics and health physics applications.

Max Credits: 3

Min Credits: 3

98.616 Data Redn for RSP

Course ID: 8847

Course Details:

Max Credits: 3

Min Credits: 3

98.631 Professional Health Physics Internship

Course ID: 36584

Course Details:

Max Credits: 1

Min Credits: 1

98.665 Advanced Radiation Therapy Physics

Course ID: 37215

Course Details: The student will be introduced to the physics of advanced treatment techniques used in radiation therapy, which include external beam electron, proton, and photon therapy and internal brachytherapy. For these techniques, the principles of the techniques such as clinical applications, radiation delivery equipment, treatment planning methods, methods of dose calculations, determination of time of irradiation from dose prescription, dose measurements, and quality assurance will be studied. This knowledge will prepare the student for an introduction to the clinical practice of medical physics applied to complex treatment techniques used in radiation therapy. Also, this should help prepare the student for research in radiation therapy physics.

Max Credits: 3

Min Credits: 3

98.671 Graduate Accelerator HP Internship

Course ID: 8857

Course Details:

Max Credits: 3

Min Credits: 3

98.672 Graduate Reactor HP Internship

Course ID: 8858

Course Details:

Max Credits: 3

Min Credits: 1

98.673 Graduate Reactor HP Internship

Course ID: 8859

Course Details:

Max Credits: 3

Min Credits: 3

98.675 Graduate Medical HP Internship

Course ID: 8861

Course Details:

Max Credits: 3

Min Credits: 3

98.676 Graduate Medical Physics Internship

Course ID: 8862

Course Details: Clinical Rotation under the direction of clinical staff. This course provides the student with exposure to medical physics responsibilities in a radiation oncology department, including simulation, treatment planning and preparation, monitor unit calculations, dose measurements and calculations, treatment delivery techniques, quality assurance, and radiation safety.

Max Credits: 3

Min Credits: 1

98.677 Graduate Medical Physics Internship

Course ID: 8863

Course Details:

Max Credits: 3

Min Credits: 3

98.678 Graduate HP Internship

Course ID: 8864

Course Details:

Max Credits: 3

Min Credits: 1

98.679 Graduate HP Internship

Course ID: 8865

Course Details:

Max Credits: 3

Min Credits: 1

98.683 Graduate HP Internship

Course ID: 8869

Course Details:

Max Credits: 3

Min Credits: 3

98.685 Advanced Medical HP Internship

Course ID: 8871

Course Details:

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Max Credits: 3

Min Credits: 3

98.686 Advanced Medical Physics Internship

Course ID: 8872

Course Details: Clinical Rotation under the direction of clinical staff. This course involves the student in one or more projects that require skill development, extended involvement, and project completion, which includes planning and delivery of advanced radiation therapy treatments.

Max Credits: 3

Min Credits: 3

98.687 Advanced Medical Physics Internship

Course ID: 8873

Course Details:

Max Credits: 3

Min Credits: 3

98.689 Advanced Graduate HP Internship

Course ID: 8875

Course Details:

Max Credits: 1

Min Credits: 1

98.690 Advanced Graduate HP Internship

Course ID: 8876

Course Details:

Max Credits: 2

Min Credits: 2

98.691 Advanced Graduate HP Internship

Course ID: 8877

Course Details:

Max Credits: 2

Min Credits: 2

98.692 Advanced Graduate HP Internship

Course ID: 8878

Course Details:

Max Credits: 3

Min Credits: 3

98.693 Advanced Graduate HP Internship

Course ID: 8879

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Course Details:

Max Credits: 3

Min Credits: 3

98.698 Advanced Medical Imaging

Course ID: 37216

Course Details: Advanced Medical Imaging course presents the key topics of modern medical imaging in a systematic program structured as follows: principles of medical imaging, computer tomography, radioactive traces imaging, magnetic resonance imaging, ultrasound imaging, and optical imaging. The purpose of this course is to outline the breadth and depth of scientific knowledge underlying Medical Imaging. It describes the core physics related to medical imaging that a physicist should know when graduating from an accredited Medical Physics program. The course will aid him/her in understanding the strengths and limitations of the available medical imaging tools.

Max Credits: 3

Min Credits: 3

98.705 Supervised Teaching in Radiological Sciences

Course ID: 8886

Course Details:

Max Credits: 0

Min Credits: 0

98.711 Graduate Seminar in Radiological Sciences

Course ID: 8887

Course Details:

Max Credits: 1

Min Credits: 0

98.712 Graduate Seminar in Radiological Sciences

Course ID: 8888

Course Details:

Max Credits: 1

Min Credits: 0

98.731 Advanced Project in Radiological Sciences I

Course ID: 8889

Course Details:

Max Credits: 6

Min Credits: 3

98.732 Advanced Project in Radiological Sciences II

Course ID: 8890

Course Details:

Max Credits: 3

Min Credits: 3

98.733 Graduate Project in Radiological Sciences and Protection

Course ID: 8891

Course Details:

Max Credits: 6

Min Credits: 3

98.743 Master's Thesis in Radiological Sciences and Protection

Course ID: 8895

Course Details:

Max Credits: 3

Min Credits: 3

98.746 Master's Thesis in Radiological Sciences and Protection

Course ID: 8896

Course Details:

Max Credits: 9

Min Credits: 1

98.749 Master's Thesis Research in Radiological Sciences

Course ID: 8897

Course Details:

Max Credits: 9

Min Credits: 9

98.753 Doctoral Dissertation in Radiological Sciences and Protection

Course ID: 8900

Course Details:

Max Credits: 3

Min Credits: 3

98.756 Doctoral Dissertation in Radiological Sciences and Protection

Course ID: 8901

Course Details:

Max Credits: 9

Min Credits: 1

98.759 Doctoral Dissertation in Radiological Sciences and Protection

Course ID: 8902

Course Details:

Max Credits: 9

Min Credits: 9

98.769 Continued Graduate Research

Course ID: 8905

Course Details:

Max Credits: 9

Min Credits: 9

99.501 Biomedical Engineering and Biotechnology Seminar

Course ID: 8917

Course Details:

Max Credits: 1

Min Credits: 1

CRIM.501 Criminological Theory: Foundations

Course ID: 5431

Course Details: This course provides a detailed examination of the best known and most influential theories of crime causation. Topics include: theory construction, hypothesis testing, theory integration, and the links among theory, research, and policy.

Max Credits: 3

Min Credits: 3

CRIM.520 Administration of Criminal Justice

Course ID: 5428

Course Details: An examination of the components of the criminal justice system and a review of the administration of federal, state and local criminal justice agencies, including a focus on criminal law and procedure.

Max Credits: 3

Min Credits: 3

CRIM.521 Managing Criminal Justice Organizations

Course ID: 5452

Course Details: A range of criminal justice management issues are addressed, including organizational structure, purpose, rewards and relationships, leadership and management styles, and the development of effective change strategies by criminal justice agencies. The complex role of the criminal justice manager in both the adult and juvenile justice system is emphasized.

Max Credits: 3

Min Credits: 3

CRIM.522 Issues in Policing

Course ID: 5439

Course Details: An introduction to research on the police, both basic research and applied, evaluative research. Since police discretion was discovered in the 1950s, basic research has focused on factors that explain the discretionary use (and abuse) of police authority, and particularly on factors that would signify bias in police decision-making, and also on the mechanisms by which police may be held accountable to the public. Evaluative research, beginning with the Kansas City Preventive Patrol Experiment in the 1970s, has been concerned with estimating the effects of programmatic and tactical innovations on social conditions such as crime, fear of crime, satisfaction with police services and quality of life.

Max Credits: 3

Min Credits: 3

CRIM.523 Courts and sentencing

Course ID: 37081

Course Details: Examines the various philosophies and theories of punishment and the distinct court structures and approaches to sentencing. Students will explore recent changes in sentencing policies and will study the social and economic costs of incarceration. We will examine sentencing disparities and their appropriateness based on offender and victim characteristics such as race and gender. Explores the debates regarding contemporary sentencing practices and investigates the increasing use of specialized courts and their effectiveness.

Max Credits: 3

Min Credits: 3

CRIM.525 Juvenile Justice and Youth Crime

Course ID: 37082

Course Details: Examines the historical development of juvenile justice in the U.S., how the juvenile justice system operates, the rationale for treating juveniles differently from adults, and the extent of youth crime in the United States according to official statistics and self-report data.

Max Credits: 3

Min Credits: 3

CRIM.526 Economic Crime

Course ID: 35786

Course Details: Introduction to economic crime including nature, causes, consequence, investigation, and prevention. Empirical findings and major economic crime cases will also be examined.

Max Credits: 3

Min Credits: 3

CRIM.540 Criminal Profiling

Course ID: 5440

Course Details: An overview of the development and characteristics of violent offenders, some of whom will evolve to become criminal psychopaths. The class provides an analytical understanding of the unique characteristics of serial criminals and the methodologies used to commit their crimes.

Max Credits: 3

Min Credits: 3

CRIM.541 Forensic Psychology

Course ID: 5441

Course Details: This course applies psychological theories, principles, and research to issues of concern to the criminal justice system with a special focus on the intersection of the mental health and criminal justice systems.

Max Credits: 3

Min Credits: 3

CRIM.570 Crisis and Emergency Management

Course ID: 34637

Course Details: This course will provide a broad introduction to the critical challenges of disaster management. The course will address past and present strategies for reducing and responding to hazards posed by both manmade and natural disasters. Emphasis will be placed on what we can learn from the history of disasters, and on how we can apply those lessons to the management of future events.

Max Credits: 3

Min Credits: 3

CRIM.571 Domestic Terrorism and Hate Crimes

Course ID: 5434

Course Details: This course examines bigotry and hate and how they are manifested in criminal behavior. Various groups who have been labeled as supporting or engaging in domestic terrorism are studied. Focus is placed on federal and state statutory laws and the dynamics of police, court, and corrections based responses to hate crimes and domestic terrorism.

Max Credits: 3

Min Credits: 3

CRIM.572 Terrorism/Counter-Terrorism

Course ID: 5444

Course Details: In order to combat "terrorism" one must be aware of what it is and is not and this course will explore "terrorism" in its totality as it occurred in the past, is occurring in the present, and how it might occur in the future. Various dominant International Terrorist groups are examined relative to their ideology, organizational behavior, and method(s) of operation. There is a heavy emphasis on the impact terrorism has and will have on the criminal justice system relative to investigation.

Max Credits: 3

Min Credits: 3

CRIM.573 Threat Assessment and Risk Management

Course ID: 32166

Course Details: The goal of this course is to enhance understanding and increase expertise regarding risk management and the impact of terrorism on economic and other critical infrastructures in the United States. The course will provide the tools (operational and statistical) and technology required to mitigate these risks. A second purpose of the course is to examine and critically discuss current and future methods to create best practices in security management.

Max Credits: 3

Min Credits: 3

CRIM.574 Overview of Homeland Security

Course ID: 32167

Course Details: The U.S. has embraced the homeland security monolith without a full understanding of what it encompasses. This course provides a comprehensive overview of homeland security and defense as undertaken in the United States since 9/11. The course critically examines the current body of knowledge with a specific focus on understanding security threats, sources, and reasons for these threats. The roles of the key players at the federal, state and local levels, the policies and procedures enacted since 9/11, and the homeland security system in practice are also examined.

Max Credits: 3

Min Credits: 3

CRIM.575 Contemporary Security Studies

Course ID: 36405

Course Details: This course examines the complex nature of key domestic and international security threats and responses. Topics include terrorism and insurgency, transnational organized crime, WMD proliferation, cyber-security, intelligence, national and homeland security strategies, critical infrastructure protection, and theories of international security.

Max Credits: 3

Min Credits: 3

CRIM.576 Criminal Justice Intelligence and Information Sharing

Course ID: 32203

Course Details: A primary function of law enforcement is the gathering of information. However, information by itself does little to support the law enforcement mission. Intelligence, in the context of law enforcement, is the outcome of rigorous analysis of information, and often

generates key decisions and/or guides tactical strategies that help facilitate the enforcement mission. This course examines the role of information and intelligence in defining and achieving the law enforcement mission. Problem solving tools such as SARA, and management tools like COMPSTAT, which rely heavily on both information and intelligence, are discussed. In a world now confronted by the threat of terrorism, the course examines the sharing/lack of sharing of information and intelligence among local law enforcement and federal agencies and the impact of this contentious relationship.

Max Credits: 3

Min Credits: 3

CRIM.578 Intelligence Analysis Policy and Practice

Course ID: 37085

Course Details: Students will examine the tradecraft of intelligence collection and analysis from various perspectives. Topics will include strategies, tactics, legal and ethical implications, sources, means, methods, limitations, covert action, methods of analysis, and case studies of prominent intelligence successes and failures in the last half century.

Max Credits: 3

Min Credits: 3

CRIM.583 Master's Thesis - Criminal Justice

Course ID: 5488

Course Details:

Max Credits: 3

Min Credits: 3

CRIM.586 Master's Thesis - Criminal Justice

Course ID: 5489

Course Details:

Max Credits: 6

Min Credits: 6

CRIM.590 Descriptive & Inferential Statistics

Course ID: 5455

Course Details: This course is a rigorous introduction to statistical inference: probability theory, confidence intervals, and hypothesis tests. The course also covers regression analysis, which is developed in a non-technical way, with an emphasis on interpretation of regression results, using examples from recent research.

Max Credits: 3

Min Credits: 3

CRIM.591 Research Design

Course ID: 5456

Course Details: Research design is a graduate-level introduction to methodology as used in criminology/criminal justice. The course surveys the research design enterprise and covers a host of issues on the measurement and collection of data, and other procedures that influence whether a research study will lead the investigator to scientifically rigorous information. This course explains various strategies for devising social science studies, compares the relative benefits of various designs, and identifies the tools necessary to conduct studies that will yield data worthy of analysis and interpretation. This material will be valuable for students who will conduct research and administrators who must evaluate the research of others.

Max Credits: 3

Min Credits: 3

CRIM.601 Criminological Theory Advanced

Course ID: 37083

Course Details: The course examines contemporary criminological thought by assessing major theories that anchor the discipline of criminology. Also explores the causal structure of these theories, the level of analysis at which they reside, the assumptions that underlie them, their strengths and weaknesses, and their policy implications.

Max Credits: 3

Min Credits: 3

CRIM.602 Nature and Extent of Crime and Criminals

Course ID: 37084

Course Details: Exposes students to the major measurement methods for the incidence of crime and prevalence of criminals. Students will become versed in using data derived from any of the three primary sources of crime statistics: police-based measures (UCR, NIBRS), victim surveys (NCVS), and self-reports of criminal behavior (Monitoring the Future, National Youth Survey).

Max Credits: 3

Min Credits: 3

CRIM.603 Correlates of Crime and Justice

Course ID: 37751

Course Details: This course examines the nature of the relationships among attributes and indices at the individual, situational, and aggregate levels to various forms of crime and systems of justice. The implications of criminal laws, criminal justice practices, and programs are examined with a focus on inequalities based on gender and race.

Max Credits: 3

Min Credits: 3

CRIM.611 Law and Social Control

Course ID: 37086

Course Details: This course examines and analyzes the various means by which society attempts to control criminal conduct. Social control encompasses both formal and informal mechanisms and a variety of institutions and social processes to deter inappropriate conduct, if possible, and/or punish and reform such conduct. Social control has evolved considerably over time and various social control philosophies and techniques have been prevalent at one time but not in others. Because social control is a response to inappropriate conduct, the course will also provide a brief introduction to the concepts of deviance and crime and the differential social control needs and priorities posed by different kinds of inappropriate conduct.

Max Credits: 3

Min Credits: 3

CRIM.612 Drugs, Crime and Justice

Course ID: 37087

Course Details: This course surveys the historical development and contemporary context of the use of criminal sanctions to combat the use of illicit drugs. The relationship between drug use/abuse and crime is explored. The course also provides a policy analysis of the alternative means available to deal with the drugs-crime issue (legalization, decriminalization, interdiction, tougher criminalization).

Max Credits: 3

Min Credits: 3

CRIM.613 Law and Public Policy

Course ID: 5454

Course Details: The course is an introduction to crime and the efforts to control crime through public policy. We explore the foundations of the policy-making process at the federal, state, and local levels. The course also considers broad theoretical applications pertaining to public opinion, national culture, and comparative analyses among Western democracies and their differing approaches to crime. This course employs a variety of learning tools, from roundtable discussions to policy cases.

Max Credits: 3

Min Credits: 3

CRIM.622 Seminar in Policing

Course ID: 37088

Course Details: This seminar examines the contemporary research literature in policing with a focus on the key research issues. Through a critical examination of the literature, students gain an understanding of the significant topic areas that have been pursued and develop an agenda for further research.

Max Credits: 3

Min Credits: 3

CRIM.623 Seminar in Courts and Sentencing

Course ID: 37089

Course Details: This seminar examines the contemporary research literature in adjudication and sentencing with a focus on the key research issues. Through a critical examination of the literature, students gain an understanding of the significant topic areas that have been pursued and develop an agenda for further research.

Max Credits: 3

Min Credits: 3

CRIM.624 Seminar in Corrections

Course ID: 37090

Course Details: This seminar examines the contemporary research literature on institutional corrections with a focus on the key research issues. Through a critical examination of the literature, students gain an understanding of the significant topic areas that have been pursued and develop an agenda for further research.

Max Credits: 3

Min Credits: 3

CRIM.625 Seminar in Juvenile Justice and Youth Crime

Course ID: 37091

Course Details: This seminar examines the contemporary research literature concerning juvenile justice with a focus on the key research issues. Through a critical examination of the literature, students gain an understanding of the significant topical areas that have been pursued and develop an agenda for further research.

Max Credits: 3

Min Credits: 3

CRIM.626 Community Based Correction

Course ID: 5470

Course Details: This course presents a detailed examination of current theory, research, and policy development in the field of community corrections, both nationally and internationally. Topic areas include sentencing, probation, parole, fines, community service, and intermediate sanctions (intensive supervision, house arrest/electronic monitoring, boot camps). Issues include the punishment vs. control argument, community justice models, special offender populations (drug offenders, sex offenders, mentally ill offenders, AIDS), and the cost effectiveness of community corrections.

Max Credits: 3

Min Credits: 3

CRIM.627 Technology, Crime, and Social Control

Course ID: 37092

Course Details: This course examines the application of new technological advances in the criminal justice system. Topic areas include the new technology of crime commission, and the corresponding new technology of crime control strategies. Our focus will be on the

application of both "hard" technology (e.g. equipment, hardware, devices, etc) and "soft" technology (e.g. computer software programs, information systems, classification devices, and other problem-solving applications) in each of the following areas: crime prevention, police, courts, institutional corrections, community corrections and the private sector.

Max Credits: 3

Min Credits: 3

CRIM.628 Innovation and Leadership in Criminal justice

Course ID: 37093

Course Details: This course critically examines one of the core concepts of criminology and criminal justice: change--at the individual, group, and organizational levels. There is a "brief history" of change in police, court, and correctional organizations, focusing primarily on major reform initiatives and change strategies introduced by criminal justice managers over the past fifty years (e.g. in policing--problem-oriented and broken windows policing, in the courts--federal mandatory sentencing and parole abolition, specialized courts, and in corrections--the new techno-prison, privatization of institutional and community corrections, control-oriented community supervision). For each part of the criminal justice system, we examine the major types of change strategies employed by criminal justice managers to implement major reforms: empirical rational, normative re-educative, and power coercive strategies.

Max Credits: 3

Min Credits: 3

CRIM.630 Victimology

Course ID: 5432

Course Details: This course examines the study of crime victims and of the patterns, impact, and formal responses to criminal victimization. Particular attention is given to research issues such as measurement of victimization, fear of crime and related measures, and conducting research with victimized populations, as well as discussion of current issues in the field of Victimology. Substantive topics may include theories of victimization, the overlap between victims and offenders, social-psychological and other impacts of victimization on primary and secondary victims, media coverage of victimization, and evaluation of prevention and intervention programs for victims (criminal justice system based programs and others).

Max Credits: 3

Min Credits: 3

CRIM.631 Intimate Partner Violence

Course ID: 5463

Course Details: An examination of the nature and extent of intimate partner violence and an analysis of the causes and consequences of violence between partners as well as the latest research regarding the criminal justice response.

Max Credits: 3

Min Credits: 3

CRIM.632 Responding to Child Maltreatment

Course ID: 5464

Course Details: Introduction to empirical findings and theoretical perspectives concerned with the maltreatment of children and youth. Includes an examination of prevalence rates, risk factors, consequences, and system responses.

Max Credits: 3

Min Credits: 3

CRIM.640 Criminal Mind and Behavior

Course ID: 5443

Course Details: This course is designed to address a broad range of topics relevant to criminal behavior and the development of the so called criminal personality. Factors that are considered to influence the evolution of criminal mentality are examined and the laws and the past and current response of the criminal justice system to repeat offenders are explored.

Max Credits: 3

Min Credits: 3

CRIM.641 Mental Health & Criminal Justice

Course ID: 33236

Course Details: The course focuses on how and why individuals with serious mental illness become involved in the criminal justice system, and on how the criminal justice and public mental health systems respond to that involvement. Topics include law enforcement responses, court-based strategies, mental health and corrections, community supervision of individuals with mental illness, violence and mental disorder, and unique challenges associated with female and juvenile populations.

Max Credits: 3

Min Credits: 3

CRIM.642 Sex Crimes and Offenders

Course ID: 32172

Course Details: This course examines the nature of sex offenses as well as the mind of the sex offender, and focuses on motives, possible victims, and rehabilitation. The responses of the mental health and criminal justice systems are examined and the effectiveness of those responses is assessed.

Max Credits: 3

Min Credits: 3

CRIM.650 Violence in America

Course ID: 5465

Course Details: This course provides an in-depth analysis of the causes, context, and control of a wide range of violent crimes. Topics covered in this class include: Murder, rape, robbery, assault, and violence in the helping professions, the workplace, school, gang violence, cult violence, and institutional violence. For each form of violence, we examine issues related to (1) the extent of the problem, characteristics of the crime, victim, and offender, (2) causation, (3) crime prevention, and (4) crime control strategies.

Max Credits: 3

Min Credits: 3

CRIM.651 Criminal Homicide

Course ID: 36676

Course Details: A survey of the nature and extent of criminal homicide. There will be five main components: statutory definitions of homicide; theories of homicide; homicide rates over time and across jurisdictions; trends and patterns in homicide characteristics; and cross-cultural comparisons. Homicide is an important topic in criminology for three reasons: (1) it is the crime of greatest severity in any penal code; (2) it is a fairly reliable barometer of all violent crime; and (3) at a national level, no other crime is measured as accurately, precisely, and comprehensively.

Max Credits: 3

Min Credits: 3

CRIM.653 Gangs

Course ID: 37094

Course Details: An introduction to the study of gang problems in the U.S. by exploring the nature of gangs, including issues such as defining gangs, types of gangs, female gang involvement, etc. The course also examines theory and methods of understanding gangs and the group process of gangs and investigates the criminal involvement of gangs, focusing on gang members? Involvement in extortion, drugs, violence, and other crimes. Also examines programs for social intervention and law enforcement, and policy issues.

Max Credits: 3

Min Credits: 3

CRIM.656 Criminal Careers Foundations

Course ID: 37095

Course Details: This course examines the concept of the "Criminal career". By examining the scholarly progression through which this term has evolved. We will investigate three main venues: (1) the research that originated in the early 1900's at the University of Chicago (Shaw and Sutherland); (2) the work of the Gluecks between 1930 and 1957; and (3) the two Philadelphia Birth Cohort Studies. These three research venues are largely responsible for the origin and sustenance of the criminal career paradigm in criminology.

Max Credits: 3

Min Credits: 3

CRIM.657 Criminal Careers Contemporary

Course ID: 37096

Course Details: Examines contemporary research on the "criminal career paradigm" which has dominated criminological research over the past 20 to 25 years. Despite a widely held belief that this area of inquiry has been significant, desirable, worthwhile, etc., there have been a number of polemical publications that have spawned a debate over the yield attained through criminal career research on the one hand, and the value of or necessity for a longitudinal approach to studying criminal behavior on the other. These debates will be examined and the nature of contemporary inquiry into criminal careers will be examined.

Max Credits: 3

Min Credits: 3

CRIM.658 Issues in Computer Crime and Cyber Security

Course ID: 37097

Course Details: This course will examine the history and evolving nature of the relationship between technology, crime, and security, with a particular focus on legitimate and illegitimate Internet commerce, and cyber criminal methodologies and techniques. We will study major issues in cyber security including criminal and state-sponsored hacking; data, intellectual property, and identity theft; financial and personal data security; cyber-terrorism; tools and methods used to exploit computer networks, and strategies to protect against them; and new and emerging technologies. This course will be taught specifically for non-computer science majors, although students with computer science backgrounds are welcome for the experiences that they can bring to the class discussions.

Max Credits: 3

Min Credits: 3

CRIM.662 Global Issues and Human Rights and Justice

Course ID: 37098

Course Details: This course examines the impact of global issues on crime and justice and the intersection of social control and human rights approaches to crime. The course interweaves readings, lectures and discussion of justice and law; security and safety; socio-economic development; and comparative cultures and institutions in an examination of the impact of globalization, migration, labor exploitation, war and transnational agendas on the construction of crime, the development and control of criminal opportunity structures, and legal/ justice system responses. It examines the complex interactions between global context, human rights and social control approaches to crime. Topics include human trafficking; children and war; refugees and migration; and transnational crime in a global economy.

Max Credits: 3

Min Credits: 3

CRIM.663 Prisons A Global Perspective

Course ID: 37099

Course Details: This course provides a comprehensive, global assessment of the use/misuse of prisons and jails in North America (U.S. focus), and in other parts of the world, including selected countries in Europe, Asia, Africa, and South America. A broad range of topics are compared among U.S. and global policies and practices. Topics include: (1) who goes to prison and why; (2) sentencing disparity and sentencing reform movements; (3) prison life and prison organization; (4) prison classification; (5) inmate, staff, and management culture; (6) prison violence and disorder; (7) treatment programs; (8) the links between prison culture and community culture; (9) the prospects for offender change; and (10) offender reentry.

Max Credits: 3

Min Credits: 3

CRIM.664 Weapons of Mass Destruction

Course ID: 37100

Course Details: This course explores the threats that weapons of mass destruction (WMD) pose to the U.S. and its interests along with the strategies to meet those threats. The course will examine the technical aspects, history, and contemporary threat of each category of weapon ? Chemical, biological, radiological, and nuclear ? followed by a critical analysis of U.S. and global efforts to limit access to these weapons and prohibit their production, proliferation and use. The course will also review some aspects of WMD attack response, recovery, and mitigation.

Max Credits: 3

Min Credits: 3

CRIM.665 Global Trafficking and Criminal Networks

Course ID: 37101

Course Details: Illicit economic activities are a global phenomenon with local impact. This course will examine the threat that global trafficking poses to a nation?s security, political stability, economic development, and social fabric. The lessons in this advanced graduate-level seminar are organized around the trafficking activities of greatest concern to the United Nations, Interpol, IAEA and other international agencies ? as well as to the U.S. Departments of State, Defense, Justice, and Homeland Security.

Max Credits: 3

Min Credits: 3

CRIM.666 Terrorist Networks Al Qaida and Affiliated Groups

Course ID: 37102

Course Details: This course will study the history and potential future of the global Al-Qaida movement. Inspirational leaders, strategies, operations, tactics, finances and other key dimensions of this network will be examined in depth. The course will also examine specific vulnerabilities of a decentralized networked organization like Al-Qaida, to include tactical control, strategic authority, dependence on technologies, and transactional integrity.

Max Credits: 3

Min Credits: 3

CRIM.667 Advanced Security Studies

Course ID: 37126

Course Details: This course examines the complex nature of key domestic and international security threats and how nations respond to them. While the traditional focus of security studies has been the phenomenon of war, the past two decades have seen tremendous growth and expansion of the field. Some scholars have studied the threat, use and control of military force, while others have studied various forms of political violence such as terrorism, organized crime, and insurgency or armed rebellion. Research in this field also incorporates scholarship on the politics of defense and foreign policymaking, traditional theories of international relations, comparative analysis of national and regional case studies, ethics and morality of security policies, and transnational issues like arms trafficking, piracy, and the proliferation of materials and technology for weapons of mass destruction. Overall, the study of national and international security has evolved into a complex, interdisciplinary field, as demonstrated on the list of journals and websites provided on the last page of this syllabus. Each lesson in this course draws on a large and diverse body of readings, including academic journal articles, government reports, and original source materials.

Max Credits: 3

Min Credits: 3

CRIM.668 Scientific & Technological Dimensions of National Security

Course ID: 37103

Course Details: In this required course for the MS in Security Studies program, students will take this course to learn all about the efforts in the public and private sector to design new sensors, scanner, and the general role of science and technology in homeland and national security.

Max Credits: 3

Min Credits: 3

CRIM.669 History of Terrorism and Counterterrorism

Course ID: 37105

Course Details: This course will study the history and potential future of the global al-Qaida movement. Inspirational leaders, strategies, operations, tactics, finances and other key dimensions of this network will be examined in depth. The course will also examine specific vulnerabilities of a decentralized networked organization like al-Qaida, to include tactical control, strategic authority, dependence on technologies, and transactional integrity.

Max Credits: 3

Min Credits: 3

CRIM.683 Directed Study

Course ID: 38163

Course Details: This course is designed as an independent study of a subject not offered in the standard curriculum.

Max Credits: 3

Min Credits: 3

CRIM.689 Special topics in Criminal Justice and Criminology

Course ID: 37106

Course Details: Special topics classes are used to address timely issues that do not fit into the regular course offerings.

Max Credits: 3

Min Credits: 3

CRIM.690 Advanced Regression Analysis

Course ID: 37107

Course Details: This course focuses on statistical methods that are useful in the investigation of hypotheses in the social sciences and the analysis of public policies and programs. The bulk of the course is a detailed examination of the bivariate and multiple regression models estimated using Ordinary Least Squares (OLS), with an emphasis on constructing regression models to test social and economic hypotheses. Several special topics in regression analysis are addressed as well, including violations of OLS assumptions and the use of dummy variables, and interaction effects. Throughout, examples are drawn from the literature so students can see the models and methods in action.

Max Credits: 3

Min Credits: 3

CRIM.691 Advanced Research Design

Course ID: 37108

Course Details: This course focuses on measurement and data development strategies and techniques to facilitate effective statistical analysis. Topics include the logic of causal inquiry and inference, the elaboration paradigm and model specification, handling threats to internal validity, hierarchies of design structure (experimental, quasi-experimental and non-experimental), linking design structure to affect estimation strategies, and analyzing design elements in published literature. Students will select a research topic in consultation with the instructor and prepare a written comparative design analysis.

Max Credits: 3

Min Credits: 3

CRIM.692 Qualitative Research Methods

Course ID: 37109

Course Details: This course designed to increase students' knowledge and understanding of the design and process of qualitative research in criminology. The material covered in this course includes the nature and uses of qualitative research; the design of qualitative research; grounded theory and the use of qualitative research to advance new theories and critically evaluate tenants or assumptions of widely held explanations of criminal behavior and justice system functioning; and the ethics of qualitative research. Qualitative research methodologies including ethnography, case studies, participant observation, interviewing, content analysis, and life history narrative / life course analysis will be studied. Students will develop and initiate their own qualitative research and learn first-hand about the conduct of such research, the sequencing of data collection, data analysis, and more data collection. Students will learn the

uses of computer assisted software programs designed to assist qualitative data analysis.

Max Credits: 3

Min Credits: 3

CRIM.693 Survey Methods

Course ID: 37110

Course Details: This course exposes students to the use of survey methods in social science research. Emphasis is placed on interview and questionnaire techniques and the construction and sequencing of survey questions as well as the use of Likert and Thurstone scales. Attention is also devoted to sampling theory, sampling designs, and sampling and non-sampling errors.

Max Credits: 3

Min Credits: 3

CRIM.694 Crime Analysis and Mapping

Course ID: 5460

Course Details: This course examines the use of new technologies to analyze crime patterns and develop crime prevention strategies. Students study theories that explain the geographic distribution of crime and learn how to use Geographic Information Systems to study crime in ways that draw upon theory as well as how to apply GIS techniques in the law enforcement and corrections fields.

Max Credits: 3

Min Credits: 3

CRIM.695 Program Evaluation Methods

Course ID: 38183

Course Details: An examination of the methods and techniques of evaluation research. Evaluation research includes the issues that characterize the generic research enterprise. In addition to the usual research concerns and problems, evaluation research must also address problems that are unique to determining whether a program, treatment, law, or policy, has had the desired effect when implemented in practice. This task is especially problematic with social policy contexts. The agenda for the course has two main components. First, the course will concern the structural features of designing and conducting a program evaluation. The second component will be an analysis of actual program evaluations in the literature.

Max Credits: 3

Min Credits: 3

CRIM.697 Security Studies Project Design and Defense

Course ID: 37111

Course Details: Under faculty supervision, students in the MS in Security Studies program will design a science or technology-related project that demonstrates mastery in a subject relevant to security. Examples could include chemical or biological sensors, computer firewall intrusion detection system, baggage scanners, signals interception device, etc.

Max Credits: 3

Min Credits: 3

CRIM.698 Security Studies Capstone 1 Data Collection and Analysis

Course ID: 37112

Course Details: This course is the first of a 2-part culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.591: Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Master's level research paper of at least 50 pages on a topic of their choosing related to security studies. The design of the 2-course capstone sequence emphasizes independent research and writing, thus required class periods are kept to a minimum.

Max Credits: 3

Min Credits: 3

CRIM.699 Security Studies Capstone 2 Writing and Presentation

Course ID: 37113

Course Details: This course is the second of a 2-part culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.591: Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Master's level research paper of at least 50 pages on a topic of their choosing related to security studies. In this second course of the sequence, students will prepare drafts of their paper for review by their faculty mentor, and at the end of the semester will give a presentation (graded), open to the community, on their research.

Max Credits: 3

Min Credits: 3

CRIM.701 Dissertation Seminar I

Course ID: 37114

Course Details: This is the first part of a two-semester sequence in which students develop a plan and a template for the conduct of the various stages of the doctoral dissertation. Topics include: theoretical foundations, hypothesis development, sampling design, construct measurement, data collection, and analysis of quantitative or qualitative data.

Max Credits: 3

Min Credits: 3

CRIM.702 Dissertation Seminar II

Course ID: 37115

Course Details: This is the second part of a two-semester sequence in which students develop a plan and a template for the conduct of the various stages of the doctoral dissertation. Topics include: theoretical foundations, hypothesis development, sampling design, construct measurement, data collection, and analysis of quantitative or qualitative data.

Max Credits: 3

Min Credits: 3

CRIM.703 Dissertation supervision

Course ID: 37116

Course Details: At the dissertation stage of doctoral study, students register for 3, 6, or 9 credits of direct supervision with their dissertation advisor.

Max Credits: 3

Min Credits: 3

CRIM.706 Dissertation Supervision

Course ID: 37117

Course Details: At the dissertation stage of doctoral study, students register for 3, 6, or 9 credits of direct supervision with their dissertation advisor.

Max Credits: 6

Min Credits: 6

CRIM.709 Dissertation Supervision

Course ID: 37119

Course Details: At the dissertation stage of doctoral study, students register for 3, 6, or 9 credits of direct supervision with their dissertation advisor.

Max Credits: 9

Min Credits: 9

CRIM.790 Categorical and Limited Dependent Variables

Course ID: 37120

Course Details: The estimation of empirical models is essential to public policy analysis and social science research. Ordinary Least Squares (OLS) regression analysis is the most frequently used empirical model, and is appropriate for analyzing continuous dependent variables that meet certain distributional assumptions. This course examines several types of advanced regression models for dependent variables that violate one or more of the assumptions of the OLS regression model. For example, some dependent variables may be categorical, such as pregnant or not, employed or not, etc. Other dependent variables may be truncated or censored, such as contributions to an individual retirement account that are limited by law to certain dollar amounts. Still others may be counts of things, like the number of children born to a given woman or the number of traffic accidents on a given day. The principal models examined in the course are binary logit and probit, multinomial logit, ordinal logit and probit, tobit, and the family of Poisson regression models. The Heckman correction for selection and Event History Analysis are also addressed. All these models are estimated using maximum likelihood estimation (MLE). The course focuses on the application and interpretation of the models, rather than statistical theory.

Max Credits: 3

Min Credits: 3

CRIM.791 Structural Equation Modeling

Course ID: 37121

Course Details: This course is an introduction to structural equation modeling (SEM). SEM represents a general approach to the statistical examination of the fit of a theoretical model to empirical data. Topics include observed variable (path) analysis, latent variable models (e.g., confirmatory factor analysis), and latent variable SEM analyses.

Max Credits: 3

Min Credits: 3

CRIM.792 Survival Analysis and Longitudinal Data

Course ID: 37122

Course Details: Criminological research often involves the study of change over time in both individuals and groups. Analyzing such over time poses a number of methodological and statistical challenges, however, and these must be addressed to derive valid inferences from data analysis. This course will examine several techniques that are appropriate for such analyses. These include the family of univariate, bivariate and multivariate techniques collectively known as "survival" or "event history analysis" that are appropriate for studying processes such as recidivism and length of time individuals spend in various programs. The course will also describe zero-inflated Poisson trajectory and latent growth curve models, as well as multilevel models for change. Emphasis will be on application as opposed to theory.

Max Credits: 3

Min Credits: 3

CRIM.793 Data Reduction and Factor Analysis

Course ID: 37123

Course Details: Criminologists are often confronted with datasets containing numerous variables resulting from surveys and archival data extraction. It is advantageous to reduce the number of variables while still maintaining the integrity of the measurement of crucial concepts. Factor analysis is a valuable statistical technique for reducing the number of variables and detecting possible underlying structure (s) in the relationships among variables. This course will examine major factor analytic techniques such as Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) designed to find underlying unobservable (latent) variables that are reflected in the observed variables or manifest variables. In addition the course will examine the various factor rotation procedures commonly used to ensure that the derived factors or dimensions are orthogonal and do not either introduce multi-collinearity problems or exacerbate collinearity issues already present in the data.

Max Credits: 3

Min Credits: 3

GLS.701 Global Studies I

Course ID: 37340

Course Details: The focus of this course is the intersection of theory and practice in Global Studies. Students will be acquainted with the three fields of study that structure the Ph.D. Global Studies curriculum: Comparative Cultures, Security and Human Rights, and Socio-Economic Development and the interdependence of these fields.

Max Credits: 3

Min Credits: 3

GLS.702 Global Studies II

Course ID: 37350

Course Details: This course elaborates on the topics introduced in GLS 701 Global Studies I. It familiarizes students with specific knowledge competencies in the three fields of study that structure the Ph.D. Global Studies curriculum: Comparative Cultures, Security and Human Rights, and Socio-Economic Development and the interdependence of these fields. Emphasis includes geography, history, economics, and cultural studies.

Max Credits: 3

Min Credits: 3

GLS.703 Global Research and Data Analysis

Course ID: 37349

Course Details: This course is designed to cultivate and further develop students' understanding and skills in research methods and data analysis as they become practitioners of qualitative and quantitative research addressing a range of global studies issues and problems. Through the use of applied analysis projects students will explore multiple methods of data analysis, critique and evaluate existing research studies and reports, and develop skills in critical thinking.

Max Credits: 3

Min Credits: 3

GLS.711 The World of Things: Consumer Culture in Historical Perspective.

Course ID: 37348

Course Details: This course examines the emergence and historical impact of consumer cultures in the modern world, for the mid nineteenth century through the present. Focusing mainly on the cases of France, the United States and Japan, it will trace the broad shift from elite luxury consumption to popular, and eventually global consumer culture over this period.

Max Credits: 3

Min Credits: 3

GLS.712 Media and Global Culture

Course ID: 37347

Course Details: in this course students will examine the development and increasing interrelatedness of the media industries from the early twentieth century to the present and the range of theoretical and critical approaches taken toward media industries. The emerging field of "Media industry studies" that emphasizes the importance of integrating analysis of media structures with consideration of cultural, global and textual matters will be explored.

Max Credits: 3

Min Credits: 3

GLS.713 Seminar on Global Trafficking.

Course ID: 37346

Course Details: This course will examine the threat that global trafficking poses to a nation's security, political stability, economic development, and social fabric. Illicit economic activities are a global phenomenon with local impact.

Max Credits: 3

Min Credits: 3

GLS.714 Globalization, Fenimism, and Liberalism

Course ID: 37345

Course Details: This course provides students with opportunities to gain an understanding of the issues necessary to consider whether, and to what extent, liberalism and feminism are compatible in a global context. The importance of critical thinking and communication are emphasized.

Max Credits: 3

Min Credits: 3

GLS.715 International Migration in the Global World

Course ID: 37344

Course Details: This course offers a holistic view of the migration process from multiple disciplinary perspectives with multiple levels of analysis and aspects of the world. The course further reflects the need to examine migration as a general social process as well as a personal/individual experience that can be both liberating and limiting.

Max Credits: 3

Min Credits: 3

GLS.716 Advanced Seminar in Global History, Politics and Theory

Course ID: 37343

Course Details: This seminar provides an overview of the history, politics and theories that underpin Global Studies. Particular emphasis is on identifying the main points of debate and contrasting research traditions within the field, developing the critical analytic skills necessary to evaluate the contrasting arguments made within the field, and grounding individual empirical interests within the context of the broader theoretical and methodological issues.

Max Credits: 0

Min Credits: 0

GLS.717 Developing Economies

Course ID: 37342

Course Details: The emphasis of this course is an examination of globalization and whether it can be made a human-centered process, to historically examine the interrelatedness of the world economy to determine how policies shaped by industrialized countries impact developing countries, and to define key terms including poverty, sustainable development, market, informal economy, and civil society.

Max Credits: 3

Min Credits: 3

GLS.720 Special Topics Seminar in Comparative Cultures

Course ID: 37341

Course Details: This special topics seminar engages students in humanistic and artistic approaches to cultural inquiry. An awareness and understanding of cultures, especially through literature, language, media and the arts are viewed as essential to a holistic understanding of global systems. This seminar applies techniques of intercultural inquiry at the intersection of culture, creativity, and technology through applied fieldwork projects.

Max Credits: 3

Min Credits: 3

GLS.791 Global Studies Directed Studies

Course ID: 38488

Course Details: Global Studies Directed Studies

Max Credits: 3

Min Credits: 3

IB.500 Introduction to Biomedical Engineering & Biotechnology

Course ID: 20110

Course Details: Team-taught introductory course that emphasizes a multidisciplinary approach to current topics in the range of academic disciplines and gives students their first exposure to faculty research areas. The course, as much as possible, will involve faculty from within Biomedical Engineering and Biotechnology. The course, as much as possible, involves faculty from all participating campuses. Speakers from industry are also invited to present topics of contemporary importance.

Max Credits: 3

Min Credits: 3

IB.510 Digital Signal Processing

Course ID: 3266

Course Details: Review of Z-Transforms and solutions of linear difference equations. Digital filter structures, parameter quantization effects and design techniques. FFT and Chirp Z-Transform methods. Discrete Hilbert Transforms, minimum-phase sequences and their application to Homomorphic Signal Processing and calculation of Complex Cepstrum.

Max Credits: 3

Min Credits: 3

IB.511 Medical Diagnostic Imaging

Course ID: 3267

Course Details: This course covers the physics and electrical engineering aspects of how signals are acquired from which images will be formed, and the principal methods by which the signals are processed to form useful medical diagnostic images. Modalities studied include: x-rays, ultra-sound, computed tomography, and magnetic resonance imaging. The principles of signal processing via Fourier transform will be reviewed. Noise and other artifacts that degrade the medical diagnostic of images are considered. MATLAB is heavily used in simulation and verification.

Max Credits: 3

Min Credits: 3

IB.512 Medical Image Processing

Course ID: 37007

Course Details: This course will focus on post-acquisition manipulation and analysis used clinically and in research. Techniques for processing N-dimensional images acquired using several different medical image modalities will be studied including basic image visualization, filtering, segmentation and registration. The emphasis will be on engineering methods & techniques rather than a rigorous mathematical investigation of algorithms and theory. Programming will not be required, but homework and projects will require use of an open-source software tool, ImageJ, to perform image processing tasks. [NOTE: Many students in prior semesters have expressed a preference for using MATLAB from Mathworks for image processing. All assignments can be completed using either ImageJ OR MATLAB].

Max Credits: 3

Min Credits: 3

IB.513 Biomedical Imaging Informatics

Course ID: 38346

Course Details: The focus of this course will be on Medical Imaging Informatics (MII), Which is the application of the technologies that enable the complex environment needed for modern medical imaging information systems. These MII systems are increasingly pushing the limits of computing, networking and storage capabilities. The stud of MII would be instructive for someone interested in generally examining instances of complex information systems are for someone who is interested in the specifics of Picture Archiving and communications Systems (PACS) and radiologic Information Systems (RIS).

Max Credits: 3

Min Credits: 3

IB.516 Basic Pinciples of Nuclear Magnetic Resonance Imaging

Course ID: 37008

Course Details: The goal of this course is to provide the student with a general understanding of the physical principles of magnetic

resonance imaging (MRI) and the instrumentation used to create a magnetic resonance image. This goal will be sought without deep exploration of any particular physical science or mathematical discipline. Background knowledge in freshman-level science and mathematics courses is assumed. The topics to be covered in this course include: 1) theoretical and experimental aspects of MRI and their application to problems in medicine and biology, 2) physical principles underlying the generation and detection of the nuclear magnetic resonance signal, 3) MRI instrumentation, and 4) Nuclear magnetic resonance relaxation parameters and how they affect contrast in a magnetic resonance image.

Max Credits: 3

Min Credits: 3

IB.517 Embedded System Design in Medical Systems

Course ID: 37006

Course Details: This course covers the design principles of embedded systems including both the hardware and software aspects. We will introduce the design methodology and cost effectiveness of embedded systems. We will discuss the microprocessor, memory and storage subsystems. The interfacing between the computer system and medical instruments will be reviewed. Firmware, operating systems, programming tools will be considered. The course will have a lab component that includes hands-on exercises of embedded Linux (or RTEMS) in an online virtual laboratory environment.

Max Credits: 3

Min Credits: 3

IB.520 Ethical Iss. Biomedical

Course ID: 20111

Course Details:

Max Credits: 1

Min Credits: 1

IB.521 Real Time Digital Signal Processing

Course ID: 3275

Course Details: This course provides an introduction to real-time digital signal processing techniques using the TMS320C3x floating point and TMS320C5x fixed point processors. The architecture, instruction set and software development tools for these processors are studied via a series of C and assembly language computer projects where real time adaptive filters, modems, digital control systems and speech recognition systems are implemented.

Max Credits: 3

Min Credits: 3

IB.550 BMBT Laboratory Experience

Course ID: 30396

Course Details:

Max Credits: 3

Min Credits: 3

IB.560 Biomedical Instrumentation

Course ID: 30817

Course Details: Analysis and design of Biomedical Instrumentation systems that acquire and process biophysical signals. Properties of Biopotential signals and electrodes; Biopotential Amplifiers and Signal Processing; Basic Sensors and Principles; Medical Imaging Systems; Electrical Safety.

Max Credits: 3

Min Credits: 3

IB.575 Quantitative Physiology

Course ID: 32058

Course Details: This course presents physiology at the organ system level with a quantitative approach. It helps integrate the curriculum for individuals with life science and engineering undergraduate backgrounds, permitting engineers and physical scientists an appreciation of how organisms function from the organ/system perspective and gives life scientists a more rigorous quantitative approach to physiology than is usual in undergraduate courses.

Max Credits: 3

Min Credits: 3

IB.600 Capstone Project

Course ID: 20112

Course Details:

Max Credits: 3

Min Credits: 3

IB.601 Sem: Biomedical Engineering & Biotechnology

Course ID: 20113

Course Details: The goal of the seminar is to have students develop effective writing and speaking skills required for preparation of research papers and professional presentations. The course emphasizes the importance of clear, concise writing style and delivery of presentations to both scientists and the lay public. Outside readings are designed to critically evaluate contemporary issues related to: disclosure and conflict of interest, publishing ethics, the balance of research, security, and publishing censorship, electronic science collaborations, and the social implications of science. Preparation of research grant proposals, the curriculum vitae, and poster presentations, and the submission of manuscripts for publication are also reviewed.

Max Credits: 3

Min Credits: 3

IB.710 Directed Study

Course ID: 30401

Course Details:

Max Credits: 3

Min Credits: 3

IB.711 Directed Studies

Course ID: 35005

Course Details:

Max Credits: 1

Min Credits: 1

IB.712 Directed Studies

Course ID: 30402

Course Details:

Max Credits: 2

Min Credits: 2

IB.720 Independent Study

Course ID: 30403

Course Details:

Max Credits: 3

Min Credits: 3

IB.721 Independent Study

Course ID: 30404

Course Details:

Max Credits: 1

Min Credits: 1

IB.722 Independent Study

Course ID: 35006

Course Details:

Max Credits: 2

Min Credits: 2

IB.756 Doctoral Dissertation

Course ID: 29832

Course Details:

Max Credits: 6

Min Credits: 6

IB.759 Dissertation Research

Course ID: 30405

Course Details:

Max Credits: 9

Min Credits: 1

IB.770 CPT - Co-op Training

Course ID: 35548

Course Details: Course required to perform CPT

Max Credits: 1

Min Credits: 1

IB.771 CPT-Co-op Training

Course ID: 35698

Course Details: Course required to perform CPT

Max Credits: 1

Min Credits: 0

IB.780 Thesis Review

Course ID: 36528

Course Details: Thesis Review

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Max Credits: 1

Min Credits: 1

IM.630 Biological Oceanography

Course ID: 20118

Course Details:

Max Credits: 3

Min Credits: 3

IM.650 Physical Oceanography

Course ID: 20119

Course Details:

Max Credits: 3

Min Credits: 3

IM.743 Master's Thesis

Course ID: 35705

Course Details:

Max Credits: 3

Min Credits: 3

IM.746 Master's Thesis

Course ID: 35706

Course Details:

Max Credits: 6

Min Credits: 6

IM.749 Master's Thesis

Course ID: 35707

Course Details:

Max Credits: 9

Min Credits: 9

IM.751 Doctoral Dissertation

Course ID: 33675

Course Details: Doctoral Dissertation Research

Max Credits: 9

Min Credits: 1

IM.752 Doctoral Dissertation

Course ID: 33676

Course Details: Doctoral Dissertation Research

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Max Credits: 2

Min Credits: 2

IM.753 Doctoral Dissertation

Course ID: 33677

Course Details: Doctoral Dissertation Research

Max Credits: 3

Min Credits: 3

IM.754 Doctoral Dissertation

Course ID: 33678

Course Details: Doctoral Dissertation Research

Max Credits: 4

Min Credits: 4

IM.755 Doctoral Dissertation

Course ID: 33679

Course Details: Doctoral Dissertation Research

Max Credits: 5

Min Credits: 5

IM.756 Doctoral Dissertation

Course ID: 33680

Course Details: Doctoral Dissertation Research

Max Credits: 6

Min Credits: 6

IM.757 Doctoral Dissertation

Course ID: 33681

Course Details: Doctoral Dissertation Research

Max Credits: 7

Min Credits: 7

IM.758 Doctoral Dissertation

Course ID: 33682

Course Details: Doctoral Dissertation Research

Max Credits: 8

Min Credits: 8

IM.759 Doctoral Dissertation

Course ID: 33683

Course Details: Doctoral Dissertation Research

Max Credits: 9

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Min Credits: 9

IM.769 Continuing Graduate Research

Course ID: 37339

Course Details: Graduate Research.

Max Credits: 9

Min Credits: 9

MB.507 Pre Req Statistics 49.211

Course ID: 32543

Course Details: Pre Req Statistics 49.211

Max Credits: 0

Min Credits: 0

PCS.501 Strategies of Conflict Transformation

Course ID: 36946

Course Details: This course will examine the underlying connections between causes of conflict on the local, national and global levels and the processes that advance peaceful resolution. The course is designed to provide a cross-disciplinary approach to the relevant social, political, economic and cultural conditions leading to conflict and the variety of approaches to solve such conflict through both violent and nonviolent means. The beginning of the course will focus on issues of power and inequality related to class, race (and related divisions of ethnicity, religion, caste, nationality, immigration status) and gender. We will look at structures and system of power ranging from the family, to the community, the workplace and the national and international dimensions. The goal is to link theoretical analysis with the study of practical problem solving.

Max Credits: 3

Min Credits: 3

PCS.502 Seminar in Peace and Conflict Studies

Course ID: 37460

Course Details: Offered from time to time to highlight specialized areas of faculty interest and to acquaint the student with new developments from a broad range of theory and research and how these developments might affect the field of Peace and Conflict Studies.

Max Credits: 3

Min Credits: 3

PCS.512 Community Conflict Resolution

Course ID: 6190

Course Details: This course gives students an understanding of the main issues and solutions involved in community level conflict resolution; e.g., in neighborhoods, workplaces, and other institutions. It develops students' skills in practicing conflict resolution and/or evaluating programs in the field of dispute resolution. It is important to understand why conflict happens and how to resolve conflict.

Max Credits: 3

Min Credits: 3

PCS.523 Everyday Peace: Community-based Approaches to Peace and Peacebuilding

Course ID: 38106

Course Details: This course will introduce students to a range of issues in community-based approaches to everyday conflict and peacebuilding. Premised on the idea that peace cannot be understood or studied in isolation of other of other social processes, the

course will allow students to collectively engage with key conceptual, methodological and praxis related issues in peacebuilding drawing from community-based and critical perspectives in the social sciences, we will focus on developing the notion of 'everyday peace', that is, building community capacities and promoting social justice as an antidote to the normalized and endemic violence in society. The course will critically examine relevant empirical literature as well as ongoing peace initiatives that utilize community-based approaches.

Max Credits: 3

Min Credits: 3

PCS.525 Gender, Work and Peace

Course ID: 37367

Course Details: "Gender, Work and Peace" will explore the relationship between human rights, gender and nonviolence in the 21st century. We will examine how current and future reality can be shaped by related policies, specifically those on the micro and macro level concerned with gender. Today we live in a period of global transition comparable to the period that followed the Industrial Revolution. It presents us with enormous challenges and opportunities regarding factors we will address in class: economic globalization, government restructuring, work-family balancing, environmental safety at work, gender inequalities and the connection between human rights and dignity at work.

Max Credits: 3

Min Credits: 3

PCS.527 Sustainable Housing Development and Land Use: Conflict, Policy, and Practice

Course ID: 37781

Course Details: Housing is fundamental to the quality of life in communities, and housing conflict, policy and practice shape the availability of this fundamental good. This course will examine the economic, environmental, social, and cultural factors that shape housing and its sustainability. The contentious nature of housing and land use policy in the United States will be summarized, with students learning how housing policy impacts communities, states, and regions. The course will then give students a detailed understanding of the conflictive process through which housing is developed and the role the market, government, funders, workers, and housing consumers play in influencing the creation and development of housing. The course will highlight ways in which current housing development policy and practices are not sustainable, and will examine more recent efforts to establish standards and practices that enhance consensus and sustainability. Students will learn how to manage conflict and take a housing project through the various stages, such as project conceptualization, market analysis, design, site acquisition, financing, construction, and occupancy. While the course focuses on the U.S. context, students will learn of international efforts to achieve greater sustainability in housing. The course will provide students with both practical and theoretical knowledge of housing and land use conflict, policy and development practices. Case studies of actual projects will be presented.

Max Credits: 3

Min Credits: 3

PCS.539 Bridging Minds for Peace: Interfaith Perspectives and The Universal Moral System

Course ID: 38122

Course Details: There has been a consensus among the intellectuals and followers of religions that one of the major reasons for the accumulating political, economical, and environmental crises in the Middle East and around world is the absence of a grand vision that can guide the future and inspire humanity to create peace everywhere. The core premises of this theory are: Without peace among religions, there is no peace among nations; Without dialogue among religions, there is no peace among religions; Without a universal moral system, there is no dialogue among religions; A new model of international relations based on a set of morals universally accepted, can help human race to live in peace and justice; and the major religions have the set of morals that can be universally accepted by all, even the non-religious. This course will examine the possibilities and obstacles to bridging the religious divide through a universal, interfaith moral code.

Max Credits: 3

Min Credits: 3

PCS.544 Advanced Research Methods

Course ID: 37360

Course Details: The purpose of this course is to introduce students to the fundamentals of research while also conveying the need for skepticism as the foundation of scientific inquiry. Both quantitative and qualitative methods will be examined. Students will gain first-hand

knowledge of the research process by formulating their own research questions, locating current literature to frame their topic, developing causal theories and then empirically testing these theories. With that in mind, the first goal of this course is for students to become critical consumers of research in general and peace and conflict research in particular. The second goal is for students to develop theories about peace and conflict and research designs to test those theories. Students are encouraged to use this course to develop their thesis or projects.

Max Credits: 3

Min Credits: 3

PCS.545 Politics of Repression and Dissent

Course ID: 36722

Course Details: A focus on the dark side of politics - political repression, including politically motivated imprisonment, torture, murder, and disappearance- and the struggle of critics to bring about change through non-violent and violent demonstrations, general strikes and armed resistance.

Max Credits: 3

Min Credits: 3

PCS.550 Integrative Seminar in Peace and Conflict Studies I

Course ID: 36947

Course Details: The purpose of the integrative seminar is to assist students in developing a robust and mature understanding of the three PCS core questions as they relate to PCS coursework within and across the three Professional Options. With a strong evidence focus, students identify patterns, principles, questions, and dilemmas relevant to the core questions that emerge from multiple courses they have taken within the Professional options. Students develop a reflective journal, a series of essays, a portfolio of their accumulated work, and a culminating portfolio presentation. The course consists of six 2-hour sessions each semester for two semesters.

Max Credits: 0

Min Credits: 0

PCS.553 Integrative Seminar in Peace and Conflict Studies

Course ID: 37444

Course Details: The purpose of the integrative seminar is to assist students in developing a robust and mature understanding of the three PCS core questions as they relate to PCS coursework. With a strong evidence focus, students identify patterns, principles, questions, and dilemmas relevant to the core questions emerge from multiple courses they have taken within the PCS program. Students develop a reflective journal, a series of essays, a portfolio of their accumulated work, and a culminating portfolio presentation.

Max Credits: 3

Min Credits: 3

PCS.555 Mediation: Theory and Practice

Course ID: 38199

Course Details: Mediation is a form of dispute resolution in which a neutral person helps two or more parties discuss their conflict, explore wants and needs, generate options, and reach an agreement. Mediation has become more prevalent over the past few decades in the courts, community-setting, and schools because it empowers the disputing parties to reach a resolution that works for them. This course introduces mediation in the context of other forms of alternative dispute resolution, teaches the principles and theory behind mediation, and trains students in the fundamentals of the mediation process. Interactive exercises and mediation role-plays will be used to provide experiential practice. Upon completion of the course, students will be connected to opportunities to practice mediation in the local courts or with community organizations.

Max Credits: 3

Min Credits: 3

PCS.558 Peace and Conflict Field Experience

Course ID: 37366

Course Details: A program of practical experience in the field of Peace and Conflict. Students can work in a variety of areas related to Peace and Conflict Studies. Students meet regularly as a class on campus with the designated instructor to discuss their experiences

and to learn more about the settings in which they practice and the challenges that they confront.

Max Credits: 3

Min Credits: 3

PCS.591 Directed Study in Peace and Conflict Studies

Course ID: 37311

Course Details: Through frequent consultation with the instructor, the student carries out the investigation of a particularly specialized area of interest. This course may be repeated for up to a total of 6 credits.

Max Credits: 3

Min Credits: 3

PCS.601 Peace and Conflict Studies Study Abroad I

Course ID: 37312

Course Details: Graduate study abroad in an institution with a University - approved Graduate - level exchange program. The specific course to be taken will be approved by the Graduate Coordinator.

Max Credits: 3

Min Credits: 3

PCS.602 Peace and Conflict Studies Study Abroad II

Course ID: 37313

Course Details: Graduate study abroad in an institution with a University - approved graduate - level exchange program. The specific course to be taken will be approved by the Graduate Coordinator.

Max Credits: 3

Min Credits: 3

PCS.603 Peace and Conflict Studies Study Abroad III

Course ID: 37314

Course Details: Graduate study abroad in an institution with a University - approved Graduate - level exchange program. The specific course to be taken will be approved by the Graduate Coordinator.

Max Credits: 3

Min Credits: 3

PCS.631 Practicum in Peace and Conflict studies I

Course ID: 37315

Course Details: The practicum allows students to intern at an organization related to the field of Peace and Conflict studies. The primary purpose of the Practicum is two-fold: 1) to allow students to apply, integrate, and evaluate the information and skills they have acquired in their masters - level academic course work; 2) to gain new understandings and competencies while contributing to a field setting. Students participate in placements for approximately 10 hours per week.

Max Credits: 3

Min Credits: 3

PCS.632 Practicum in Peace and Conflict Studies II

Course ID: 37316

Course Details: The practicum allows students to intern at an organization related to the field of Peace and Conflict Studies. The primary purpose of the Practicum is two - fold: 1) to allow students to apply, integrate, and evaluate the information and skills they have acquired in their masters - level academic course work; 2) to gain new understandings and competencies while contributing to a field setting. Students participate in placements for approximately 10 hours per week.

Max Credits: 3

Min Credits: 3

PCS.733 Project in Peace and Conflict Studies I

Course ID: 37317

Course Details: The project will consist of a scholarly investigation, such as a review, report, synthesis or design in the student's field resulting in a written document.

Max Credits: 3

Min Credits: 3

PCS.734 Project in Peace and Conflict Studies II

Course ID: 37318

Course Details: For a student who wants to complete a 2-semester project. The project will consist of a scholarly investigation, such as a review, report, synthesis or design in the student's field resulting in a written document.

Max Credits: 3

Min Credits: 3

PCS.743 Master's Thesis in Peace and Conflict Studies

Course ID: 37319

Course Details: For graduate student actively engaged in research leading toward the submission of written thesis. A program of supervised study will be arranged between student and a faculty supervisor. This course may be repeated for credit, but only a total of 6 credits may be counted toward the Master's Degree.

Max Credits: 3

Min Credits: 3

PCS.746 Masters Thesis in Peace and Conflict Studies

Course ID: 37320

Course Details: For graduate students actively engaged in research leading toward the submission of a written thesis. A program of supervised study will be arranged between the student and a faculty supervisor.

Max Credits: 6

Min Credits: 6

PHSC.610 Principles of Pharmaceutical Sciences

Course ID: 37990

Course Details: The purpose of this introductory course in the pharmaceutical sciences is to provide an overview of the drug development process, involving drug discovery, drug action, and drug delivery. The student will become acquainted with cutting-edge research in discovery, action, and delivery and will gain laboratory experience. This course provides a foundation in pharmaceutical sciences along with theoretical, practical, regulatory, and professional issues in the pharmaceutical sciences.

Max Credits: 4

Min Credits: 4

PHSC.620 Pharmacokinetics

Course ID: 37932

Course Details: This course focuses on the study of the biochemical and physiological effects of drugs and the mechanisms of their actions. The quantitative aspects of drug absorption, distribution, metabolism, and excretion will be explored. The philosophy of pharmacokinetic modeling and its application in practice will be introduced.

Max Credits: 3

Min Credits: 3

PHSC.630 Pharmaceutical Research Design and Ethics

Course ID: 37985

Course Details: This course explores research methodologies and statistics that are commonly used in pharmaceutical research. Scientific integrity in research will be discussed, as well as ethical issues in conducting pharmaceutical research in the laboratory.

Max Credits: 3

Min Credits: 3

PHSC.640 Pharmaceutical Analysis

Course ID: 37992

Course Details: Students in this course analyze the purity, strength, and quality of drugs and pharmaceuticals by applying modern analytical methods. Raw materials and completed dosage forms will also be analyzed in the laboratory.

Max Credits: 4

Min Credits: 4

PHSC.641 Drug Delivery

Course ID: 37931

Course Details: The biological, biophysical and chemical factors that influence drug delivery systems will be analyzed. Principles of cellular drug transport, in vivo drug transport, and modern drug delivery, including drug targeting will be explored. The course will also address membrane trafficking and intracellular transport and the utilization of these mechanisms in drug delivery and targeting.

Max Credits: 3

Min Credits: 3

PHSC.710 Advanced Topics in Pharmaceutical Sciences

Course ID: 37993

Course Details: Select advanced topics and the evaluation of scientific literature in pharmaceutical sciences will be discussed in this seminar.

Max Credits: 2

Min Credits: 2

PHSC.711 Clinical Research Design and Methodology

Course ID: 37994

Course Details: Experimental research methodologies and the ethical issues in clinical pharmaceutical research will be analyzed. Principles of translational research will be discussed. Students will develop a pharmaceutical clinical trial protocol.

Max Credits: 3

Min Credits: 3

PHSC.712 Pharmacoepidemiology

Course ID: 37996

Course Details: In this course the student applies epidemiological knowledge, reasoning, and research methods to the examination of the use and effectiveness of pharmacotherapy in human populations.

Max Credits: 3

Min Credits: 3

PHSC.713 Applied Clinical Pharmacokinetics

Course ID: 37997

Course Details: This course reviews the major methods, models, and equations used in pharmacokinetics with their physicochemical and physiological assumptions and limitations. Current graphic and computer methods of applying pharmacokinetics experimental and clinical data will be explored. Clinical research literature and approaches to the design of studies will be explored.

Max Credits: 3

Min Credits: 3

PHSC.714 Nanotechnology and Drug Delivery

Course ID: 37951

Course Details: A multidisciplinary course covering nanotechnology based drug delivery, materials and processes for novel drug delivery systems, synthesis of biocompatible nanoparticles for healthcare, product design, products today and regulatory issues.

Max Credits: 3

Min Credits: 3

PSM.500 Professional Science Master's (PSM) Internship

Course ID: 37165

Course Details: Professional Science Master's students who are preparing to participate in an internship enroll in this Professional Development Seminar prior to the semester of their work period. This seminar will provide them with resources and skills to manage an internship search, secure a position and work successfully in a professional environment.

Max Credits: 0

Min Credits: 0

PSM.501 Professional Science Master's (PSM) Reflective Seminar.

Course ID: 37168

Course Details: Reflective seminar concurrent with the internship which will enable Professional Science Master's (PSM) students to share and learn from the experiences of colleagues in other settings. The seminar may be conducted online, and campus, or in a blended mode and will include writing and oral presentation of experience.

Max Credits: 1

Min Credits: 0

PSM.535 Project Management for Scientists

Course ID: 37833

Course Details: This course is designed to provide skills to prepare students to take on the role of project manager. The necessity for project Management is now realized by most companies where the entire business including most of the routine activities can be regarded as a series of projects. Project Management principles provide a systematic approach to running a business; both large and small businesses as well as a scientific laboratory.

Max Credits: 3

Min Credits: 3

PSM.545 Professional and Scientific Communication

Course ID: 37732

Course Details: This course will help you improve your professional communication. A science professional who can communicate quickly, clearly and effectively will be most successful in the workplace. In this course, you will gain a fuller understanding of the communication process, and will practice the application of effective communication skills. You will develop both written and oral communication within the context of your professional area. Students will prepare and present a variety of short to moderate length presentations and written assignments. These assignments simulate those encountered in the "real-world" including persuasive presentations, oral and written reports, media interviews, memoranda, and crisis situations. This class will also display the impact of

newer technologies such as e-mail and presentational software and the opportunities they present and constraints they place on effective communication. Supplemental course reading and materials included as appropriate.

Max Credits: 3

Min Credits: 3

PSM.555 Professional Leadership in Science and Engineering

Course ID: 37832

Course Details: This course is designed to provide awareness and skills to prepare students to take on the role of leader. Part of a technically competent professional's responsibilities or opportunities for advancement may include leading small projects or work groups. This course will be organized around thematic video interviews with industry leaders to impart knowledge of and experience in leadership topics that support professional development.

Max Credits: 3

Min Credits: 3

Academic Integrity Policy

UNIVERSITY OF MASSACHUSETTS LOWELL POLICY AND PROCEDURES RELATING TO STUDENT ACADEMIC INTEGRITY AND MISCONDUCT

I. Statement of Principles: The University has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others academic endeavors. Academic dishonesty is prohibited in all programs of the university.

II. Academic Misconduct Subject to Disciplinary Action: ?

(1) Academic misconduct is an act in which a student:

- ????(a) Seeks to claim credit for the work or efforts of another without authorization or citation;?
- ????(b) Uses unauthorized materials or fabricated data in any academic exercise;
- ????(c) Forges or falsifies academic documents or records;
- ????(d) Intentionally impedes or damages the academic work of others;
- ????(e) Engages in conduct aimed at making false representation of a student s academic performance; or
- ????(f) Assists other students in any of these acts.

(2) Examples of academic misconduct include, but are not limited to: cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one s own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; getting unauthorized access to examinations or course materials; submitting, without the permission of the current instructor, work previously presented in another course; tampering with the

laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.

III. Possible Disciplinary Sanctions:

(1) The following are the disciplinary sanctions that may be imposed by an instructor for academic misconduct:

- ????(a) An oral or written notice of misconduct;
- ????(b) An assignment to repeat the work, to be graded on its merits;?
- ????(c) A lower or failing grade on the particular assignment or test;?
- ????(d) A lower grade in the course;
- ????(e) A failing grade in the course;

In addition, an instructor or the Academic Dean may recommend the following sanctions:?

- ????(f) A non-deletable failing grade in the course;
- ????(g) Suspension from the University; (h) Expulsion from the university.

Sanctions f h are imposed by the Office of the Provost.

(2) One or more of the disciplinary sanctions listed above may be imposed for an incident of academic misconduct.

IV. Definitions

As used herein:

- (1) Office of the Provost means the Provost, Vice Provost or a designee.
- (2) Days means academic calendar days and excludes Saturdays, Sundays, legal holidays and days upon which the university is closed.
- (3) Academic Dean means the Academic Dean or designee for the college in which the subject course is taught.
- (4) Instructor refers to the Instructor of Record.
- (5) Minor Disciplinary Sanction means a disciplinary sanction, identified in paragraph III (1) (a)-(e) and imposed, for academic misconduct, upon a student by an instructor.
- (6) Major Disciplinary Sanction means a disciplinary sanction, identified in paragraph III (1) (f)-(h) and imposed, for academic misconduct, upon a student by the Office of the Provost or the Academic Integrity Appeals Board upon the recommendation of the instructor or the Academic Dean or imposed at the discretion of the Office of the Provost.
- (7) Notice to the student, whenever required herein, shall be e-mailed to the student's official student.uml.edu e-mail address or mailed to the student by regular first class United States mail at his or her current address as maintained by the university.

V. Imposition of Disciplinary Sanctions by the Instructor:

(1) Where an instructor concludes that a student enrolled in one of his or her courses has engaged in academic misconduct, the instructor may impose one or more of the following disciplinary sanctions, as listed under paragraph III, subsections (a) through (e):

- ????(a) An oral or written notice of misconduct;
- ????(b) An assignment to repeat the work, to be graded on its merits; ? ??
- ????(c) A lower or failing grade on the particular assignment or test;?
- ????(d) A lower grade in the course;
- ????(e) A failing grade in the course.

(2) When possible, prior to imposing a minor sanction, the instructor shall notify the student that the instructor believes an act of academic misconduct has occurred, that a sanction may be imposed, and that a Notification of Academic Dishonesty Form will be filed with the Office of the Provost.

(3) Upon the imposition of a minor sanction under this section, the instructor shall notify the Office of the Provost. ?Notification to the Office of the Provost shall occur within 10 days, using the [Notification of Academic Dishonesty Form](#), and shall include identification of the student, a description of the misconduct and a specification of the sanction imposed.

(4) Within 10 days following receipt of such notice, the Office of the Provost shall provide notice of the imposed discipline to the student, the instructor and to the Academic Dean. Notification to the student shall include a statement of the misconduct, specification of the sanction imposed, a statement indicating the student's right to an appeal before the Academic Dean and a link to the policy and procedures set forth herein.

(5) A student who receives notice of a disciplinary sanction imposed under this section has the right to a hearing before the Academic Dean to contest the determination that academic misconduct occurred or the disciplinary sanction imposed or both. If the student desires such a hearing, he or she must file a written request with the Office of the Provost and the Academic Dean within 10 days of receipt of notice from the Office of the Provost.

(6) In the event that the student does not file a written request for an appeal within 10 days, the Office of the Provost shall review the matter with respect to the subject student and may, at his or her discretion, uphold the recommended sanction or impose a major sanction. ?In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, the instructor and to the Academic Dean.

VI. Recommendation of Major Disciplinary Sanction by the Instructor:

(1) Where an instructor concludes that a student enrolled in one of his or her courses has engaged in academic misconduct in the course, the instructor for that course may recommend one or more of the following disciplinary sanctions:

- ????(f) A non-deletable failing grade in the course;?
- ????(g) Suspension from the University
- ????(h) Expulsion from the university.

(2) When possible, prior to the recommendation of a major sanction, the instructor shall notify the student that the instructor believes an act of academic misconduct has occurred, that a major sanction is being recommended, and that a Notification of Academic Dishonesty Form will be filed with the Office of the Provost.

(3) Upon the recommendation of a major sanction under this section, the instructor shall notify the Office of the Provost using the [Notification of Academic Dishonesty Form](#). Notification to the Office of the Provost shall occur within 10 days and shall include identification of the student, a description of the misconduct and a specification of the sanction recommended.

(4) Within 10 days following receipt of such notice, the Office of the Provost shall provide notice of the recommended discipline to the

student, the instructor, and the Academic Dean. Notification to the student shall include a statement of the misconduct, specification of the sanction recommended, a statement indicating the student's right to an appeal before the Academic Dean and a copy of the policy and procedures set forth herein.

(5) A student who receives notice of a disciplinary sanction recommended under this section has the right to a hearing before the Academic Dean to contest the determination that academic misconduct occurred or the disciplinary sanction recommended or both. If the student desires such a hearing, he or she must file a written request with the Office of the Provost and the Academic Dean within 10 days of receipt of notice from the Office of the Provost.

(6) In the event that the student does not file a written request for an appeal within 10 days, the Office of the Provost shall review the matter and may, at his or her discretion, impose or modify the sanction recommended. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, the instructor, and to the Academic Dean.

VII. Appeal to the Academic Dean: When an appeal to the Academic Dean is commenced in accordance with the provisions set forth in Paragraphs V(5) or VI(5), the Academic Dean shall proceed in accordance with this section to consider one or more of the disciplinary sanctions listed in paragraph IV, subsections (1) (a) through (h).

(1) **Conference With Student:** The Academic Dean shall offer to discuss the matter with the student. The purpose of this discussion is to permit the Academic Dean to review with the student the charges levied against him or her and to afford the student an opportunity to respond.

(2) **Conference With Instructor:** The Academic Dean shall attempt to discuss the matter with any involved instructor. This discussion may occur either before or after the conference with the student. It should include consultation with the instructor on the facts underlying the alleged academic misconduct and on the appropriateness of the imposed or recommended sanction.

(3) **Determination that No Academic Misconduct Occurred:** If, as a result of discussions under subsections (1) and (2), the Academic Dean determines that academic misconduct did not in fact occur or that the disciplinary sanction is not appropriate under the circumstances, the Academic Dean shall notify the instructor and the Office of the Provost. The Office of the Provost shall promptly thereafter notify the student and take appropriate action with respect to the student records.

(4) If, as a result of discussions under subsections (1) and (2), the Academic Dean determines that academic misconduct did occur and that one or more of the disciplinary sanctions listed under paragraph III, subsections (1) (a) through (h) is appropriate, the Academic Dean shall prepare and forward to the Office of the Provost, within 10 days, a written Finding of Misconduct which shall include identification of the student, a description of the alleged misconduct, a summary of evidence, findings of fact and a specification of the disciplinary sanction imposed.

VIII. Appeal to the Office of the Provost

The decision reached by the Academic Dean may be appealed to the Provost Office of the

Provost if the student believes that he or she did not receive due process.

Grounds for Appeal of Due Process

An appeal to the Office of the Provost shall be limited to a review of supporting documents and the process and outcome of the Academic Dean or designee for one or more of the following grounds:

" Bias by the Instructor, Academic Dean, or designee substantially influenced the outcome of the process to the detriment of the student.

" New, relevant information has come to light that was not available at the time of the hearing by the Academic Dean.

" Unusual procedures were followed or the procedures outlined herein were not followed, to the detriment of the student.

If the student desires such a hearing, he or she must file a written request with the Office of the Provost and the Academic Dean within 10 days of receipt of notice from the Office of the Provost. The request must be based upon the Grounds for Appeal listed above.

(2) When an appeal to the Office of the Provost is commenced in accordance with this paragraph, the Office of the Provost shall review the matter with respect to the subject student and may, at his or her discretion, uphold, vacate or modify the discipline imposed or direct such appeal to be heard by the Academic Integrity Appeals Board. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, instructor, and to the Academic Dean.

(3) In the event that the student does not file a written request for an appeal within 10 days, the Office of the Provost shall review the matter with respect to the subject student and may, at his or her discretion, uphold or modify the discipline imposed. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, instructor and to the Academic Dean.

IX. Role of the Academic Integrity Appeals Board:

(1) The Academic Integrity Appeals Board is an ad hoc committee appointed by the Office of the

Provost and consists of a minimum of three faculty members chosen by the Office of the Provost with no two members selected from the same College; the board shall not include a faculty member from within the department initiating charges of academic dishonesty. The Board is chaired by the Office of the Provost who shall vote only in the case of a tie. [Or One member shall serve as Chair at the direction of the Office of the Provost. The Chair shall vote only in the case of a tie.]

When an appeal is directed to the Academic Integrity Appeals Board by the Office of the Provost in accordance with the provisions set forth in Paragraphs VIII, the Academic Integrity Appeals Board shall schedule the hearing, within a reasonable time period, at a time that is mutually agreed upon by the student, Office of the Provost and members of the Academic Integrity Appeals Board.

(2) Reasonably in advance of the hearing, the Academic Integrity Appeals Board shall obtain from the Academic Dean, in writing, a full explanation of the facts upon which the determination of misconduct was based and shall provide to the student a copy of the policy and procedures set forth herein.

(3) The hearing before the Academic Integrity Appeals Board shall be conducted in accordance with the following requirements:

(a) The Academic Integrity Appeals Board shall consider relevant evidence including documentary evidence and testimony of the instructor, student, Chair and/or Dean where appropriate.?

(b) The student shall have the right to be heard and to present relevant evidence, including documentary evidence and the testimony of witnesses, in his or her own behalf.?

(c) The Academic Integrity Appeals Board shall maintain a record of the hearing including any and all pleadings and documentary evidence presented.?

(d) The Academic Integrity Appeals Board shall prepare written findings of fact and a written statement of its decision based upon the record of the hearing.?

(e) The Academic Integrity Appeals Board may find academic misconduct and impose a sanction of suspension or expulsion only if the proof of such misconduct is clear and convincing. In other cases, a finding of misconduct must be based on a preponderance of the credible evidence.?

(f) The Academic Integrity Appeals Board may impose a disciplinary sanction that differs from the recommendation of the Academic Dean.?

(g) The instructor or Academic Dean may be witnesses at the hearing conducted by the Academic Integrity Appeals Board, but shall not have responsibility for conducting the hearing.

(4) Determination that No Academic Misconduct Occurred: ?If, after the hearing, the Academic Integrity Appeals Board determines that there is insufficient evidence that academic misconduct occurred or that no disciplinary sanction is appropriate under the circumstances, the Academic Integrity Appeals Board shall notify the instructor, the Academic Dean and the Office of the Provost. The Office of the Provost shall promptly thereafter notify the student and take appropriate action with respect to the student records.

(5) Process Following Determination by the Academic Integrity Appeals Board that Academic Misconduct Occurred:

(a) If, after the hearing, the Academic Integrity Appeals Board determines that academic misconduct did occur and that one or more of the disciplinary sanctions listed under paragraph III, subsections (1) (a) through (h) is appropriate, the Academic Integrity Appeals Board shall prepare and forward to the Office of the Provost, within 10 days, a written Finding of

Misconduct which shall include identification of the student, a description of the misconduct and a specification of the disciplinary sanction to be imposed.

(b) Within 10 days following receipt of the written Finding of Misconduct from the Academic Integrity Appeals Board, the Office of the Provost shall provide written notice of the imposed discipline to the instructor, the Academic Dean and the student. ?

Academic Standing

[Warning Notice](#)

[Probation](#)

[Academic Dismissal and Reinstatement](#)

[Graduate Fresh Start](#)

GPA Minimum

No more than 6 course credits of grades below a B may be counted toward the master's degree; no more than 9 credits of the same grades may be counted toward the doctorate. ?**No graduate degree will be awarded to any student whose overall cumulative grade point average falls below 3.0.**

Academic Standing

Graduate academic standing is run three times per year - Fall, Spring and Summer.?

The consequences of the academic standing of warning or suspension will not apply for students completing degree requirements for that semester.

Warning Notice

Any graduate student whose semester grade point average (GPA) falls below 3.0 will automatically receive a **warning** notice which will

also be sent to the graduate coordinator, and filed with the student's record in the Registrar's Office. The student will be strongly advised to meet with the graduate coordinator or his/her designee within 30 days of receipt of the warning notice and develop an academic plan to bring his or her GPA to a level above 3.0.

Probation

Any graduate student whose semester GPA falls below 3.0 for a second time, will automatically receive a letter of **probation** from the Vice Provost for Graduate Education. Copies of the letter will be sent to the graduate coordinator, chairperson, college dean, and also placed on file with the student's record in the Registrar's Office. Within 30 days, the department graduate committee, chaired by the graduate coordinator or his/her designee, will meet with the student and decide whether to recommend loss of degree candidacy. Such a decision or other course of action will be fully documented in writing with copies sent to the chairperson, and college dean. A recommendation of loss of degree candidacy and dismissal are subject to the approval of the college dean.

Academic Dismissal and Reinstatement

Any student whose semester GPA falls below 3.0 for a third time, and whose cumulative GPA is below 3.0, will automatically be **dismissed** from his or her graduate program and the University. Reinstatement will be considered if the student provides a detailed justification and academic plan concerning how he or she will correct this academic deficiency. The plan must be attached to a Graduate Academic Petition and approved by the graduate coordinator, chairperson, the college dean, and the Vice Provost for Graduate Education or his/her designee. **If any of the above individuals disapproves of the reinstatement, the dismissal will remain in effect and no subsequent appeals will be considered.**

Independent of the warning/probation/dismissal system, the dean of the college where the student's degree program resides may at any time examine the performance of any student not meeting the academic standard expected of graduate students within that college and recommend to the appropriate graduate committee a course of action including dismissal.

For the procedure for formal adjudication of any academic issues (non-misconduct) which may arise, please see University Appeals Process Regarding Academic (non-misconduct) Issues of Graduate Students.

Graduate Fresh Start

Master and Doctoral degree candidates and non-degree students who have been absent from the University for four years or longer may be readmitted under the program Graduate Fresh Start. If admitted into a degree granting program, under the terms of Graduate Fresh Start, a returning graduate student will be treated as if s/he were a new student. A maximum of two courses (six credits) at the 500 level or higher completed during earlier periods of enrollment with grades of "B" or better may, with the approval of the degree granting department, be transferred into the degree program. These courses must be transferred via an academic petition and will be accepted toward graduation but not included in the cumulative grade point average (GPA). Thesis and dissertation research credits are ineligible for transfer. Courses completed during earlier periods of enrollment with grades below "B" are not eligible for transfer. A student may be readmitted under the Graduate Fresh Start program only once at the graduate level.

Students who wish to be considered for the Graduate Fresh Start Program must follow the normal procedures for admission to the University and file a Graduate Fresh Start contract at <http://www.uml.edu/catalog/graduate/policies/Fresh%20Start%20Contract.pdf>. Academic Petitions for transfer credits must be approved by the appropriate graduate coordinator and/or department chair of the degree granting department, and must be filed with the University Registrar. In addition, the student must submit a personal statement which addresses personal and professional growth during the period of time in which the student was absent from the University which supports the student's potential for academic success. If admitted, credits and GPA start at zero. Transfer courses may count towards the degree, but are not included in the GPA.

All courses taken and grades achieved during earlier periods of enrollment will appear on the transcript along with a notation that they are not included in the cumulative grade point average. Once this change is made to the academic record, the change can NOT be reversed.

Acceptance of Foreign or American Master's Degree toward Doctoral Requirements

Students accepted into a doctoral program who hold a master's degree in the same or a closely related discipline from a U.S. or foreign academic institution will have their transcripts and supporting documentation reviewed by the department graduate committee.

The committee may choose one of the following actions:

1. Approve all coursework and thesis for the master's degree up to the total number of credits granted by the University of Massachusetts Lowell department for its master's degree, and thereby require the student to complete only "beyond the master's" course/thesis credits for the doctorate.
2. Accept the U.S. or foreign master's degree, but because of deficiencies in the student's master's program, require a limited number of graduate courses to be added to the total credits required for doctoral degree completion "beyond the master's".
3. Require that a student with a U.S. or foreign master's degree obtain a University of Massachusetts Lowell master's degree before proceeding to the doctorate.

All coursework for U.S. or foreign master's degrees considered for approval by the department must be at a grade level of B or better. Official, documented verification of the degree awarded must also be provided.

Commencement

[Commencement](#)

[Conferring of Degrees](#)

[Academic Honors?](#)

[Replacement Diploma](#)

Commencement

Graduation exercises are held once a year at the end of the spring semester. Students who have completed degree requirements during the previous summer term or fall semester are permitted to attend commencement exercises, and their names are listed in the commencement booklet. Attending commencement exercises is not compulsory. An individual who wishes to receive a diploma by mail must notify his/her college dean and file a corrected address through student self service if he or she anticipates moving from a previously reported permanent address.

Conferring of Degrees

Diplomas are awarded three times a year:

1. In June for students completing degree requirements during the spring semester.
2. In October for students completing degree requirements during the summer term.
3. In February for students completing degree requirements during the fall semester.

Individuals who wish to submit verification of degree completion to employers or to graduate schools during the period between the end of their final grading period and the awarding of diplomas may obtain a letter of completion from the Registrar's Office.

Academic Honors

Due to the many fields and diversity of study at UMass Lowell, academic honors for graduate students are discipline-based and vary within respective colleges. Honors for graduate students are not listed on transcripts.

Replacement Diploma

Replacement diplomas may be ordered through University Alumni Relations for an additional fee.

Registration and Enrollment Policies

[Continuous Registration](#)

[Dropping Classes and Refund Policy](#)

[Changes in Registration](#)

[Change of Program](#)

Continuous Registration

In order to maintain continuity of enrollment, a matriculated student must register each fall and spring until the program of study is complete and the degree has been earned. A graduate student who plans to receive his/her graduate degree in the summer term (awarded in October) must register during the previous summer session in order to maintain continuous matriculation.

If for any reason a student is not registered for a course (because of a leave of absence or because the thesis or dissertation has been successfully defended, but the final manuscript has not been submitted to the library), the student must register for CM.601.201 (Continued Matriculation) in order to maintain continuous registration. Since students are not allowed to register if they have outstanding financial obligations to the university, it will be necessary for them to clear their financial record in order to register for Continued Matriculation.

Continued Matriculation does not entitle a student to any use of university facilities, services or resources, but only maintains an active record and provides for appropriate mailings. Students who are engaged in academic work necessary to complete their thesis or dissertation, participate in a required full time internship or curricular practical training, or otherwise engage in or make use of University facilities or other resources must register for a minimum of 1 credit. (Note: Specific internship/CPT requirements will vary by department and students may be required to register for 3, 6, or 9 credits depending upon their program of study.)

The rules regarding the Statute of Limitations for the completion of master's and doctoral degrees still apply to students registered for Continued Matriculation.

All international students on F-1 or J-1 visas must register as full-time students (9 credits) each semester until their degree requirements are completed. Any variance from this policy must be approved by the International Student and Scholars Office.

A student who fails to maintain continuous matriculation loses the status of a degree candidate and must reapply to the () for readmission and for renewal of candidacy.

Dropping Classes and Refund Policy

Graduate students may drop courses during the first ten days of classes and receive a refund. No refund will be given after these time periods. To formally withdraw from a course during this period, or thereafter, the student must drop the course through self service (S). If the student fails to officially drop a course, he or she will remain enrolled and be required to pay for tuition and fees. In addition, if the student does not drop a course and does not attend classes, he or she will receive an "F" on the official transcript.

Changes in Registration?

Courses may be added or dropped through self-service in (S). Students who wish to add a course during the sixth through 10th day of classes will need a permission number from the instructor of the course. Permission numbers are not needed to drop a course. In addition, students may change from audit to credit or from credit to audit during this period. Courses dropped during the first 10 academic days will not appear on the student's permanent record. No new courses may be added and no course may be changed from audit to credit after the tenth academic day. Thereafter, a student wishing to drop courses must do so by the date indicated in the Graduate Academic Calendar (S). ?

No refund of tuition and fees is allowed after the tenth day of the semester. The grades for courses dropped after the tenth day will appear as W on the student's record. ?

Change of Program

A graduate student wishing to change departments or transfer to a doctoral program upon completion of his or her master's degree must follow the steps listed below:

1. No transfers will be considered until the student has been in the original department in which he or she was accepted for at least one semester.?
2. All sections of a new application sheet must be completed.?
3. If so desired, the student may request that all test scores, letters of recommendation, etc., in his or her original file be used as part of his or her new application package.?
4. The student must specify on the application form when his or her master's degree will be completed and when he or she will actually begin doctoral studies (for students applying to a doctoral program).?
5. A check made payable to University of Massachusetts Lowell to cover the application fee must be included, or payment must be made by credit card when applying online.?

Course Credit

[Maximum Semester Credit Limit?](#)

[Graduate Credit for Undergraduate Courses](#)

[Undergraduate Credit for Graduate Courses](#)

Maximum Semester Credit Limit

The usual course load for full-time graduate students is 9 credits/semester. Depending upon the program requirements and abilities of the student, individuals may carry more than 9 credits each semester. However, the absolute maximum number of total credits (combined undergraduate and graduate) for which a graduate student will be allowed to register is 18 credits/semester. The maximum number of thesis or dissertation credits for which a student may enroll in any semester is nine credits.

During the summer term students are classified as full-time when they are registered for a minimum of 9 credits which may combine courses/credits from the different sessions within the summer term. Students who enroll in **only** one of the accelerated summer session (summer I or summer II) may be considered by the institution as the equivalent to full-time for the specific time period of that session **only** when registered for a minimum of 6 credits. This is for enrollment purposes only. Please note: Financial aid, veterans benefits or other types of aid define 9 credits for full-time study.?

?

Navitas Summer Pathway Program

The University of Massachusetts Lowell (UMass Lowell) offers a 10-week summer session to its Pre Undergraduate and Pre Master s international students. These students are admitted into a Bachelor s or Master s program with the condition of a preparatory semester(s) which could encompass the summer session.?? The Pre Undergraduate and Pre Master s summer session consists of? intensive academics? of? 18-22 clock hours per week in English, Mathematics and Cultural Support.

Graduate Credit for Undergraduate Courses

UMass Lowell courses at the 400 level are designed for seniors but under certain circumstances may be taken by graduate students for graduate credit. A maximum of 6 credits of 400 level courses may be used for credit toward the graduate degree with the permission of the degree granting department. Three hundred level courses and below are never counted toward a graduate degree. If a graduate student takes certain undergraduate courses to make up for background deficiencies or to satisfy language requirements, the course credit hours are not used as part of the graduate degree program but will appear on the graduate transcript.?

Undergraduate Credit for Graduate Courses

A qualified junior or senior may take a course at the 500 level for undergraduate credit in accordance with the policy and procedures of

the department or college in which the course is offered. The grade received in any such course is used in calculating the undergraduate's cumulative grade point average. Counting of graduate credits for both the bachelor's and master's degrees is subject to departmental requirements.

At no time may grades computed in an undergraduate GPA be used toward a graduate GPA.

Course Designations

- [Course Numbering System](#)
- [Continuing Graduate Research](#)
- [Course Prefixes](#)
- [Audit](#)

Maximum Semester Credit Limit

The usual course load for full-time graduate students is 9 credits/semester. Depending upon the program requirements and abilities of the student, individuals may carry more than 9 credits each semester. However, the absolute maximum number of total credits (combined undergraduate and graduate) for which a graduate student will be allowed to register is 18 credits/semester. The maximum number of thesis or dissertation credits for which a student may enroll in any given semester is nine credits.

Course

Numbering System and Designation:

- 4000-4999 - Undergraduate courses usually designed for juniors or seniors; no more than six credits may be taken for graduate credit with the permission of the graduate coordinator.
- 5000-5999 - Courses for graduate credit, but which may be taken by advanced undergraduates with the advisor's permission.
- 6000-6999 - Graduate courses which are open only to graduate students.
- 7000-7999 - Seminars, special topic courses, projects, or thesis research for advanced candidates in master's and doctoral degree programs.

Each course offering is designated by a four letter prefix and a four-digit course number (e.g., BIOL.5290).

Continuing Graduate Research

Once a student has completed the required number of credits for master's or doctoral thesis/dissertation research with grades of PR or S (see summary of degree credit requirements), he or she will not be allowed to sign up for additional thesis/dissertation research credits. Instead, if required for teaching/research assistantships or immigration/visa purposes, the student may enroll in 3, 6, or 9 credits of Continuing Graduate Research designated __763, 766, or 769___ where the first two blanks represent the departmental designation, 3, 6, and 9 indicate the respective number of credits, and the last three blanks are the standard numbers which code to a particular faculty member in the department.

The two digit college prefix identifies a college department and/or special area. The three-digit course number identifies the course level.

Course Prefixes

Each college department and/or special subject area has been assigned an identifying two digit number within the numerical ranges specified as follows:

- Education - EDUC
- Engineering - CHEN, CME, EECE, ETEC, ENVE & MECH, MTEC, ENGY, ENGN, PLAS
- Health - PUBH & AREO, HSCI, NURS, DPTH, NUTR, HSCI, MLSC, EXER
- Humanities/Social Sciences, Fine Arts - AMST, LGST, ENGL, HIST, CRIM, PHIL, POLI, PSYS, ASP, SOCI, ECON, WLFT, WLGE, WLIT, WLAR, WLKH, WLCH, WLPO, WLAN, WLSI, WLSP, WLLA, ARHI, FAHS & ARTS, MUTH, MUAP MUED, MUHI, MUPF, MUEN, MUBU, MUSR, AEST
- Management - ACCT, FINA, MKTG, POMS, MIST, ENTR, MGMT, BUSI
- Science and Math - BIOL, LIFE, CHEM, ATMO, ENVI, GEOL, INFO, COMP, MATH, MSIT, PHYS, POLY, RAD1
- Biomedical Engineering - BMBT
- Marine Science - im

Audit

A graduate student may, upon approval of the advisor and the instructor, register for a course on an audit basis, but must pay the full amount of tuition and fees. An audit student is not required to take tests or the final examination. A change in registration from audit to credit or credit to audit must be done during the add/drop period. Under no circumstances can a course taken for audit be given credit at a later date.

General Regulations for Graduate Students

Each University student is subject to two sets of academic regulations - those of the University as a whole, which are cited in this section, and the academic rules of the college and program in which he or she is enrolled. The academic rules of colleges and programs are listed in sections devoted to college programs.

In registering for courses, each student assumes full responsibility for knowledge of and compliance with the definitions, regulations, and procedures for the University, as set forth in this publication. Moreover, in accepting admission to the University, each student assumes responsibility for knowledge of and compliance with the definitions, regulations, and procedures of the University pertaining to his or her student status as set forth in the appropriate UML publications.

Students who have questions about the interpretation or application of University academic policy should consult the dean of their college or the Vice Provost for Graduate Education.?

Equal and Fair Treatment

Under federal and state laws, all students are protected from discrimination based on race, color, religion, national origin, disability, gender, (including sexual harassment), age, sexual orientation, marital or veteran status. If you feel that you have been discriminated against based upon any one of these areas, you must contact Equal Opportunity and Outreach (EOO). These protections also include retaliation for filing complaints of discrimination. Concerns regarding course offerings, instructor and student attitudes should also be directed to EOO staff at 978-934-3565.

Students are responsible for adhering to the policies of the University regarding equal and fair treatment.

Graduate Grading Policies

[Grading System](#)

[Grade Exclusion](#)

[Grades for Projects, Theses/Dissertations and Seminars](#)

[Incompletes](#)

[Course Listing on the Graduate Transcript ?](#)

[Audited Courses?](#)

Grading System

The grading system uses grades:

A+(4.0), A(4.0), A-(3.7)?

B+(3.3), B(3.0), B-(2.7)?

C+(2.3), C(2.0)

F(0.0)

FX (0.0) Failed due to Academic Misconduct (May not be replaced or deleted)

The following special grades are also used:

INC (Incomplete),?

S (Satisfactory, B or better),?

U (Unsatisfactory) for projects, theses/dissertations, and seminars only

AU (Audit)?

W (Withdrawal from a course or from the University)?

X (Withdrawal because of illness or personal emergency)?

Y (Administrative dismissal),?

Q (Never attended but did not withdraw. This grade requires a letter from the instructor to the University Registrar stating the student never attended the class.)

PR (In Progress for theses or dissertations)?

NC (No Credit for theses or dissertations where no progress has been made).?

A student registering for research will do so each semester up to the total number recommended. ?No graduate degree will be awarded to a student whose cumulative average for course work in his or her program is below 3.0. ?Some programs may require a higher grade point average for graduation. The cumulative grade point average is computed from all graduate level courses taken for a grade at the University of Massachusetts Lowell.?

Grade Exclusion

A request may be submitted to omit a specific course (grade and credits) from the GPA for matriculated students. Such a request must be presented on an Academic Petition, provide detailed justification for the specific action, and certify that the action has been approved by a majority of the departmental graduate committee. Only one grade exclusion in total, including a grade for a repeated course, will be permitted for each degree sought by the student as recommended by the departmental graduate committee. ?However, the official transcript will list grades for all undergraduate and graduate courses taken at the University with the notation that the grade and credits are excluded from the GPA. ?Grade substitutions are not permitted.?

Grades for Projects, Theses/Dissertations and Seminars

- **Projects** (Enrollment Restricted to Matriculated Graduate Students):
Only one of three grade designations will be allowed for projects:
S for projects completed at a satisfactory level
U for unsatisfactory completion of a project (no credit toward degree requirements)?
INC Incomplete
- **Theses/Dissertations** (Enrollment Restricted to Matriculated Graduate Students):
PR will be given for thesis/dissertation research if the student has made satisfactory progress during the semester.
NC will be given if the student has made no progress during the semester on thesis/dissertation research.
U Unsatisfactory (no credit toward degree requirements)

After successful defense of the thesis/dissertation, a grade of "S" (Satisfactory) will be given for all semesters of the thesis/dissertation research. ?Only the Registrar's Office can issue this grade.

- **Seminars:**

- S** - Satisfactory
- U** - Unsatisfactory (no credit toward degree requirements)
- INC** - Incomplete

Under no circumstances will letter grades (A, B+, etc.) be allowed for projects, theses/dissertations, or seminars.

Incompletes ?

If, because of unusual circumstances, a student is unable to meet all the requirements of the course by the end of a semester, the grade of Incomplete (INC) may be given. Responsibility for making arrangements with an instructor to complete all outstanding coursework rests entirely with the student, who must complete all outstanding coursework by the date listed on the (). Under no circumstances will a student be allowed to graduate with incomplete(s) on his or her transcript.

Prior to completion of the missing work, the incomplete will not be computed into the grade point average (GPA). If the student completes the missing work within the specified period, the instructor must evaluate the work and turn in a grade change form to the Registrar's Office before the deadline for instructors to submit final grades for incomplete courses as specified on the??(). However, if the student does not complete the missing work by the specified date and no grade change form is submitted by the instructor, the student's grade will automatically change to a grade of "F" and be computed into the GPA.

Course Listing on the Graduate Transcript?

All graduate courses for which a student registers (including repeated courses) are listed on the transcript and are used to calculate the student's grade point average whether or not they are taken to fulfill degree requirements. In addition, undergraduate courses which a student takes to fulfill prerequisite requirements before or during matriculation in a graduate program, or courses taken for personal enrichment, will also be listed on the transcript.

Audited Courses

A graduate student may, upon approval of the advisor and the instructor, register for a course on an audit basis, but must pay the full amount of tuition and fees. An audit student is not required to take tests or the final examination. A change in registration from audit to credit or credit to audit must be done during the add/drop period. Under no circumstances can a course taken for audit be given credit at a later date.?

Graduate Clearance

Applying for graduation is a two step process for graduate students. ?

First, the student must file a with the Registrar's Office. ?The Registrar's Office will mail the Graduate Clearance Form to students. ?

When the student receives the "Graduation Clearance" form, it must be completed, approved by all appropriate faculty and submitted to the Registrar s Office by the date listed in the Graduate Academic Calendar.?

The registrar's office will verify course credit credit, grade and GPA requirements, and submission of thesis/dissertation (if applicable) prior to the awarding the degree.?

Additional Requirements for Students Completing a Thesis or Dissertation?

All students who are completing a thesis or dissertation must also submit one clean copy (NOT the original) of the signature page for the thesis or dissertation. ?The signature page must be signed and dated by the thesis/dissertation advisor and all committee members. ? Copies of the Thesis or Dissertation must be submitted to the Library for binding and microfilming by the deadline dates listed for degree clearance. ?In addition, doctoral students are required to submit a completed "Survey of Earned Doctorates" at the time of earned doctorates. Unless the Registrar s Office receives the completed signature page which verifies that a student has successfully defended the thesis/dissertation on or before the "last day to submit clearance forms" in the Graduate Academic Calendar and confirms that the thesis/dissertation has been submitted to the library, the student will not be eligible to graduate.?

Graduate Grade Appeal Process for Students

The instructor of the class is the primary authority with respect to a student's proficiency and final grade in that course. A student who believes that his or her final grade reflects an erroneous, capricious, arbitrary, or prejudiced academic evaluation may appeal the grade. The academic judgment used in determining the merits of the grade to be awarded shall not be reviewable. This process does not apply to cases of academic dishonesty, which are adjudicated through the "academic dishonesty process."

1. The student may file an appeal of his or her complaint, in writing, to the instructor within 30 days after a final grade is posted to the student's record. The instructor must respond within 14 days of receiving the appeal.
2. If the student remains dissatisfied by the decision of the instructor under step (1), he or she may, within 14 days after formal receipt of the instructor's final decision, appeal, in writing, to the chairperson of the program (or the Dean of the College if the instructor is the chairperson) in which the course or other exercise or activity is offered. The chairperson must respond within 14 days of receiving the appeal. The decision may be: (a) that the appeal be dismissed; (b) if there is demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the chairperson will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or (c) that another appropriate remedy be administered.
3. If no satisfactory resolution is reached in step (2) then the student or the instructor may appeal, in writing, to the Dean of the College within 14 days after formal receipt of the chairperson's final decision.
4. The Dean, after discussion with the appropriate parties, may resolve the grievance by agreement or render a decision within 21 days of receipt of the written appeal. The decision may be: (a) that the appeal be dismissed; (b) if the student provides demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the Dean will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or (c) that another appropriate remedy be administered.
5. The decision of the Dean is final and not subject to additional appeal by either student or instructor. The appeals process ends at this step.
6. The Department chair or his/her designee is responsible for keeping a record of the appeal on file in accordance with University Records Retention Policy.

Right of Access to Student Records

- [Access](#)
- [University Student Records](#)
- [Release of Student Records](#)
- [Release Exclusions](#)
- [Additional Information](#)

Access

The Family Educational Rights and Privacy Act of 1974 (FERPA) grants any student currently in attendance, or any former student, the right of access to inspect or review his or her educational files, records, or data. Students who wish to inspect their records must file a Right of Access form with the office or department in which the desired record is kept. Right of Access forms are available in the Office of Student Services or through student self service. Wherever practicable, within ten days of receipt of the Right of Access form, the office or department will notify the student as to the date, time, and location when the desired record will be available for inspection. If a student believes that circumstances effectively prevent inspecting and reviewing the records at the designated date, time and location, he or she may request alternative inspection arrangements or copies of the records instead, subject to a fee for copies. The Dean of Students or the Dean's designee will consider the request.

University Student Records

The University maintains the following general records on students:

Admission File - -

Permanent Academic Records - -

Financial Aid Records - -

Health Records - -

Account and Payment Records - -

Campus Conduct Records - -

The file of each student must contain a record of all non-University affiliated individuals or organizations requesting access to information in the file, plus statements that specify the legitimate educational purposes for which access was requested.

Except as otherwise permitted under FERPA, information or records concerning individual students may not be released to any individual or agency without the student's written permission. Any request for such information received without such written permission will not be honored and will be returned with a request for a written release from the student.

Release of Student Records

FERPA allows release of a student's education records without the student's written permission under certain circumstances, including the following:

1. To personnel of the University, i.e., faculty, administrators, or staff for legitimate educational purposes only.?
2. To officials of other institutions in which the student seeks admission or intends to enroll, provided that the student is notified of the release.?
3. To federal or state officials in connection with the audit and evaluation of programs funded by federal or state governments, with the enforcement of legal requirements that relate to such programs, or in connection with the student's application for or receipt of financial aid.?
4. To accrediting organizations in order to carry out their accrediting functions.?
5. To parents who claim the student as a dependent on their IRS statement.?
6. In connection with an emergency, to appropriate persons if revealing such information is necessary to protect the health or safety of the student or other persons.?
7. In response pursuant to a validly issued subpoena, subject to advance notification of the student unless such notice is prohibited by court order.?
8. As otherwise permitted under or consistent with FERPA.

The following data are considered informational in nature and may be released without the permission of the student, at the discretion of the University: student's name, major, acknowledgement of a student's participation in officially recognized activities and sports, weight and height of members of athletic teams, date(s) of attendance; degrees, certificates, awards received; the most recent previous educational agency or institution attended by the student and appointment as a Resident Assistant or Community Development Assistant. ?For graduate students who are teaching credit courses, work department, office address, and employments category are also defined as directory information.

Release Exclusions

Any student who wishes to have some or all of his or her directory information excluded from release by the University without prior permission must complete the appropriate selections available thru . ()

Additional Information

Any student who believes that his or her records are inaccurate or misleading may request a hearing with the Dean of Students to discuss the contents of such records and whether or not they need to be changed. Additional information on procedures or policies relating to University compliance with the Family Rights and Privacy Act can be obtained from the Office of Student Services or the Registrar's Office.

Statute of Limitations (Time Limit for Degree Completion)

A graduate degree, at either the master's or doctoral level, implies a significant mastery of a discipline within a specified time period. A well designed curriculum is not a mere collection of classes that add up to a set number of credits. ?It is, rather, a coherent selection of courses with an overall educational achievement that is greater than the sum of its parts. However, this coherence is lost if the program is completed over a long time span.?

Master's degree requirements must be completed within a **five-year** period from the semester of admission. For those master's programs requiring 45 or more credits, the time limit is six years. ?

The doctoral degree must be completed within an **eight-year** period beginning with the semester of admission as fully matriculated or matriculated with conditions.?

A student may obtain an extension of one year by filing an () signed by his or her coordinator, department chair, and college dean, and which is then submitted to the Registrar's Office. ?

Time Extension Appeal Procedure

In exceptional cases, an additional extension may be granted by the Graduate Policy and Affairs Committee (GPAC). In this case, the student must submit an??(), a letter of explanation accompanied by a detailed schedule for degree completion, and a letter from the student's coordinator or thesis advisor in support of the request.

Transcripts

In order to obtain a transcript, a student may print an unofficial transcript or order an official copy though self-service in (). ?If ISIS is not available, a transcript may be ordered by filling out a () and submitting it to the University of Massachusetts Lowell Registrar's Office at 883 Broadway Street, Lowell, MA 01854.?

Course Listing on the Graduate Transcript

All graduate courses for which a student registers (including repeated courses) are listed on the transcript and are used to calculate the student's grade point average whether or not they are taken to fulfill degree requirements. In addition, undergraduate courses which a student takes to fulfill prerequisite requirements before or during matriculation in a graduate program, or courses taken for personal enrichment, will also be listed on the transcript.

Transfer Credit

The following are minimal guidelines for transfer of credit. Individual departments are free to impose more stringent requirements. Only courses completed elsewhere within five years prior to the date of admission to a graduate degree program at the University of Massachusetts Lowell may be considered by the faculty of the department for transfer in accordance with the following regulations.

1. A maximum total of 12 graduate credits earned with a grade of B or better taken at another accredited institution may be transferred to a master's degree program (see individual programs for further restrictions, if any). A maximum of 24 credits with a grade of B or better may be transferred to a doctoral program. The limits of 12 credits toward a master's and 24 toward a doctoral degree do not apply to any credits earned at UMass Lowell by students while in a non-degree or undergraduate BA/MA or BS/MS status, provided the courses were taken within the department offering the master's or doctoral degree.
2. Grades of C or better for courses taken at UMass Lowell when the student held non-degree status may also be transferred (by Academic Petition) into a degree program. However, the 6 and 9 credits with grades below a B (graduation limit) for master's and doctoral degrees, respectively, (see Retention Policy) and calculation of the cumulative grade point average based on all graduate courses taken at the University (see Academic Grades) remain in effect.
3. An official transcript and description of the course(s) must be submitted with the written request.
4. The courses presented must be from an accredited U.S. or Canadian institution authorized to grant graduate degrees.
5. The courses presented for a master's degree must not have been used in earning another master's degree.
6. The courses presented must be appropriate to the degree program for which the applicant is applying.
7. The courses presented must be graduate level.
8. Transfer credit may not be granted for research seminars, clinical courses, practica, internships, or special projects.
9. Transfer credit from another U.S. or Canadian institution must not exceed equivalent course credit (typically 3) at UMass Lowell, and will be based on UMass Lowell's standard of 37.5 semester contact hours being equal to 3 credits. One and two course credit transfers will also be considered providing they are proportional to the 37.5 semester contact hour standard.
10. Students who wish to transfer credit must file (within the first semester of matriculation) the Academic Petition form available from the Registrar's Office.?
11. With the approval of the department, a maximum of 6 credits of 400 level courses taken at the University of Massachusetts Lowell with grades of C or better, not used for the baccalaureate degree, may be considered for transfer and counted toward the graduate degree.

University Appeals Process Regarding Academic (Non-Grade Appeal and Non-Misconduct) Issues

The underlying purpose of the University's appeals procedure is to guarantee due process and to protect the rights of both students and faculty in graduate programs.?

The following procedure provides a mechanism for formal adjudication of any academic issues (non-misconduct and not related to grade appeal) which may arise.(For information regarding the process for grade appeals, see the Graduate Grade Appeal Process.)?

Responsibility for initiation of each of the steps belongs to the appellant.

Step 1. If an informal discussion between the student and the instructor or individual with whom the student has a conflict does not resolve the issue, the resolution of an academic appeal of a student should begin within the department. The first step in the resolution of a problem or disagreement should be a discussion between the instructor, the student, and his/her faculty advisor or the coordinator of the program.

Step 2. If the matter cannot be resolved after such a discussion, a formal appeal, in writing and containing the pertinent facts, should be presented by the student to the chairperson/head of the department within two months of the occurrence that precipitated the appeal. Any appeal made outside this time period shall not be considered by any University body. ?The chairperson of the department will appoint committee composed of faculty members in the department. Within seven working days, this committee shall convene and discuss the appeal with the student and the instructor, coordinator, or individual with whom the student has a conflict. The student may be accompanied by his or her advisor or a faculty representative during the discussion of the appeal. The committee, by a majority vote after deliberations with only members of the committee present, shall render a decision within five working days and notify the appropriate parties in writing with the rationale for the decision included in the notification.

Step 3. If the decision of the departmental committee is not satisfactory to all parties, the appeal may be forwarded to the College Dean within two weeks of the decision of the departmental committee. ?The Dean will appoint a college committee composed of area coordinators of all graduate programs within the college or a suitable committee of faculty. ?The committee will be chaired by the college dean, or his/her designee. Within seven working days, the committee shall convene and discuss the appeal with the student. At this level the student may request to be present at the committee meetings, that discussions or proceedings be tape recorded, and that a transcript be prepared from the tape. The request for a recording must be made at the time the appeal is made to the college committee. The college committee shall render a decision by majority vote after deliberations with only members of the college committee present within five working days and notify the appropriate parties in writing with the rationale for the decision included in the notification.

Step 4. If the decision of the college committee is not satisfactory to all parties, the appeal may be forwarded to the Graduate Policy and Affairs Committee (GPAC) within ten working days after the decision of the college committee. The committee shall convene within 10 working days after the GPAC chairperson has received a written request for a hearing from the appellant, and discuss the appeal with the student and faculty advisor or representative. A request for recording and preparing a transcript of the

discussions with the student present may be made at the time of appeal. The committee shall render a written decision within five working days and notify the appropriate parties. The decision of the Graduate Policy and Affairs Committee shall be final, and the information accumulated during the appeal procedure shall be forwarded to the Provost to be kept on file. If any decision involving the awarding of a degree is made and the official deadline for graduation exercises has passed during the appeal, the degree date will reflect the initiation of the appeal.

The above time periods define working days as days when classes are in session for the fall and spring semesters. Efforts will be made to honor the same time periods during intercession and June - August although some flexibility must be accepted by the appellant because of potential difficulties in assembling committee members during these periods.?

The GPAC chairperson may modify the Step 4 hearing time framework at his/her discretion to coincide with regularly scheduled GPAC meetings. In either of the above cases, the appellant must be notified in writing by the hearing officer (along with an explanation) of any modification of the hearing time schedule. The chairperson may recommend that final voting/discussion of Step 4 cases be done in Executive Session with only committee members present.

University Disciplinary Procedures for Graduate Students

Academic Dishonesty -

Administrative Dismissal from the University

Administrative dismissal may be invoked when a student fails to comply, after due notice, with an administrative regulation of the University. Examples of some conditions which justify administrative dismissal are listed in the Undergraduate Catalog at ?and apply to all students, undergraduate and graduate.

Non-Academic Misconduct

Improper conduct or behavior of graduate students is subject to the University of Massachusetts Lowell Student? [Conduct Code and Judicial Process](http://www.uml.edu/student-services/DOS_Documents/Student%20Conduct%20Code%20&%20Discipline%20Process.pdf) (www.uml.edu/student-services/DOS_Documents/Student%20Conduct%20Code%20&%20Discipline%20Process.pdf). Copies of this document may be obtained from the Dean of Students Office.

Withdrawal Policies

[Withdrawal from a Course](#)

[Withdrawal from the University?](#)

Withdrawal from a Course

A student finding it necessary to withdraw from a course must do so within the time specified in the graduate (). The student's permanent record will indicate a grade of W for the course(s) from which he or she has withdrawn unless the withdrawal has taken place within the first 10 class days of the semester during which time no record will be kept. (See in this Catalog for information on dropping a course.)?

Withdrawal from the University?

A student who wishes to withdraw from the University must submit his/her request in writing to the Registrar's Office. This procedure ensures that the student's academic and financial obligations are cleared before leaving the University. If a student officially withdraws from the University by the withdrawal date indicated in the graduate academic calendar, the permanent record will indicate a grade of W. If the student fails to follow the official withdrawal procedure and does not withdraw in good standing, the student will not be permitted readmission to a graduate program at the University except under extenuating circumstances.?

All previous application materials will remain on file for a two year period. At any time during this period, a student who has officially withdrawn may request readmission by completing and submitting only the cover page of the graduate application and paying the application fee. After two years, a student must file a new, complete application and submit the appropriate fee to the () in order to be readmitted.

Academic Integrity

Statement of Principles

The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others academic endeavors. Academic dishonesty is prohibited in all programs of the university.

Academic Misconduct Subject to Disciplinary Action

(1) Academic misconduct is an act in which a student:

- (a) Seeks to claim credit for the work or efforts of another without authorization or citation;
- (b) Uses unauthorized materials or fabricated data in any academic exercise;
- (c) Forges or falsifies academic documents or records;
- (d) Intentionally impedes or damages the academic work of others;
- (e) Engages in conduct aimed at making false representation of a student's academic performance; or
- (f) Assists other students in any of these acts.

(2) Examples of academic misconduct include, but are not limited to: cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; getting unauthorized access to examinations or course materials; submitting, without the permission of the current instructor, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.

Possible Disciplinary Sanctions?

?

(1) The following are the disciplinary sanctions that may be imposed by an instructor for academic misconduct:

- (a) An oral or written notice of misconduct;
- (b) An assignment to repeat the work, to be graded on its merits;
- (c) A lower or failing grade on the particular assignment or test;
- (d) A lower grade in the course;
- (e) A failing grade in the course;

In addition, an instructor or the Academic Dean may recommend the following sanctions:

- (f) A non-deletable failing grade in the course;
- (g) Suspension from the University;
- (h) Expulsion from the university.

?

Sanctions f-h are imposed by the Office of the Provost.

?

(2) One or more of the disciplinary sanctions listed above may be imposed for an incident of academic misconduct.

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Definitions

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As used herein:

- (1) Office of the Provost means the Provost, Vice Provost or a designee.
- (2) Days means academic calendar days and excludes Saturdays, Sundays, legal holidays and days upon which the university is closed.
- (3) Academic Dean means the Academic Dean or designee for the college in which the subject course is taught.
- (4) Instructor refers to the Instructor of Record.
- (5) Minor Disciplinary Sanction means a disciplinary sanction, identified in paragraph III (1) (a)-(e) and imposed, for academic misconduct, upon a student by an instructor.
- (6) Major Disciplinary Sanction means a disciplinary sanction, identified in paragraph III (1) (f)-(h) and imposed, for academic misconduct, upon a student by the Office of the Provost or the Academic Integrity Appeals Board upon the recommendation of the instructor or the Academic Dean or imposed at the discretion of the Office of the Provost.
- (7) Notice to the student, whenever required herein, shall be e-mailed to the student's official student.uml.edu e-mail address or mailed to the student by regular first class United States mail at his or her current address as maintained by the university.

?

Imposition of Disciplinary Sanctions by the Instructor

?

(1) Where an instructor concludes that a student enrolled in one of his or her courses has engaged in academic misconduct, the instructor may impose one or more of the following disciplinary sanctions, as listed under paragraph III, subsections (a) through (e):

?

- (a) An oral or written notice of misconduct;
- (b) An assignment to repeat the work, to be graded on its merits;
- (c) A lower or failing grade on the particular assignment or test;
- (d) A lower grade in the course;
- (e) A failing grade in the course.

(2) When possible, prior to imposing a minor sanction, the instructor shall notify the student that the instructor believes an act of academic misconduct has occurred, that a sanction may be imposed, and that a Notification of Academic Dishonesty Form will be filed with the Office of the Provost.

(3) Upon the imposition of a minor sanction under this section, the instructor shall notify the Office of the Provost. Notification to the Office of the Provost shall occur within 10 days, using the [Notification of Academic Dishonesty Form?](#)(pdf), and shall include identification of the student, a description of the misconduct and a specification of the sanction imposed.

(4) Within 10 days following receipt of such notice, the Office of the Provost shall provide notice of the imposed discipline to the student, the instructor and to the Academic Dean. Notification to the student shall include a statement of the misconduct, specification of the sanction imposed, a statement indicating the student's right to an appeal before the Academic Dean and a link to the policy and procedures set forth herein.

(5) A student who receives notice of a disciplinary sanction imposed under this section has the right to a hearing before the Academic Dean to contest the determination that academic misconduct occurred or the disciplinary sanction imposed or both. If the student desires such a hearing, he or she must file a written request with the Office of the Provost and the Academic Dean within 10 days of receipt of notice from the Office of the Provost.

(6) In the event that the student does not file a written request for an appeal within 10 days, the Office of the Provost shall review the matter with respect to the subject student and may, at his or her discretion, uphold the recommended sanction or impose a major sanction. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, the instructor and to the Academic Dean.

?

Recommendation of Major Disciplinary Sanction by the Instructor

?

(1) Where an instructor concludes that a student enrolled in one of his or her courses has engaged in academic misconduct in the course, the instructor for that course may recommend one or more of the following disciplinary sanctions:

(f) A non-deletable failing grade in the course;

(g) Suspension from the University

(h) Expulsion from the university.

(2) When possible, prior to the recommendation of a major sanction, the instructor shall notify the student that the instructor believes an act of academic misconduct has occurred, that a major sanction is being recommended, and that a Notification of Academic Dishonesty Form will be filed with the Office of the Provost.

(3) Upon the recommendation of a major sanction under this section, the instructor shall notify the Office of the Provost using the [Notification of Academic Dishonesty Form](#)?(pdf). Notification to the Office of the Provost shall occur within 10 days and shall include identification of the student, a description of the misconduct and a specification of the sanction recommended.

(4) Within 10 days following receipt of such notice, the Office of the Provost shall provide notice of the recommended discipline to the student, the instructor, and the Academic Dean. Notification to the student shall include a statement of the misconduct, specification of the sanction recommended, a statement indicating the student's right to an appeal before the Academic Dean and a copy of the policy and procedures set forth herein.

(5) A student who receives notice of a disciplinary sanction recommended under this section has the right to a hearing before the Academic Dean to contest the determination that academic misconduct occurred or the disciplinary sanction recommended or both. If the student desires such a hearing, he or she must file a written request with the Office of the Provost and the Academic Dean within 10 days of receipt of notice from the Office of the Provost.

(6) In the event that the student does not file a written request for an appeal within 10 days, the Office of the Provost shall review the matter and may, at his or her discretion, impose or modify the sanction recommended. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, the instructor, and to the Academic Dean.

?

Appeal to the Academic Dean

?

When an appeal to the Academic Dean is commenced in accordance with the provisions set forth in Paragraphs V(5) or VI(5), the Academic Dean shall proceed in accordance with this section to consider one or more of the disciplinary sanctions listed in paragraph IV, subsections (1) (a) through (h).

?

(1) Conference With Student: The Academic Dean shall offer to discuss the matter with the student. The purpose of this discussion is to permit the Academic Dean to review with the student the charges levied against him or her and to afford the student an opportunity to respond.

?

(2) Conference With Instructor: The Academic Dean shall attempt to discuss the matter with any involved instructor. This discussion may occur either before or after the conference with the student. It should include consultation with the instructor on the facts underlying the alleged academic misconduct and on the appropriateness of the imposed or recommended sanction.

?

(3) Determination that No Academic Misconduct Occurred: If, as a result of discussions under subsections (1) and (2), the Academic Dean determines that academic misconduct did not in fact occur or that the disciplinary sanction is not appropriate under the circumstances, the Academic Dean shall notify the instructor and the Office of the Provost. The Office of the Provost shall promptly thereafter notify the student and take appropriate action with respect to the student records.

?

(4) If, as a result of discussions under subsections (1) and (2), the Academic Dean determines that academic misconduct did occur and that one or more of the disciplinary sanctions listed under paragraph III, subsections (1) (a) through (h) is appropriate, the Academic Dean shall prepare and forward to the Office of the Provost, within 10 days, a written Finding of Misconduct which shall include identification of the student, a description of the alleged misconduct, a summary of evidence, findings of fact and a specification of the disciplinary sanction imposed.

?

Appeal to the Office of the Provost

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The decision reached by the Academic Dean may be appealed to the Provost Office of the Provost if the student believes that he or she did not receive due process.

?

Grounds for Appeal of Due Process

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An appeal to the Office of the Provost shall be limited to a review of supporting documents and the process and outcome of the Academic Dean or designee for one or more of the following grounds:

- Bias by the Instructor, Academic Dean, or designee substantially influenced the outcome of the process to the detriment of the student.
- New, relevant information has come to light that was not available at the time of the hearing by the Academic Dean.
- Unusual procedures were followed or the procedures outlined herein were not followed, to the detriment of the student.

If the student desires such a hearing, he or she must file a written request with the Office of the Provost and the Academic Dean within 10 days of receipt of notice from the Office of the Provost. The request must be based upon the Grounds for Appeal listed above.

?

(2) When an appeal to the Office of the Provost is commenced in accordance with this paragraph, the Office of the Provost shall review the matter with respect to the subject student and may, at his or her discretion, uphold, vacate or modify the discipline imposed or direct such appeal to be heard by the Academic Integrity Appeals Board. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, instructor, and to the Academic Dean.

?

(3) In the event that the student does not file a written request for an appeal within 10 days, the Office of the Provost shall review the matter with respect to the subject student and may, at his or her discretion, uphold or modify the discipline imposed. In any event, the Office of the Provost shall, within a reasonable time, provide notice of the outcome to the student, instructor and to the Academic Dean.

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Role of the Academic Integrity Appeals Board

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(1) The Academic Integrity Appeals Board is an ad hoc committee appointed by the Office of the Provost and consists of a minimum of three faculty members chosen by the Office of the Provost with no two members selected from the same College; the board shall not include a faculty member from within the department initiating charges of academic dishonesty. The Board is chaired by the Office of the Provost who shall vote only in the case of a tie. [Or One member shall serve as Chair at the direction of the Office of the Provost. The Chair shall vote only in the case of a tie.]

?

When an appeal is directed to the Academic Integrity Appeals Board by the Office of the Provost in accordance with the provisions set forth in Paragraphs VIII, the Academic Integrity Appeals Board shall schedule the hearing, within a reasonable time period, at a time that is mutually agreed upon by the student, Office of the Provost and members of the Academic Integrity Appeals Board.

?

(2) Reasonably in advance of the hearing, the Academic Integrity Appeals Board shall obtain from the Academic Dean, in writing, a full explanation of the facts upon which the determination of misconduct was based and shall provide to the student a copy of the policy and procedures set forth herein.

?

(3) The hearing before the Academic Integrity Appeals Board shall be conducted in accordance with the following requirements:

?

(a) The Academic Integrity Appeals Board shall consider relevant evidence including documentary evidence and testimony of the instructor, student, Chair and/or Dean where appropriate.

(b) The student shall have the right to be heard and to present relevant evidence, including documentary evidence and the testimony of witnesses, in his or her own behalf.

(c) The Academic Integrity Appeals Board shall maintain a record of the hearing including any and all pleadings and documentary evidence presented.?

(d) The Academic Integrity Appeals Board shall prepare written findings of fact and a written statement of its decision based upon the record of the hearing.

(e) The Academic Integrity Appeals Board may find academic misconduct and impose a sanction of suspension or expulsion only if the proof of such misconduct is clear and convincing. In other cases, a finding of misconduct must be based on a preponderance of the credible evidence.

(f) The Academic Integrity Appeals Board may impose a disciplinary sanction that differs from the recommendation of the Academic Dean.

(g) The instructor or Academic Dean may be witnesses at the hearing conducted by the Academic Integrity Appeals Board, but shall not have responsibility for conducting the hearing.

?

(4) *Determination that No Academic Misconduct Occurred:* If, after the hearing, the Academic Integrity Appeals Board determines that there is insufficient evidence that academic misconduct occurred or that no disciplinary sanction is appropriate under the circumstances, the Academic Integrity Appeals Board shall notify the instructor, the Academic Dean and the Office of the Provost. The Office of the Provost shall promptly thereafter notify the student and take appropriate action with respect to the student records.

?

(5) *Process Following Determination by the Academic Integrity Appeals Board that Academic Misconduct Occurred:*

?

(a) If, after the hearing, the Academic Integrity Appeals Board determines that academic misconduct did occur and that one or more of the disciplinary sanctions listed under paragraph III, subsections (1) (a) through (h) is appropriate, the Academic Integrity Appeals Board shall prepare and forward to the Office of the Provost, within 10 days, a written Finding of Misconduct which shall include

identification of the student, a description of the misconduct and a specification of the disciplinary sanction to be imposed.
(b) Within 10 days following receipt of the written Finding of Misconduct from the Academic Integrity Appeals Board, the Office of the Provost shall provide written notice of the imposed discipline to the instructor, the Academic Dean and the student.

Academic Standing

Academic standing and eligibility for a degree are determined by the quality of the student's course work.

[Determination of Academic Standing](#)

[Appeal of Suspension](#)

[Academic Probation](#)

[Extended Academic Probation](#)

[Academic Dismissal](#)

[Fresh Start Program](#)

[Returning to UMass Lowell with an Earned Associate's Degree](#)

Determination of Academic Standing

To ascertain the student's academic standing, the University uses a point system, each qualitative grade having an equivalent numerical value.

A????? 4.0

A-?????3.7

B+????3.3

B? ? ??3.0

B-?????2.7

C+????2.3

C? ? ??2.0

C-? ? ?1.7

D+????1.3

D????? 1.0

F? ? ??0.0

Quality points are computed by multiplying the number of course credits by the numerical value of the qualitative grade assigned. For instance, a three-credit course with a grade of B+ would carry 9.900 quality points (3 x 3.300). Grade-point averages and cumulative grade-point averages are obtained by dividing the number of quality points earned by the number of credit hours attempted.

Specified grade-point averages are computed solely on the basis of those courses attempted at the University of Massachusetts Lowell which have been qualitatively evaluated with the following letter grades: A, A-, B+, B, B-, C+, C, C-, D+, D, and F.

Academic Standing

Students who are on Academic Warning or Academic Suspension after the fall semester and are registered for a Winter Intersession course at the University of Massachusetts Lowell will have the grade for that course included in the review of any appeals related to their Academic Standing.

Students who are on Academic Warning or Academic Suspension after the spring semester and are registered for Summer 1 classes offered May through June at the University of Massachusetts Lowell will have the grade(s) for those courses included in the review of any appeals related to their Academic Standing.

The consequences of the academic standing of warning or suspension will not apply for students satisfying all degree requirements that semester.

All students are required to maintain at least a 2.000 average throughout their academic career. Academic records are evaluated at the end of each semester. No student, however, will be academically suspended without having at least one semester of academic warning.

The academic status of a student is one of the following categories:

Satisfactory Academic Standing

A student whose semester grade-point average is at least 2.000 and whose cumulative grade-point average is at least 2.000 is in Satisfactory Academic Standing.

Academic Warning

Beginning with the Fall 2011 semester, a first-semester freshmen whose grade point average (GPA) falls below 2.0 will not be placed on Academic Warning but will be notified that he or she is considered to be academically at risk and strongly advised to seek help through appropriate University Resources. After the first semester at the University the student will be subject to the following *Academic Standings*:

A student whose semester GPA is below 2.000 is placed on Academic Warning. A student on warning is still considered to be in acceptable academic standing, and may register for the following semester and participate in campus and athletic activities. Certain

campus programs and activities may choose to prohibit the participation of students on Academic Warning. At the end of the student's warning semester the student's cumulative grade point average must equal or exceed 2.000 to continue in Satisfactory Academic Standing.

Academic Suspension:

A student who was on Academic Warning at the end of the previous semester and whose cumulative GPA falls below 2.000 is placed on Academic Suspension. A student who is on Suspension may not enroll in the succeeding semester, and therefore may not represent the University in athletic programs nor participate in campus activities.

Academic Dismissal:

A student who was on Academic Suspension at the end of the previous semester and whose cumulative GPA at the end of the probationary semester is below 2.000 is automatically dismissed from the University.

Appeal of Suspension

A suspended student may submit a written appeal to the College Dean requesting permission to continue enrollment for an additional semester on academic probation. If permission to continue is granted, the program of study that must be undertaken and the minimum semester grade-point average that must be attained during the additional semester of academic warning will be made explicit.

Entering freshmen and transfer students who are permitted to initiate their University studies with summer school day courses should note that credits attempted in University summer sessions are included in grade-point averages. Subsequent to preliminary evaluations for retention purposes, the records of all students (including probationary students) are evaluated at the end of each semester.

Grades earned during summer session or winter intersession may be used to change a student's academic status prior to the beginning of the following semester. A student who has been suspended is prohibited from enrolling in any credit-bearing program of the University, including credit courses offered by continuing studies, in summer sessions, or in winter intersession. If a suspended student chooses to enroll in another accredited degree-granting institution, earns credit at that institution, and subsequently seeks to return to the University of Massachusetts Lowell, such credit may or may not be accepted in transfer at the University of Massachusetts Lowell, depending upon the specific circumstances.

Students who enroll in University summer school and/or continuing studies courses after they have been notified by the Office of the Registrar that they are suspended from the University for unsatisfactory academic standing are in defiance of University regulations. Grades received by such students will not be credited to University baccalaureate programs, even if the students are subsequently reinstated as probationary students or achieve satisfactory academic standing after reinstatement.

Academic Probation

A student who has been suspended from the University is entitled to apply to the suspension hearing office for immediate readmission as a probationary student in accordance with procedures enumerated under the admission policy heading Probationary Readmission.

Students who have been suspended and decide to remain un-enrolled for four semesters or more must apply for readmission on probation through the Office of the Registrar whenever they decide that they are prepared to undertake such a probationary period. The student will receive a letter that specifies the conditions of their probation, and the semester average that they must achieve during their probationary semester in order to achieve satisfactory academic standing.

Probationary students are prohibited from holding student offices or running for elective office and from representing the University in athletic or other activities.

A student who achieves the required minimum semester grade-point average during his or her probation is automatically reinstated as a student in satisfactory academic standing.

Extended Academic Probation

Students whose academic performance during a probation semester has significantly improved, but whose cumulative grade average is still slightly below 2.0, may apply to the suspension hearing office for an extended period of probation. Students who are granted such extensions will be notified in writing prior to the beginning of classes for the following semester that they have been granted an additional semester to achieve satisfactory academic standing.

Students who fail to achieve satisfactory academic standing and are not granted extensions of their probations by the Provost and students who are granted such extensions and fail to achieve satisfactory academic standing are dismissed from the University.

Students readmitted on probation should not withdraw from any course unless they withdraw from the University for emergency or medical reasons. A probationary student who withdraws from any course may thus be unable to satisfy the conditions of his or her probation and may be dismissed from the University at the end of the current semester of enrollment.

Probationary students who receive course evaluations of INC (incomplete) and who fail to make up their work prior to the beginning of the next semester are advised that they may not qualify for extension of their probation and may not register for or attend University courses (including continuing studies courses) until such time as a final determination of their status has been made. Probationary students who have received permission from the suspension hearing office to extend their make-up period should understand that such extension does not waive the requirement for a final determination of academic standing that is based upon grades for all probationary courses.

Academic Dismissal

Students on academic probation who fail to achieve satisfactory academic standing during their probationary semester and are not granted extensions of their probation by the suspension hearing office and students who are granted such extensions and fail to achieve satisfactory academic standing are dismissed from the University and are subsequently barred from attending both day and evening courses.

While on dismissal, students are not allowed to make progress toward a University degree. Students who have enrolled in University summer school and/or continuing education courses after they have been notified by the Office of the Registrar that they are dismissed for unsatisfactory academic standing are in defiance of University regulations. Grades received by such students will not be credited to University baccalaureate programs even if the students are subsequently reinstated as probationary students or achieve satisfactory academic standing after reinstatement.

The University recognizes that dismissal from the institution for reasons of academic failure need not be permanent. Under the following circumstances readmission is possible.

Freshman and sophomore students [attempted less than 60 credits] who have been academically dismissed may qualify for readmission to the university as follows: 1) under the provisions of the Massachusetts Transfer Compact after completion of an associate's degree at a Massachusetts Community College; and 2) after a lapse of two years, under the provisions of the Fresh Start program.

Students of junior or senior standing at the time of dismissal may reapply to the University after an absence of at least two years, under the provisions of the Fresh Start program.

The procedure for readmission of academically dismissed students begins with filing an application with the Office of the Registrar. The final decision to readmit an academically dismissed student rests with the dean of the college in which the student was enrolled at the time of dismissal from the University.

Fresh Start Program

Students who have been absent from the University for two years or longer may be readmitted under the terms of the Fresh Start program. Under this program, a returning student will be treated as if he or she were a transfer student. A maximum of 75 credits completed during earlier periods of enrollment with grades of C or above may be accepted toward graduation but will not be included in the cumulative average. Courses completed during earlier periods of enrollment with grades below C will not be counted toward graduation or included in the cumulative average. After readmission under Fresh Start the student must earn a minimum of 45 credits in residence at the University of Massachusetts Lowell in a matriculated program of study.

Courses taken in the academic major during earlier periods of enrollment must be approved by the major department before those courses can be counted toward the requirements of the major. (This provision is especially important in majors that undergo regular curriculum revision).

Students may use the Fresh Start Program only once in his or her career at the University of Massachusetts Lowell. Students who return under the Fresh Start program and as a result have previous coursework excluded from his or her cumulative GPA are not eligible to use course deletions or course repetitions for grade replacement and exclusion from GPA.

Returning to UMass Lowell with an Earned Associate's Degree

Students who have been absent from the University after being placed on academic suspension or academic dismissal, and who enrolled in a community college and earned an Associate's Degree, may be considered for readmission to UMass Lowell. Students who wish to return with an earned Associate's Degree may be readmitted and present a maximum of 75 credits as outlined in articulation agreements and transfer policies to be counted towards graduation. These 75 credits may also include prior UMass Lowell coursework that was not included in the Associate's Degree when a grade of C or better was earned. In cases where the eligible combined transferable courses from the associate's degree and prior UML coursework exceeds the 75 credits permitted, the student must work with his/her academic advisor to select courses to be included. 75 credits is the maximum total number of credits that will be considered including transfer credits and previous UMass Lowell coursework. This should be outlined on an academic petition and submitted to the Registrar's Office. After readmission with an Associate's Degree students must earn a minimum of 45 credits in residence at the University of Massachusetts Lowell in a matriculated program of study.

Students who return with an Associate's Degree and have previous coursework excluded from his or her cumulative GPA are not eligible to use course deletions or course repetitions for grade replacement and exclusion.

Administrative Dismissal

A student may be administratively dismissed from the University through cancellation of registration for due cause, through suspension or expulsion for academic dishonesty (cf. Academic Dishonesty, Cheating and Plagiarism), and through disciplinary procedures for violations of good conduct. For information concerning procedures that govern violations of campus conduct contact the Dean of Students.

Administrative dismissal may be invoked when a student fails to comply, after due notice, with an administrative regulation of the

University. Official notification of an administrative dismissal is noted on the permanent record card by the symbol X, which is entered for each course carried by the dismissed student.

Reinstatement of a student who has been administratively dismissed may be made only by application for readmission with the Office of the Registrar and only when the condition that has necessitated administrative dismissal can be ameliorated to the satisfaction of University officials. Examples of some conditions that may justify administrative dismissal are:

- forgery or fraudulent use of University records, documents, or forms; unauthorized entry into University records (including computerized records);
- non-payment of tuition, board, room charges, student fees, library fines, overdue University loans, and other official University fiscal obligations;
- failure to comply with a duly authorized administrative order relating to the safety of persons or the protection of University property;
- failure to submit required health forms to University Health Services.?

Attendance Policies

Although the University does not require class attendance as a matter of institutional policy, course instructors may establish required attendance in their courses and specify penalties for student violations of such attendance requirements. Colleges also have this option and sometimes have adopted attendance policies for introductory courses and special learning situations.

Instructor Attendance Policies

At the beginning of each course, the instructor will inform students of any specific attendance regulations which apply.

Attendance Requirements of the Veterans Administration

In compliance with the requirements of the Veterans Administration (VA), all recipients of Veterans benefits, including eligible children of veterans, must certify their attendance at the University, under penalty of perjury through directions received with the students benefits.

Absence of Students for Religious Beliefs

Chapter 375, Acts of 1975 of the Commonwealth of Massachusetts, requires recognition of student religious beliefs as noted.

Any student...who is unable, because of his religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be excused from any such examination or study or work requirements, and shall be provided with an opportunity to make up such examination, study, or work requirement which he may have missed because of such absence on a particular day; provided, however, that such make up examination or work shall not create an unreasonable burden upon such school. No fees of any kind shall be charged by the institution for making available to the said student such opportunity. No adverse or prejudicial effects shall result to any student because of his availing himself of the provisions of this section.

Students should inform the course instructor in writing of the day(s) when they will be absent. This should be done as early as possible in the semester and always prior to the day(s) the student will be absent for religious reasons.

Bachelor's Degrees

Undergraduate programs that are offered by the University of Massachusetts Lowell lead to one of the following degrees: Bachelor of Arts, Bachelor of Fine Arts, Bachelor of Liberal Arts, Bachelor of Science, Bachelor of Music, Bachelor of Science in Business Administration, Bachelor of Science in Industrial Management, Bachelor of Science in Engineering, Bachelor of Science in Engineering Technology, and Bachelor of Science in Industrial Technology. The complete list of bachelor's degrees can be found at?

Commencement

Graduation exercises are held once a year at the end of the spring semester. Undergraduates who have completed degree requirements during the previous summer term or fall semester are permitted to attend commencement exercises, and their names are listed in the commencement booklet. Attending commencement exercises is not compulsory, but all seniors are required to pay the specified graduation fee, which covers the cost of the diploma, academic attire, and incidental graduation expenses. An individual who wishes to receive a diploma by mail must notify their college dean and file their corrected address through student self service if he or she anticipates moving from a previously reported permanent address.

Conferring of Degrees

Diplomas are awarded three times a year: 1) in June for students completing degree requirements during the spring semester, 2) in October for students completing degree requirements during the summer term, and 3) in February for students completing degree requirements during the fall semester. Individuals who wish to submit verification of degree completion to employers or to graduate schools during the period between the end of their final grading period and the awarding of diplomas may obtain a letter of completion from their college dean. Duplicate diplomas are not issued for any reason.?

Online & Continuing Education

Subject to University residency requirements and college regulations, the following categories of day students may be permitted to register for continuing studies courses at the University of Massachusetts Lowell and to have such courses credited to baccalaureate day programs:

1. individuals who have been admitted to day colleges for baccalaureate study;?
2. individuals in satisfactory academic standing who are currently matriculating in day colleges of the University;*?
3. previously matriculated students in day colleges who withdrew from the University while in satisfactory academic standing, and who have been readmitted to programs in which they were previously enrolled;?
4. full-time undergraduate day school student tuition and fees do not cover courses offered by Online & Continuing Education. Full-time undergraduate students who register for OCE courses will be charged OCE tuition and fees as specified on the [OCE](#) website (a minimum \$900 per course);?
5. In addition to the OCE tuition and fees, all students registered for OCE courses are charged a non-refundable \$30 OCE registration fee.

Individuals are warned that departments reserve the right to deny baccalaureate credit for the University of Massachusetts Lowell continuing studies courses which have been taken in violation of University residency requirements, curriculum requirements of their baccalaureate day programs, and/or special college regulations. Students who have been suspended or dismissed from day programs of the University are prohibited from enrolling in any program of the University. Students who combine University day courses with continuing education courses during the regular academic year are subject to all restrictions concerning semester course loads (cf. Registration and Course Enrollment Policies).

*Students on Academic Warning are permitted to register for continuing studies, winter intersession, and summer school courses; students who have been suspended are prohibited from enrolling in any course offered by the University.

For further information visit? [Online & Continuing Education](#).

Course Descriptions

Each course offering is designated by a two-digit or 2-4 alpha designated prefix and a three-digit course number. The digit or alpha designated prefix identifies a college department and/or special area. The three-digit course number identifies the course level.

Each college department and/or special subject area has been assigned an identifying digit or alpha designation. View the on the Office of the Registrar's website.

Course Numbers?

Beginning fall 2015, course number consists of the four digits that follow the course/department prefix (for example, MATH.1310). Courses numbered 0001-0999 are pre-freshman and special undergraduate courses and do not carry baccalaureate degree credit. Those numbered 1000-2999 are lower-division undergraduate courses and those numbered 3000-4999 are upper-division undergraduate courses. The 4000 level courses are generally limited to juniors and seniors majoring in a field but are open, with permission, to other advanced undergraduates and to graduate students.

Directed studies courses and practicum experience courses are generally limited by departmental policy to students majoring in the area in which such courses are offered.

Courses numbered 5000-5999 are graduate courses open to upper division undergraduates with the consent of instructors and chairpersons. Courses numbered 6000 and above are graduate courses open only to graduate students.?

Course Restrictions

Special course pre-requisites, co-requisites, and enrollment restrictions are indicated at the end of the course description. A course listed as a pre-requisite must have been completed and passed prior to taking the course for which the pre-requisite is specified.

A course listed as a co-requisite must be taken during the same semester as the course for which the co-requisite is specified. Subject to college or department policy to the contrary, exceptions may be granted by the designated department chair.

Courses that carry such notations as "open for majors only" and "sophomore status required" are restricted to the specified students. Courses that carry the notation "permission of instructor" require instructor's approval. Approved students will be given permission numbers to enroll through self-service.

Courses at the 100-300 levels that do not carry pre-requisite, co-requisite, and enrollment restrictions are open for election by all students unless general restrictions have been listed under the department or course area heading, or unless policy of the college or department in which the student is matriculated prohibits such registration.

Course Equivalency Examinations

The University recognizes two types of course equivalency for which credit is awarded. These are 1) College Level Examination Program (CLEP) examinations, and 2) departmental examinations. Restrictions, where applicable, are noted below.

Subject to specified policies of academic departments, unusually qualified degree candidates are given the opportunity to demonstrate their special competencies and receive University credit for such competencies through established course equivalency procedures without having to fulfill classroom or faculty course requirements.

Students may demonstrate their special competencies through subject examinations of the CLEP and through departmental equivalency examinations. Credits granted through course equivalency procedures are so noted on the student's permanent record. However, no grades for equivalency examinations are recorded and examination credit so granted is not included in grade-point averages.

The purpose of course equivalency procedures is to provide credit for existing competencies—that is, those competencies which students possess prior to their applications for equivalency credit and prior to their registration for a University course.

Students may not receive credit for a specific proficiency examination if they have registered at the University in the same course for which the examination covers, if they have previously received a University grade either for that course or a course in sequence above the course for which they wish to take an examination, or if they have previously attempted an equivalent course at another institution. Credits for CLEP Examinations are typically granted at the time of admissions. Once a student is matriculated, permission to take a CLEP Exam must be obtained by the student's department chair or program coordinator and the student must file an academic petition to have approved CLEP credits posted to the student's record. University departments reserve the right to refuse to grant by examination for those courses which are presented by a student for his or her major(s) and to deny recognition of previously granted credit for students who, prior to their declaration of major field, have received equivalency credit in their subsequently declared major.

Subject to the additional limitations of the college and program in which the student is enrolled, the maximum number of credits that a matriculating student may earn through course equivalency procedures is 30 semester credits. Students who have transferred to the University may not apply for equivalency credit in excess of a number determined by subtracting all course equivalency and transfer credits accepted by the University from the maximum of 90 total credits permitted for both transfer and equivalency credit. Nor may transfer students present equivalency credits in fulfillment of the major field residency requirement of 15 credits in University courses.

Course Requirements

Within the policies listed below, faculty members are permitted to establish their examination and course requirements.

Course Examination Policies

Final examinations are required for all undergraduate courses of the University unless exemptions have been granted by the department chairperson and the dean of the college. Exemption requests must be made by the end of the first month of the semester. Final examinations may not be given at a place or time other than those which have been specified by the Student Records Office.

There shall be no final examinations other than those administered during the final examination period. No hour examination shall be administered during the last five academic days of the semester unless exemption has been allowed by the college dean. Final take-home examinations may be submitted to instructors during the final examination period only. Take-home examinations may be submitted only on the day and time at which the Student Records Office has scheduled the final examination for the course in question.

Instructor Course Requirements

By the end of the first full week of classes, instructors must distribute a written statement of requirements, pre-requisites and co-requisites for each course and section to all students and to the department chairperson. This statement must include a specification of the number and types of course evaluations to be employed throughout the semester (including approximate date and nature of the first evaluation), special requirements for completing assignments and taking examinations, and a definition of course attendance policy.

A minimum of three evaluations of student progress (written or oral examinations, written reports, recitations, laboratory techniques and reports, jury or performance evaluations) should be made in each course, with at least one evaluation being required during each half semester. Upon the request of a student, an instructor is required to provide a statement of the student's course progress.

Appeals of grades or grading policies arising from alleged violations of established or published policies must follow procedures cited under the heading Grading Policies. The terms grade and grading policy refer 1) to all grades awarded, 2) to the computation of grades examinations including final examinations, tests, quizzes, papers, essays, laboratory reports, practicum experiences, and any other kind of academic activity for which a grade of any kind is awarded, and 3) the final course grade which is submitted to the Student Records Office.

Declaration or Change of Major

- [Declaration of Major](#)
- [Declaration of Second Major](#)
- [Dual Degree Programs](#)
- [Change of Major](#)
- [Change of Major within College of Enrollment](#)
- [Change of Major with Intercollegiate Transfer](#)

Declaration of Major

Students who have declared a major at the time of their admission to the University are officially enrolled in the college in which their designated major is offered and are referred by the college dean to the chairperson of the designated major for assignment of a faculty advisor.

Although the University does not require students to declare their major fields until they have achieved 60 semester credits, an early

decision by students will greatly facilitate the selection of appropriate prerequisite courses for major fields.

Students enrolled in the College of Fine Arts, Humanities and Social Sciences are strongly encouraged to declare their major fields by the end of the freshman year. Students contemplating majors in chemistry or environmental sciences should initiate prerequisite course work immediately upon entrance to the College of Fine Arts, Humanities and Social Sciences and should make a declaration of major at this time or prior to the end of their freshman year.

Students in the College of Health Sciences should not delay declaration of major beyond their freshman year.

Additional course work beyond the minimum degree requirement and extension of the normal four-year period of study may be expected when individuals declare a major later than recommended above.

Students who make no declaration of major prior to the end of their sophomore year are listed as undeclared students for their first two years. Individuals who wish to designate a major which is offered by the college in which they are enrolled as undeclared students must secure the signature of the appropriate department chairperson (or the chairperson of the committee which exercises jurisdiction over an interdepartmental major) on a declaration of major form and must file the completed form with the Office of the Registrar. Individuals who wish to designate a major which is not offered by the college in which they are enrolled as undeclared students must file an approved form for intercollegiate transfer and declaration of major with the Office of the Registrar. This form requires the signatures of the dean of the college to which the student transfers and the appropriate department chairperson.

Undeclared students are advised that openings may be limited or unavailable in some programs and that different admission criteria may be applied to program or college applicants when staffing or facilities render it necessary to establish limits upon enrollments.

Students seeking professional advice regarding selections of majors, second majors, and minors should consult a college dean or a faculty advisor.

Declaration of Second Major

Students who wish to declare a second major should consult with their college dean to determine if a second major can be completed within specified degree requirements or will require additional study beyond the minimum degree requirements and extension of the regular period of baccalaureate study. Students who wish to declare a second major in the college in which they are enrolled as degree candidates ordinarily may do so by filing an approved declaration of second major with The Solution Center. Students who wish to declare such a major in another college of the University may do so only when regulations of that college and the college in which they are enrolled as degree candidates both permit. Such declarations require the approval of both college deans. Students who are permitted to carry two majors are assigned an advisor in each major department.

Individuals who are matriculating for the Bachelor of Arts degree may not count more than 72 credits in their two academic majors combined toward the minimum degree requirement of 120 credits. Students who present more than 72 credits in the two majors combined may not present less than 48 semester credits outside the two major fields in satisfying the minimum degree requirement of 120 credits. Accordingly, students who present more than 72 credits in the two majors combined must present a number of credits beyond the minimum degree requirement of 120 credits that equals the number of credits by which they exceed the combined major credit maximum.

Except as noted under the heading Dual Degree Program, students who elect academic majors in more than one college are candidates for one degree only; and they are considered to be degree candidates in the college of their initial major unless they indicate to the contrary by filing for intercollegiate transfer at the time they make a declaration of second major. Accordingly, a student who pursues academic majors in two colleges is subject to all degree requirements as specified by the college of his or her initial academic major and is subject only to major course requirements (including collateral and prerequisite courses for the major) as specified by the department of his or her second academic major. Individuals who pursue double majors within different degree programs will receive the degree that is designated for their initial academic major unless they also filed for intercollegiate transfer when they filed their declaration of second academic major.

Professional programs in business administration, engineering, health education, clinical laboratory sciences, nursing, exercise physiology, industrial management, industrial technology and Bachelor of Music programs may be designated as degree majors only. Although students in these programs may be permitted to pursue a second major in an academic field offered by another college, they are subject to all degree requirements as specified by the college for their professional major.

Dual Degree Programs

Students who wish to pursue a dual degree program must establish simultaneous matriculation in both programs and designate their candidacy for two degrees. The curricula for dual degree programs are approved by participating college faculties and must be completed as prescribed. It is therefore imperative that a student who wishes to pursue an approved dual degree program obtain a copy of the specified curriculum that enumerates the specific semester-by-semester course requirements. Students interested in this program must receive authorization from all relevant chairs and deans. The minimum credits to receive two degrees is 150.

Change of Major

Once students have begun a program of major studies, they may change their major field only by filing an approved change of major form with The Solution Center. Students who make substantial changes in their plans of study after the beginning of their sophomore year, regardless of major, may find it difficult to complete degree requirements within the normal four-year period of study.

Change of Major within College of Enrollment

Students who wish to change their declaration of major within the college in which they are enrolled as degree candidates are required to file an approved change of major form with The Solution Center. This form requires the approval of the chairperson of the major department to which the student desires to transfer and should be filed by November 1 for spring semester transfer and by April 1 for fall semester transfer to insure proper advising during the periods of fall and spring registration. Filing after the recommended dates may be permitted by the chairperson of the department with jurisdiction over the new major.

Change of Major with Intercollegiate Transfer

Students desiring to transfer from a baccalaureate continuing studies program to a baccalaureate day program, to transfer from a baccalaureate day program to a baccalaureate continuing studies program, must complete appropriate paperwork in the Admission Office.

An individual seeking an intercollegiate transfer must file a change of major form with the chairperson and dean having jurisdiction over the program to which transfer is desired. Following endorsement by both the chairperson and the dean, this form must be filed with the Office of the Registrar. Individuals petitioning for intercollegiate transfer are required to satisfy and maintain the admission requirements of their desired college and program.

Individuals seeking transfer from one college to another are advised that openings may be limited or unavailable in some programs, that different admission criteria may be applied to program or college applicants when staffing or facilities render it necessary to establish limits on enrollments, and that the completion of degree requirements within the customary four-year period may not be possible since the correction of deficiencies cannot always be accommodated within the schedule of course offerings.

The official date of intercollegiate transfer is the first day of the semester following approval of a student's application. Since course registration may be conducted prior to the official date of transfer, students should make immediate arrangements for advising with the dean of the college to which they will transfer. Subsequent to approval of a student's application for transfer and prior to the official date of transfer, the college dean will review the academic record of the student to determine the applicability of previously completed courses to the requirements of the college and, if appropriate, to the new major.

Academic Policies

Each university student is subject to two sets of academic regulations those of the University as a whole, which are cited in this section, and the academic rules of the college and program in which he or she is enrolled. The academic rules of colleges and programs are listed in sections devoted to college programs.

In registering for courses, each student assumes full responsibility for knowledge of and compliance with the definitions, regulations, and procedures for the University, as set forth in this publication. Moreover, in accepting admission to the University, each student assumes responsibility for knowledge of and compliance with the definitions, regulations, and procedures of the University pertaining to his or her student status as set forth in the appropriate University of Massachusetts Lowell publications.

Students who have questions about the interpretation or application of University academic policy should consult the dean of their college or the Office of the Provost.?

Departmental Examinations

Students who are interested in taking departmental examinations may obtain applications for such examinations from the Office of the Registrar at any time during the fall and spring semesters, but they must initiate the application process in sufficient time to permit the completion of examinations and the processing of examination results prior to the final deadline for filing course grades during the semester in which they are examined. Applications for departmental course-equivalency examinations are filed with the chairperson of the student's major department, the chairperson of the department in which the examination is to be administered, and the faculty examiner.

Students may not repeat departmental equivalency examinations and, except for documented medical reasons or personal emergencies, they may not reapply for such examinations in the event that they fail to keep an examination appointment.

Examinations must be wholly or substantially written unless the nature of the course makes more appropriate an oral or performance examination. Departments may authorize instructors to administer end-of-semester examinations that are scheduled during the final examination period when such examinations are adequate measures of total course requirements. After the student has completed an authorized examination, the faculty examiner must file his or her recommendation for course credit with the Office of the Registrar by the final deadline for filing semester grades.

General Degree Requirements

To qualify for University degrees, baccalaureate candidates are required to obtain a minimum of 2.000 (C) average in their total course of study; to present a minimum of 120 semester credits; to fulfill the minimum residency requirement; to satisfy the regulations and academic standards of the colleges that exercise jurisdiction over the degree for which they are matriculating; to complete all curriculum requirements specified by the college in which they are enrolled and department(s) in which they are majoring; and to complete the University general education requirements.

[General Education Requirements](#)
[Residency Requirements](#)

General Education Requirements

For students who enrolled in September, 2000 and subsequently...

Residency Requirements

Please note that all credits transferred may not be used to satisfy requirements in your program of study.

All candidates for baccalaureate degrees, must meet the residency requirement by completing a minimum of 60 semester credits at the University of Massachusetts Lowell except as indicated below. The following residency options apply, as specified, to candidates for baccalaureate degrees:

1. Complete three years at the University of Massachusetts Lowell, earning not less than 90 credits, and an approved junior or senior year program at another accredited baccalaureate institution, earning not more than 30 semester credits or the number of semester credits specified for juniors or seniors by those prescribed courses of study that are listed in this catalogue.?
2. Complete an associate s degree at a Massachusetts community college under the provisions of the Mass Transfer agreement and complete the last two years at the University, earning not less than 60 credits at the University of Massachusetts Lowell. ?An exception to this residency requirement, not to exceed 15 credits, may be granted by the Department Chair of the major field with the approval of the College Dean at the time of initial matriculation at the University of Massachusetts Lowell.?
3. Complete up to the first two years in an accredited two-year institution, earning not more than 60 semester credits with grades of C- (1.700 on a 4.000 scale) or better, and the remaining years in the University, earning not less than 60 semester credits. An exception to this residency requirement, not to exceed 15 credits, may be granted by the Department Chair of the major field with the approval of the College Dean at the time of initial matriculation at the University of Massachusetts Lowell.?
4. Complete up to the first three years of a baccalaureate program in an accredited four-year institution, earning not more than 90 semester credits, with grades of C- (1.700 on a 4.000 scale) or better, and the remaining year(s) in full-time study in University classes, earning not less than 30 credits.

An individual who has been admitted to day courses of the University as a non-matriculating (special) student is not considered a student in residence. If subsequently admitted as a matriculating student, such an individual must petition the college dean for recognition of non-matriculated courses. Up to 15 credits of non-matriculated day courses may be recognized for application to the minimum residency requirements of 30 semester credits of University courses.

Off Campus Study

Once students have matriculated at the University of Massachusetts Lowell, they are expected to complete their coursework at the University of Massachusetts Lowell. Such coursework may also include credits earned through approved study-abroad programs. ?In some cases, in order to clear a deficiency or to remain on track for graduation, a student may seek permission for off-campus study to take a course at another accredited institution. Even when authorization for off-campus study is granted, all students are required to fulfill their University of Massachusetts Lowell residency requirements.

Matriculating students in satisfactory academic standing may be permitted to apply off-campus courses to their degree programs when they comply with established procedures. ?Students wishing to apply credits earned off-campus must obtain approval prior to off-campus enrollment, through an (pdf) form () available in the Office of the Registrar.

Off-campus courses may be taken in regionally accredited institutions only, and ordinarily should be taken at baccalaureate colleges or universities. Permission to pursue off-campus courses in regionally accredited associate degree institutions may be granted to students only for courses which are to be presented for lower-division requirements of University of Massachusetts Lowell curricula and provided that such courses do not lead to a violation of the University Residency Requirements. All off-campus courses must be taken under the regular grading system and may not be taken on a pass-no credit (pass/fail) basis.?

To view the list of courses approved by departments for transfer into the University of Massachusetts Lowell, visit the Transfer Dictionary on the Registrar's Office website.

University Restrictions Concerning Off-Campus Study

Students are not permitted to pursue off-campus courses until an initial evaluation of their academic progress at the University has been made. Students who have transferred to the University with 60 or more semester credits, or who have been admitted from another institution with a baccalaureate degree to pursue a second bachelor s degree, are not permitted to pursue off-campus studies. Students who combine University courses with off-campus courses during the regular academic year are subject to University restrictions on semester course loads.

Residency Requirement for Major Fields

Baccalaureate degree candidates must complete at least 15 semester credits within the academic department(s) in which they are majoring for each major presented for a degree. Upon the approval of the appropriate college dean, the course requirement of 15 credits within the major department may be satisfied through satisfactory completion of courses in the University of Massachusetts Lowell Continuing Studies Division.?

Residency Requirement for Active Duty Service Members, their Spouse and College-age Children

The University of Massachusetts Lowell will limit academic residency to twenty-five percent (30 credits for bachelors degree, 15 credits for associates degree) or less of the degree requirement for all degrees for active-duty servicemembers and their adult family members (spouse and college-age children). In addition, there are no final year or final semester residency requirements for active-duty servicemembers and their family members. Academic residency can be completed at any time while active-duty servicemembers and their family members are enrolled. Reservist and National Guardsmen on active-duty are covered in the same manner.

Dual Degree Program

Students who wish to pursue a dual degree program must establish simultaneous matriculation in both programs and designate their candidacy for two degrees. The curricula for dual degree programs are approved by participating college faculties and must be completed as prescribed. It is therefore imperative that a student who wishes to pursue an approved dual degree program obtain a copy of the specified curriculum that enumerates the specific semester-by-semester course requirements. Students interested in this program must receive authorization from all relevant chairs and deans. The minimum credits to receive two degrees is 150.

Grading Policies

Please review the following grading policies:

- [Grading Policies](#)
- [Mid-term Grades](#)
- [Pass-No Credit Course Registration](#)
- [Satisfactory-Unsatisfactory Course Registration](#)
- [Incomplete Courses](#)
- [Audited Courses](#)
- [Grade Changes](#)
- [Course Grade Appeal Policy](#)

The following qualitative letter grades are employed by faculty members to characterize the quality of a student's work in a course:

A	Superior Work: Highest Quality	4.0
A-	High Honors Quality	3.7
B+	High Quality	3.3
B	Basic Honors Quality	3.0
B-	Below Honors Quality	2.7
C+	Above Satisfactory Quality	2.3
C	Satisfactory	2.0
C-	Below Satisfactory Quality	1.7
D+	Above Minimum Passing	1.3
D	Minimum Passing	1.0
F	Failed	0.0
FX	Failed due to Academic Misconduct (may not be replaced or deleted)	0.0

In addition to the above qualitative letter grades, the following symbols are used to designate special enrollment provisions or course statuses and do not affect the student's academic average:

AU	Audit
W	Withdrawn
CR	Credit Only
INC	Incomplete
W	Voluntary withdrawal (before deadline-to-withdraw indicated on academic calendar)
X	Administrative withdrawal
NC	No credit
P	Satisfactory Grade C- or Above
S	Satisfactory Grade C or Above
U	Unsatisfactory Failed
T	Transfer Credit
Y	Administrative Dismissal

Academic Honors

Academic honors are of three types: university honors, honors in major fields, and dean's list (semester honors). Undergraduate students may qualify for university honors and the dean's list. Honors in major fields are available at the option of the major departments.

University Honors

The University recognizes baccalaureate graduates who have attained exceptional scholastic distinction. To be eligible for such recognition a student must achieve a minimum grade point average of 3.25 for all courses completed at the University and must have earned a minimum of 60 credits from the University of Massachusetts Lowell. A total of nine (9) credits of departmental exam and/or courses graded "S" may be used toward the 60 credits needed to be considered for University Honors. Credits taken on a Pass/Fail basis may not be counted toward the 60 credit requirement.

Students who transfer into the University will be also be eligible for University Honors if they earned a minimum of 3.0 at their previous institution, earned a minimum of grade point average of 3.25 for all courses completed at the University and satisfied the University Residency Requirement.

Three levels of distinction are noted at commencement:

Summa Cum Laude ? ? ? 3.85 - 4.0

Magna Cum Laude ? ? ? 3.500 - 3.849?

Cum Laude ? ? ? ? ? ? ? 3.250 - 3.499

University honors are officially entered on the permanent record of students.

Honors in Major Fields

In addition to honors awarded by the University, honors in major fields may be awarded by the colleges in which students are enrolled or (in the case of Continuing Studies students) by the colleges that exercise academic jurisdiction over the program in which they are enrolled. Recommendations for such honors are made by the faculty of the student's major department (or by interdisciplinary committees that exercise academic jurisdiction over the student's major studies) for outstanding achievement in the major field. In order to qualify for such honors, the student must fulfill the following requirements:

- complete a minimum of 24 credits in the major field at the University of Massachusetts Lowell;
- fulfill any honors requirement specified by colleges, departments, or interdisciplinary committees in the major field;?
- achieve a certain grade-point average as specified below.

High Honors

4.00 in all courses that are taken in the major field at the University of Massachusetts Lowell.

Honors

3.50 to 3.99 in all courses that are taken in the major field at the University of Massachusetts Lowell with no course grade in such courses less than B.

Honors in the major field are not noted on the permanent records of students.

Dean's List (Semester Honors)

At the end of the fall and spring semesters, the dean of each college issues a list of undergraduate students who have achieved distinguished semester records. The dean's list recognizes students who have completed full-time programs (at least 12 credits of which must have been qualitatively graded) with a minimum gpa of 3.25, no grade less than C, and with no grades of INC [incomplete] (Please note that students who are approved through Disability Services for a reduced course load in accordance with the American Disabilities Act (ADAAA) will be exempt from the 12 credit minimum).

University Honors Program

Undergraduate students enrolled in the University Honors Program who complete all program requirements graduate as Commonwealth Honors Program Scholars.

Language Requirements Before Fall 2015

Students enrolled in Bachelor of Arts programs in the social sciences and humanities (with the exception of Economics) are required to demonstrate intermediate level proficiency in a foreign language. Students with documented learning disabilities may be allowed to fulfill the language requirement through an alternate set of courses. Such students should file appropriate documentation with the office of Disability Services, at which time they will receive information on their alternative requirement.

For information on test scores that may be applied to the foreign language requirement, please consult .

Major Field Requirements

Candidates for the Bachelor of Arts degree may not be required to take more than 45 credits in their major fields. Candidates for the Bachelor of Arts degree with a single major may take up to 54 credits in their major field. Candidates for the Bachelor of Science

degree may not be required to take more than 60 credits in their major fields. However, candidates for either degree may elect to take additional courses in the major beyond the specified maximum providing that such additional courses are not presented for the minimum degree requirement of 120 credits.

Credits for each course may be counted only once in a student's program of studies. A course which is specified as a requirement for both a student's major and minor will satisfy both requirements, as stated, but course credits may not be counted more than once and may be applied to one category of a student's program of studies only. Individual departments may have a more restrictive policy.

Maximum Period of Bachelor's Degree Study

Depending on the nature of the subject and discipline, courses taken by a student may become obsolete for curricula of the University when they have been completed over a period of time that exceeds the customary period for bachelor's degree study. Accordingly, University departments reserve the right to delete courses from a student's program of study when such courses have been determined to be obsolete for the curriculum in which the student is enrolled.

Minor Area Requirements

The requirements for minors are established by university departments or by interdisciplinary committees. No minor program may consist of less than 18 semester credits in the minor field or more than 24 semester credits. At least six credits must be completed at the upper-division course level for all minor studies. Students are advised that an aggregation of courses that totals 18 or more credits may not constitute a minor field. Specific options for minor programs depend on the major field which a student has elected to pursue and the collateral course requirements specified by major departments.

Individuals interested in electing a minor program should consult the relevant section for curriculum requirements and prerequisites.

For minors

1. A course which is specified as a requirement for both a student's major and an interdisciplinary minor will satisfy both requirements, but credits for the course are counted only once in the total number of credits presented for graduation.
2. For any interdisciplinary minor, a student must present at least 9 credits of coursework that come from outside the student's major.
3. An individual course may be applied only to one minor, even if the course is accepted in more than one. For students who elect to do more than one minor, separate and distinct coursework must be presented for each.
4. Collateral courses that fall outside the discipline of a student's major field may be applied toward a minor. For example, a physics major who takes Chemistry I and II may apply those courses toward a minor in Chemistry.
5. For General Education Breadth of Knowledge (distribution) requirements the limit of two courses from the same department directed to any one category of General Education (AH, SS, SC) still applies.
6. Students who direct coursework from the major field to an interdisciplinary minor must still meet College requirements regarding credits outside the major field.

See our?

Off-Campus Study

Once students have matriculated at the University of Massachusetts Lowell, they are expected to complete their coursework at the University of Massachusetts Lowell. Such coursework may include credits earned through approved study-abroad programs. In some cases, in order to clear a deficiency or to remain on track for graduation, a student may seek permission for off-campus study to take a course at another accredited institution. Even when authorization for off-campus study is granted, all students are required to fulfill their University of Massachusetts Lowell residency requirements.

Students wishing to apply credits earned off-campus must obtain approval prior to off-campus enrollment, through an Authorization of Off-Campus Courses form available in the Office of the Registrar.

Off-campus courses may be taken in regionally accredited institutions only, and ordinarily should be taken at baccalaureate colleges or universities. Permission to pursue off-campus courses in regionally accredited associate degree institutions may be granted to students for courses that are to be presented for lower-division requirements of University of Massachusetts Lowell curricula provided that such courses do not lead to a violation of the University Residency Requirements. All off-campus courses must be taken under the regular grading system and may not be taken on a pass-no credit (pass/fail) basis.

To view the list of courses approved by departments for transfer into the University of Massachusetts Lowell, visit the Office of the Registrar's website (<http://www.uml.edu/registrar/transfer/>).

University Restrictions Concerning Off-Campus Study

Students are not permitted to pursue off-campus courses until an initial evaluation of their academic progress at the University has been made. Students must comply with current . Students who combine University courses with off-campus courses during the regular academic year are subject to University restrictions on semester course loads.

Full-Time Off-Campus Study Abroad

Study Abroad Eligibility

To be eligible for study abroad, students must:

- Have a cumulative grade point average of 2.5
- Not have a disciplinary record active during the period of study abroad
- Maintain full-time status for semester/academic year programs
- Have completed at least 1 full-time semester at UMass Lowell

Study Abroad Credit Transfer

All students must have their study abroad program approved through The Office of Study Abroad & International Experiences.

All courses taken through an approved study abroad program must be pre-approved first through the Academic Department from which the student is seeking credit as well as their Major Department Chair or Academic Advisor and submitted for final review to the Office of Study Abroad & International Experiences. Study Abroad course preapprovals will then be sent to the Office of the Registrar to grant the student approval for full-time, off-campus study abroad status.

Upon receipt of the Official Transcript, all courses completed on an approved study abroad program will be posted to a student's UMass Lowell academic record. The final grade earned for each course will be documented on the UMass Lowell academic record but will not be factored into the student's GPA statistics unless prior determination is made by the student's Major/Minor Department. Courses with a grade of C- (1.7 on a 4.0 scale) or better may be applied to the University residency requirement, not to exceed one semester of full-time study, maximum of 18 credits.

Programs of Study and Declaration of Intent to Graduate

All students are required to file with their advisor a copy of their final semester course registrations (including notification of course withdrawal) and an accurate account of courses taken, grades received, and changes of designated programs of study. Deadlines for conferring with faculty advisors concerning the completion of degree requirements and for filing final programs of study and declarations of intent to graduate with college deans are specified in the University calendar.

Each college has adopted a program of studies form that best reflects the nature of its degree programs. Forms employed by the College of Fine Arts, Humanities and Social Sciences and the College of Health Sciences have been standardized and designate three areas: University general education requirements, major requirements, and collateral programs (second majors, minors, and unrestricted elective courses).

Credits for each course may be counted only once in a student's program of studies. A course which is specified as a requirement for both a student's major and minor will satisfy both requirements, as stated, but course credits may not be counted more than once and may be applied to one category of a student's program of studies only. Individual departments may have a more restrictive policy.

At the end of the semester following the filing of a declaration of intent to graduate, the college dean verifies course completions and required cumulative and major averages. The names of students who have satisfied all degree requirements are then forwarded to the appropriate college faculty for endorsement and, finally, to the Office of the Provost, which orders appropriate diplomas for conferral at graduation. Students who unofficially complete all degree requirements and fail to file either a declaration of intent to graduate or a program of studies will not be recommended to the Office of the Provost and conferral of the degree will be delayed until an approved declaration has been filed.

Registration and Course Enrollment Policies

Students are required to register for courses during periods which are officially designated for registration unless they have been authorized to make other arrangements by the dean of the college in which they are matriculated. Non-matriculated students are permitted to enroll for course loads only as specified by their conditions of admission and must comply with the policies (below) concerning semester course loads and reduced load status.

[Semester Registration](#)

[Semester Course Loads](#)

[Deadline for Changes of Course Enrollment Status](#)

Semester Registration

First time students are strongly encouraged to register in person. Returning students are required to register during the designated registration periods. They have satisfied the registration requirement when they have paid the required tuition and fees and have complied with the course drop and add process.

Students who pre-register for courses for which they subsequently fail to satisfy prerequisites must initiate changes of registration during the add-drop period. Students are not enrolled in classes for which they are not properly registered.

Student schedules are available through the university's [self-service](#) website. Students who believe that errors have been made in their

registrations should consult with the Office of the Registrar prior to the deadline for adding courses. Students who do not check their schedule and, accordingly, fail to correct scheduling errors by established deadlines may not expect to have University regulations waived for their benefit.

Course Additions

Students who wish to add a course during the first five days of classes may do so in person at the Office of the Registrar or through self-service.

Dropped Courses

A student who wishes to drop a course may do so in person at the Office of the Registrar or through student self-service during the first ten days of classes.*

There are only two cases for which a drop is not necessary:

1. ?if the course is cancelled by the University; or
2. ?if courses (or sections) carry no credit and will not appear on their transcript

*Courses dropped during the first ten days of classes will not show on the permanent record. Courses dropped from the eleventh to the fiftieth day of class will be assigned a grade of W and will appear on the permanent record.

Courses Cancelled by the University

Students are not required to drop courses or sections that are cancelled by the University. If students wish to replace a cancelled course with another, they must follow the procedures above for course additions.?

Semester Course Loads

The typical course load expectation for full-time students is 15 credits. Professional curricula may specify credits in excess of this number, in which case such specifications are regarded as regular course loads.

Maximum Credit Loads

Students may enroll for course loads in excess of 15 credits but are advised that course loads in excess of the number of credits specified by recommended courses of study may not be in their academic interests when their grade-point averages are less than 3.000.

Unless specified as part of an established course of study, course loads in excess of 15 credits are recommended for enrichment purposes only and should be taken as no-credit courses. In any event, a student is prohibited from registering for course loads in excess of 20 credits unless such loads are required by established University curricula or unless special permission has been granted by the dean of the college in which the student has established matriculation.

Students who are enrolled in curricula which do not require a semester course load in excess of 20 credits and who wish to obtain permission to carry such an overload must file an academic petition with the dean of the college in which they have established matriculation. Students who register for course loads in excess of 20 credits (including continuing studies courses) without the prior authorization of the dean of the college in which they have established matriculation will not receive credit for more than 20 credits per semester, and the college dean will determine which course(s) shall receive the administrative symbol of Y. Permission to carry course loads in excess of stated maxima will be denied when resources of a college or program render it necessary to establish limitations on course enrollments.

Minimum Credit Loads

Matriculating students are classified as full-time when they carry the course credit load in University day programs that is specified by their curricula. Full-time students are required to register for a minimum of 12 credits of day courses each semester. Please note that students who are approved through Disability Services for a reduced course load in accordance with the American Disabilities Act (ADA) will be exempt from the 12 credit minimum to be considered full time.

During the summer term students are classified as full-time when they are registered for a minimum of 12 credits which may combine courses/credits from the different sessions within the summer term. Students who enroll in only one of the accelerated summer sessions (summer I or summer II) may be considered by the institution as the equivalent to full-time for the specific time period of that session only when registered for a minimum of 6 credits. This is for enrollment purposes only. Please note: Financial aid, veterans benefits or other types of aid define 12 credits for full-time study.?

Navitas Summer Pathway Program

The University of Massachusetts Lowell (UMass Lowell) offers a 10-week summer session to its Pre Undergraduate and Pre Master s international students. These students are admitted into a Bachelor s or Master s program with the condition of a preparatory semester(s) which could encompass the summer session.?? The Pre Undergraduate and Pre Master s summer session consists of intensive academics? of? 18-22 clock hours per week in English, Mathematics and Cultural Support.

Part-time Enrollment

A student enrolled on a part-time basis is charged by the credit hour for tuition and all applicable fees.

Students enrolled on a part-time basis should understand that part-time enrollment may have an impact on financial aid and on eligibility for insurance through non-University agencies. Students who enroll for fewer than six credits may be required to begin repayment of student loans. Varsity athletes and international students on I-20 permits must enroll for a minimum of 12 credits per semester and may not be part-time students. See summer session exception for students who are registered in a minimum of 6 credits during an accelerated term (summer I or summer II).

Deadline for Changes of Course Enrollment Status

The last day for students to add a course is the fifth day of class of the semester. To change sections within a course, and to change enrollment status from audit to credit or from credit to audit and from pass-no credit to letter grade or from letter grade to pass-no credit is the tenth class day of the semester. The last day for dropping a course with a course notation of W is the fiftieth class day of the semester. Students dropping a course during this time are charged full tuition and fees.

Repeated Coursework/Course Deletions

Repeated Coursework/Course Deletions

Course repetition is permitted only in accordance with the policies cited below, the provisions of which are applicable only to courses taken at the University of Massachusetts Lowell and consequently do not apply to off-campus courses.

A course substitution is not permitted under the provisions of this regulation unless a course has been dropped as a University offering and an alternate course has been authorized as a suitable substitution by the chairperson of the department that offered the course. Once a student has reached the credit limitations cited below, no further courses may be replaced for the purpose of grade substitution, nor may a student who has used the maximum number of course repetitions for the purpose of grade substitution petition to revoke one or more of these substitutions in order to permit course repetition and grade substitution in an additional course or courses.

Grade Substitution/Deletion Rule

Students who entered the University of Massachusetts Lowell as freshmen or transfer to the University of Massachusetts Lowell with fewer than 60 semester credits are permitted a maximum of 15 semester credits for course repetitions/deletions to remove grades of C- or below earned in previously completed courses from their cumulative grade-point averages. Transfer students who enter the University with 60 or more credits are permitted a maximum of 7 semester credits of course repetitions for this purpose. The number of actual course repetitions permitted for any student depends on the number of credits allocated to the courses that he or she wishes to repeat.

Administrative Requirements

Repetition of Passed Courses

Except for courses of a professional nature, which regulations of a particular college may designate as being non-repeatable, students may repeat a course previously passed with a grade of C-, D+, or D within the provisions of the grade substitution rule cited above. When a course previously passed has been repeated within the provisions of this regulation, the cumulative grade-point average is appropriately corrected for the semester in which the course is repeated. If the grade for the repeated course is lower than the original grade in the course, the lower grade may be deleted under the provisions of the grade deletion rule (see above). Credit is never granted twice for a course that has been passed and subsequently taken again and passed for a second time.

Repetition of Failed Courses

Except for courses of a professional nature, which regulations of a particular college may designate as non-repeatable, students may substitute passing grades for repeated failed courses in the computation of cumulative grade-point averages. Except for non-repeatable courses, students must repeat all required courses which they have failed. Courses in which F grades have been received must be repeated and passed before students may take courses for which those failed are prerequisites.

A course which is failed but is not required for a student's program need not be repeated, but other course work must be taken when a student's total degree program will fall short of the specified credit hours for degree requirements. Unless a failed course is repeated within the deadlines for grade substitution, cited above, both the original failing grade and the repeated course grade are counted in computing grade-point averages. Although the provisions of the grade substitution rule and the requirements for maintaining satisfactory academic standing may indirectly limit the number of failed courses which a student may repeat, no formal limitation is placed upon the number of failed courses that may be repeated.

Repetition of Transferred Courses

When competence is demonstrably inadequate, a student who has been granted transfer credit (and on this basis has been assigned to advanced courses for which the transferred course is a prerequisite) may be advised to repeat such transferred work at the University or to take a more elementary course than that which has been transferred.

Permission to repeat a transferred course is granted upon filing an academic petition form with the dean of the college. Since credit may not be granted more than once for the completion of any course, a condition for filing such a petition is the simultaneous filing of a request to revoke recognition of the previously transferred course.

Right of Access to Student Records

The Family Educational Rights and Privacy Act of 1974 (FERPA) grants any student currently in attendance, or any former student, the right of access to inspect or review his or her educational files, records, or data. Students who wish to inspect their records must file a Right of Access form with the office or department in which the desired record is kept. Right of Access forms are available in the Office of Student Services or through student self service. Wherever practicable, within ten days of receipt of the Right of Access form, the office or department will notify the student as to the date, time, and location when the desired record will be available for inspection. If a student believes that circumstances effectively prevent inspecting and reviewing the records at the designated date, time and location, he or she may request alternative inspection arrangements or copies of the records instead, subject to a fee for copies. The Dean of Students or the Dean's designee will consider the request.

The University maintains the following general records on students:

- Admission File?
- Admissions Office
- Permanent Academic Records?
- Office of the Registrar
- Financial Aid Records?
- Financial Aid Office
- Health Records?
- Health Services Office
- Account and Payment Records?
- Business Office
- Campus Conduct Records?
- Dean of Students Office
- Academic Dishonesty?
- Office of the Provost

The file of each student must contain a record of all non-University affiliated individuals or organizations requesting access to information in the file, plus statements that specify the legitimate educational purposes for which access was requested.

Except as otherwise permitted under FERPA, information or records concerning individual students may not be released to any individual or agency without the student's written permission. Any request for such information received without such written permission will not be honored and will be returned with a request for a written release from the student.

FERPA allows release of a student's education records without the student's written permission under certain circumstances, including the following:

1. to personnel of the University, i.e., faculty, administrators, or staff for legitimate educational purposes only;
2. to officials of other institutions in which the student seeks admission or intends to enroll, provided that the student is notified of the release;
3. to federal or state officials in connection with the audit and evaluation of programs funded by federal or state governments, with the enforcement of legal requirements that relate to such programs, or in connection with the student's application for or receipt of financial aid;
4. to accrediting organizations in order to carry out their accrediting functions;
5. to parents who claim the student as a dependent on their IRS statement;
6. to in connection with an emergency, to appropriate persons if revealing such information is necessary to protect the health or safety of the student or other persons;
7. in response to pursuant to a validly issued subpoena, subject to advance notification of the student unless such notice is prohibited by court order; and
8. as otherwise permitted under or consistent with FERPA.

The following data are considered informational in nature and may be released without permission of the student, at the discretion of the University: student's name, major, acknowledgement of a student's participation in officially recognized activities and sports, weight and height of members of athletic teams, date(s) of attendance; degrees, certificates, awards received; the most recent previous educational agency or institution attended by the student and appointment as a Resident Assistant or Community Development Assistant. For graduate students who are teaching credit courses, work department, office address, and employment category are also defined as directory information.

Any student who wishes to have some or all of his or her directory information excluded from release by the University without prior permission must complete the appropriate selections available thru student self service.

Any student who believes that his or her records are inaccurate or misleading may request a hearing with the Dean of Students to discuss the contents of such records and whether or not they need to be changed. Additional information on procedures or policies relating to University compliance with the Family Rights and Privacy Act can be obtained from the Office of Student Services or the Registrar's Office.

Student Complaints

Student Complaints Arising from Grades and Grading Policy of a Faculty Member

Faculty members are expected, as a matter of right and professional standards, to recalculate any grade in which a computational error is alleged or suspected, provided that the student challenges the grade before the deadlines established by the policy on grade appeals (.). Generally speaking grades may only be challenged when a faculty member is alleged to have violated University, college, or departmental academic regulations and policies, or to have violated the faculty member s own grading policy, as determined from the published course requirements for the course or section in question.

Complaints Concerning Classroom Matters Exclusive of Grades and Grading Policy

Students confronting classroom problems that are a source of legitimate concern are entitled to have their complaints heard and resolved according to the procedures specified below.

Classroom problems may include, but are not limited to, the following examples (but note that questions concerning grades and grading policies are reserved to the process specified above):

1. faculty failure to observe University policy and/or regulations, such as violating the regulation against scheduling examinations during the last week of the semester;
2. changing class schedules without the permission of the department chairperson and the college dean, or rescheduling final examinations (including setting a due date for take-home examinations) to a time and place other than that established by the Student Records Office;
3. terminating semester classes prior to the date specified by the University calendar;
4. failing to fulfill instructional obligations (such as unjustified cancellation of classes, frequent absenteeism, and lateness);
5. failing to provide and distribute a written statement of course requirements within the first 10 days of classes, which is mandated for all instructors;
6. failing to adhere to the written statement of course requirements; and
7. failing to post office hours or to maintain such hours.

Students normally should seek to resolve problems by discussion with the faculty member. If this is not feasible or if, after discussion, the matter cannot be resolved, the student must inform the faculty member in writing that he or she will initiate a formal complaint. This complaint must be in writing and addressed jointly to the chairperson of the department and the dean of the college in which the alleged problem and/or violation occurred.

After discussing the problem with the student and the faculty member, the chairperson and the dean determine whether the complaint is valid. (Should the subject of a formal complaint be a department chairperson, the review and determination will be made by the dean and the chairperson of another department.) Copies of the complaint, together with the written decision of the chairperson and the dean, will be sent to the student, the faculty member, the Provost, and the President of the MSP.

Formal complaints about classroom problems shall be initiated before the last day of semester examinations in the semester during which the violation is alleged to have occurred. The determination of the chairperson and the dean must be made within ten working days following receipt of the student complaint and, if unchallenged by the MSP, it is final.

Equal and Fair Treatment

Under federal and state laws, all students are protected from discrimination based on race, color, religion, national origin, disability, gender, (including sexual harassment), age, sexual orientation, marital or veteran status. If you feel that you have been discriminated against based upon any one of these areas, you must contact Equal Opportunity and Outreach (<http://www.uml.edu/equal/>). These protections also include retaliation for filing complaints of discrimination. Concerns regarding course offerings, instructor and student attitudes should also be directed to EOO staff.

Students are responsible for adhering to the polices of the University regarding equal and fair treatment.

Undergraduate Classification

Irrespective of the provisions of specific curricula and the number of full-time semesters completed by students, the University determines class standing on the basis of total credits earned (including AFROTC credits) in accordance with the following scales:

Freshman standing	0-23 credits
Sophomore standing	24-53 credits
Junior standing	54-83 credits
Senior standing	84 or more credits

Withdrawal from Courses

W and X are administrative symbols which indicate that a student has been authorized to withdraw from courses, or from the university. These symbols, which are entered upon the student s permanent record without prejudice, may be authorized only in accordance with established policies of the university. The grade of W signifies voluntary withdrawal from a course. It is initiated by the student and can only be applied prior to the deadline-to-withdraw indicated in the academic calendar, specified on the academic calendar. The grade of X signifies an administrative withdrawal from class. The grade of X is applied by the administration in circumstances where profound impact to academic performance due to a personal or immediate-family medical event, disability, death, or active military service is documented sufficiently. Disciplinary action may also result in administrative withdrawal from classes.

Students may not take more than two withdrawals (W s) in any given course.

Voluntary Course Withdrawal before the deadline-to-withdraw indicated on the Academic Calendar.

Students who desire to withdraw from courses with notations of W prior to the deadline-to-withdraw specified on the academic calendar may withdraw through SIS self-service. Students who do not complete the process of withdrawal before the approved deadline will not be assigned course notations of W, will be subject to all instructor course requirements, and will receive final course grades assigned by the course instructors.

Students who voluntarily withdraw from all courses are withdrawn from the university.?

Note that withdrawal from a course or courses may have implications for degree progress, veteran s benefits, health insurance, financial aid, and immigration status. Students are advised to consult their academic adviser as well as officials in appropriate offices prior to withdrawing from any course.?

Administrative Course Withdrawal

Course withdrawal, with an assigned course notation of X, after the deadline-to-withdraw specified on the academic calendar for reason of a documented extended illness or critical personal emergency may be allowed and ordinarily requires withdrawal from the University, but partial withdrawal may be authorized if circumstances are warranted.

1. In order to apply for medical withdrawal the form with accompanying documentation from a licensed health service professional, must be submitted to the Office of Health Services. Health information is covered by HIPAA laws and medical information received by Health Services is strictly private and confidential. In consultation with the Office of the Registrar, the Office of Health Services submits recommendations to the Provost s Office for final review and approval.?
2. Administrative withdrawal for non-medical reasons is initiated through an to the Office of the Provost with appropriate, verifiable documentation that corroborates the reason for withdrawal advanced on the petition.
3. Neither complete nor partial withdrawal will be authorized because a student anticipates a low or failing grade in the course (or courses) or because of the presumed effect of a low or failing grade on the student s cumulative grade-point average.
4. Faculty are notified when the grade of X is retroactively applied to a course for which a grade was entered. Typically administrative withdrawal is applied to a whole semester rather than to isolated courses. Medical withdrawals occurring after the approved withdrawal period are not associated with financial reimbursement of tuition or fees.?

Withdrawal from University

All students who desire to withdraw from the University are required to:?

1. discharge all financial obligations to the University,
2. return all University property, and?
3. file a written notification of withdrawal with the Office of the Registrar. Since the date of official withdrawal as recorded by the Office of the Registrar is one basis of any claim for tuition refund, and it may be of importance in determining subsequent legal or student insurance claims, students should process withdrawal papers in person prior to leaving the University.

Students who absent themselves from the University without officially withdrawing will remain on class rosters until they officially withdraw from the University or until the end of the semester. Students who remain on class rosters after the fiftieth class day will be assigned final course grades. The date on which a withdrawal request is filed with the Office of the Registrar is the date on which withdrawal is academically effective and constitutes the basis for final course notations.

The names of students who have withdrawn from the University for any reason are removed from all rolls. Students who have withdrawn must be reinstated. This is accomplished through the Office of the Registrar.

Students who are recipients of benefits from the Veterans Administration may not process withdrawals from the University that violate their declarations of classroom attendance. Recipients of veterans benefits are advised that they must receive course grades when their requests to withdraw from the University have been filed after deadlines of the Veterans Administration for processing changes of declared benefit status or when their dates of withdrawal will conflict with declarations of classroom attendance.?

University Withdrawal before Deadline-to-Withdraw specified on Academic Calendar

Students who register for courses and withdraw from the University prior to the first day of classes of a semester are withdrawn without record. Students who register for courses and who withdraw from the University before the deadline-to-withdraw specified on the academic calendar are withdrawn with course notations of W.

University Withdrawal After the Deadline-to-Withdraw specified on the Academic Calendar

A student who withdraws from the University after the Deadline-to-Withdraw specified on the academic calendar must be graded by all course instructors unless the student is authorized to withdraw for documented reasons of extended illness or critical personal emergency.?

A student who wishes to withdraw from the University after the deadline-to-withdraw specified on the academic calendar must file an academic petition, together with appropriate documentation specifying the cause for the withdraw, with the Office of the Provost. Following a review of the academic petition and verification of attached documentation, the Office of the Provost may permit the student to withdraw from all courses with course notations of X.

Withdrawal from courses may have implications for degree progress, veteran s benefits, health insurance, financial aid, and immigration status. Students are advised to consult their academic advisor as well as officials in appropriate offices prior to withdrawing from class.?

University Withdrawal After the End of the Semester

A student who has unofficially withdrawn from the University (i.e., has ceased attending classes) for reasons of extended illness or critical personal emergency and was unable to officially withdraw from the University before the end of the semester may petition to withdraw from all courses with course notations of X. Such a student must file an academic petition, together with supporting documentation, no later than one calendar month from the beginning of the following semester. This petition must be filed with the Office of the Provost. Following a review of the academic petition and verification of attached documentation, the Office of the Provost will notify the student and the Office of the Registrar of the decision. Faculty are notified when the grade of X is retroactively applied to a course for which a grade was entered.?

Readmission

Students who have withdrawn from the University may apply for re-admission through the Office of the Registrar. The form for re-admission may be found at ?

AFROTC Requirements

Uniforms, equipment, and textbooks required for AFROTC will be supplied. Students in the POC or on scholarship receive a monthly subsistence allowance of \$250 to \$400. Competitive scholarships are available for academically qualified cadets in the program. Students who successfully complete the POC are commissioned as second lieutenants in the United States Air Force and are required to serve on active duty in the Air Force for a minimum of four years.

Policies

Both general military courses and professional officer courses in Aerospace Studies may be used as undesignated or unrestricted elective courses in a student s baccalaureate program. Grades for all AFROTC courses are applicable to the determination of grade-point averages. Students should consult the regulations of the college in which they are matriculating concerning the number of AFROTC courses which may be included as part of their programs of study.?

In the event that such elective courses are insufficient to accommodate all the AFROTC courses, students wishing to pursue the AFROTC program will be required to fulfill program requirements on an overload basis. Consequently, AFROTC credit toward graduation requirements will vary from six (minimum to meet AFROTC/University of Massachusetts Lowell contract requirements) to sixteen credits dependent on the student s particular college and degree program. Some colleges allow AFROTC courses to be substituted for technical general electives.

Field Training

AFROTC field training is offered during the summer months at selected Air Force bases throughout the United States. Students in the four-year program participate in four weeks of field training, usually between their sophomore and junior years. Students applying for entry into the two-year program must successfully complete six weeks for field training prior to enrollment in the Professional Officer Courses. The major areas of study in the four-week field training program include junior officer training, aircraft and aircrew orientation, career orientation, survival training, base functions and Air Force environment, and physical training. The major areas of study included in the six week field training program are essentially the same as those conducted at four-week field training and in the General Military Course, including leadership laboratory.

Leadership Laboratory

AFROTC field training is offered during the summer months at selected Air Force bases throughout the United States. Students in the four-year program participate in four weeks of field training, usually between their sophomore and junior years. Students applying for entry into the two-year program must successfully complete six weeks for field training prior to enrollment in the Professional Officer Courses. The major areas of study in the four-week field training program include junior officer training, aircraft and aircrew orientation, career orientation, survival training, base functions and Air Force environment, and physical training. The major areas of study included in the six week field training program are essentially the same as those conducted at four-week field training and in the General Military Course, including leadership laboratory.

Admission to Upper Division

All BSBA students must apply to be admitted to the upper division program in a concentration of their choice upon completion of the filter courses listed below. Minimum criteria for admission to upper division are an overall grade point average of 2.000/4.000.

- 60.201 Accounting/Financial?
- 49.201 Economics I?
- 49.211 Statistics I?
- 92.122 Management Calculus?
- 42.101 College Writing I?

- 42.102 College Writing II?
- 47.101 General Psychology?
- 48.101 Intro to Sociology

For students transferring from another institution, a course deemed equivalent to any of the above courses by the Manning School of Business will be used to meet this requirement.

Application for admission is submitted directly to the Office of the Dean. The application must include: a completed change of major form obtained from the Office of Enrollment Services, the Office of the Dean of the School, or any department in the School.

Admission to the Manning School of Business upper division is guaranteed for transfer students if they have completed an Associate in Science, Business Transfer Option, and the above mentioned courses.

Students who are not eligible to declare a concentration after earning 60 credits but who satisfy university retention requirements may file for intercollegiate transfer within the university. Students who are ineligible to file for intercollegiate transfer or are denied admission to another college following application for intercollegiate transfer are dismissed from the university.

Transfer Rules

The Manning School of Business welcomes transfer students from Massachusetts community colleges and other regionally accredited institutions to the BSBA program. All MSB students including transfer students from other accredited institutions and from other colleges of University of Massachusetts Lowell initially enter the BSBA program as Business Administration students. After completing the filter courses, students apply to be admitted to the upper division and to declare a concentration according to the upper-division admission policies stated in section III. Students entering UMass Lowell with an associate degree may apply to be admitted directly to the upper division. Transfer students who have not earned an associate degree and transfer more than 45 credits toward the BSBA program may apply to be admitted to the MSB upper division after completion of the filter courses. All students must complete at least 60 academic credits in residence at University of Massachusetts Lowell subject to exceptions specified in this catalogue.

Transfers from:

- [Other Institutions](#)
- [Other UMass Lowell Departments](#)
- [Other MSB Departments](#)

?A. Transfer From Other Institutions

Students transferring to the Manning School of Business from any program not included in the Commonwealth Transfer Compact, with or without an associate degree, must have a cumulative grade point average of at least 2.500/4.000. Students may not transfer any course in which they earned a grade of less than C- (1.700 on a 4.000 scale). Courses at a level below the first MSB requirements, such as algebra or the first semester of a two semester precalculus sequence, are not transferable. Only Business Courses taken at other AACSB accredited institutions may transfer as upper division (junior and senior level) MSB courses.

Transfer from Massachusetts Community Colleges

Students transferring with an Associate in Science, Business Transfer Option, from a member of the Commonwealth Transfer Compact can transfer all courses up to a maximum of sixty-six (66) credits. Although all transferred courses are listed on the student's transcript, due to differences in program requirements of different institutions, some courses may not apply to minimum degree requirements of the Manning School of Business. Courses at a level below the first COM requirements, such as algebra or the first semester of a two-semester precalculus sequence, are examples of such courses. However, the student transferring with an associate degree, Business Transfer Option, will be eligible to take upper level courses in the College of Management subject to the stated prerequisites for each course. Courses taught by the School as part of its upper division core that are not acceptable for transfer may be validated by departmental exam. Courses that are equivalent to courses taught by the School in the upper division (junior and senior level) which are not a part of the COM core requirements cannot be used to satisfy the minimum degree requirements of the BSBA degree in the Manning School of Business. Students transferring to the Manning School of Business with an associate degree are prohibited by University policy from pursuing further off-campus study.

B. Intercollegiate Transfer

Intercollegiate transfer students to the Manning School of Business must be in good standing and have completed at least 15 credits at the University of Massachusetts Lowell. Upon acceptance, students will be listed as Business Administration (BA) and will usually be permitted to enroll only in lower division courses.

The transfer request is normally initiated by the students and is submitted to the Manning School of Business. Students must submit a completed change of major form obtained from the Office of Enrollment Services, the Office of the Dean of the School, or any department in the School.

University of Massachusetts Lowell students intending to apply for intercollegiate transfer to the College of Management should do so preferably before completing 60 credits (prior to completing the sophomore year). This will minimize delays in completing their educational objectives since MSB upper division courses are restricted to juniors and seniors in the College of Management with appropriate prerequisites who have been admitted to upper division according to rules stated in Section III of the Policies for Undergraduate Admissions.

The Manning School of Business reserves the right to limit intercollegiate transfer activity if student enrollment capacities are met.?

C. Transfer from Other MSB Departments

Once admitted to the Manning School of Business upper division program, students can choose to enroll in any concentration within MSB. Depending on the number of unrestricted electives available in the curriculum of the concentration students are entering and the number of credits completed by the students at the time of transfer, some courses may not be usable in the students new program, requiring students to take courses above and beyond the University's minimum graduation credit requirements. All courses stay on the students transcripts at the University and are included in the determination of the cumulative grade point average as specified by University policies. Students shall not be permitted more than two intercollegiate transfers.

Admission Requirements

Students entering the university as freshmen in the Manning School of Business must be registered as Business Administration (BA) if pursuing the BSBA degree. Upon completion of the first semester of the sophomore year, BA students may apply to be admitted to the upper division program and to declare a concentration. The College offers concentrations in Accounting, Finance, Management, Marketing, and Management Information Systems (MIS).

Transfer students may apply for admission to the Manning School of Business according to the transfer rules described in sections II and III below. Business Administration students may apply for admission to upper division MSB programs described in section III.

Special Academic Policies

The following rules govern the applicability of courses satisfying curriculum requirements in any Manning School of Business concentrations:

- A. Students may transfer a course that COM offers in its upper division (junior and senior years) if the course was taken at a school accredited by the AACSB, and a grade of C or better was earned.?
- B. Upper division Manning School of Business courses (300 and 400 level) are restricted to matriculated students who have been admitted to the upper division program and have completed all prescribed prerequisites. Transfer students may not count any courses that require validation or which are not creditable to the MSB concentration towards this requirement.
- C. MSB upper division courses are restricted to:
 1. juniors and seniors enrolled in MSB;?
 2. juniors and seniors enrolled in another college of the university whose major requires completion of specific business courses; and?
 3. special students who meet appropriate prerequisites.
- D. An unrestricted (free) elective (designated non-MSB) for MSB students is any course satisfying one of the following criteria:
 1. a 100 or above level course from any college offered in the day program;?
 2. a course listed as satisfying a University area distribution requirement;?
 3. a course allowed by an approved academic petition.

Any course taken in violation of these rules may not be used to fulfill MSB curriculum requirements regardless of the grade

Graduation Requirements

In addition to satisfying degree requirements listed in this catalog under University Academic Policies and under Manning School of Business, MSB majors must also satisfy the following requirements:

A. Residency Requirement

MSB majors must take all required upper division courses in residence in the day programs of MSB. Any exceptions to this (for international study, etc.) must be approved by the appropriate department chairperson and the Dean or her designee prior to enrolling in such courses. No approvals for transfer credit of any required course taken at any other institution will be granted after the course has been completed except as noted above for transfer students.

B. Degree Requirements

In order to qualify for a Bachelor's Degree offered by the Manning School of Business, undergraduate students must satisfy all course requirements applicable to the major and their area of concentration and must earn a cumulative grade point average of 2.200 at completion of the baccalaureate program.

Policies

Please review the following:



Academic Integrity Policy

The integrity of the academic enterprise of any institution of higher education requires honesty in all aspects of its endeavor. Maintaining academic integrity is therefore the responsibility of all faculty, staff, and students at the University of Massachusetts Lowell.

Academic dishonesty is prohibited in all programs of the University. Sanctions may be imposed on any student who has committed an act of academic dishonesty.

Definitions of Academic Dishonesty

Academic dishonesty includes but is not limited to:

Cheating - use, or attempted use, of trickery, artifice, deception, breach of confidence, fraud, or misrepresentation of one's academic work. Submission of the same work in its entirety for credit in two courses without obtaining the permission of the instructors constitutes cheating. Collaborating with others when not explicitly allowed by the instructor constitutes cheating.

Fabrication - falsification or invention of any information or citation in any academic exercise.

Plagiarism - representing, whether intentionally or unintentionally, the words or ideas of another as one's own work in any academic exercise.

Facilitating dishonesty - helping or attempting to help another commit an act of academic dishonesty, including substituting for another in an examination, misrepresenting oneself, or allowing others to represent as their own one's papers, reports, or academic works.

INITIATING CHARGES OF ACADEMIC DISHONESTY

Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. The procedures outlined below are intended to provide the process by which sanction may be imposed if it appears that academic dishonesty has occurred, and by which students may appeal such sanctions.

These procedures apply to all students participating in academic classes and programs, including all graduate, undergraduate, and CSCE programs. The procedures associated with this policy are the only official procedures for making allegations of, issuing sanctions because of, or appealing charges of academic dishonesty.

Any instructor may initiate charges of academic dishonesty by following the procedures outlined below.

I. Determining Sanctions and Notification of Students

- a. When academic dishonesty is suspected, the instructor (complainant) should bring the case to the attention of the complainant's chair and discuss an appropriate course of action/sanction.
- b. Possible sanctions include a reduction in grade in an assignment or exam; a zero or failing grade in an assignment or exam; a forced repeat of an assignment or exam; a reduction in grade in a course; a recommendation of a grade of FX (non-deletable failure); recommendation of suspension; or recommendation of dismissal.
- c. If a sanction is to be applied, the instructor must notify the student, in writing or orally, of the incident observed and the sanction that will be imposed. Such notification should be made within 10 business days after recognizing the incident.
- d. The instructor must maintain a record of the notification.

Notification to the Provost by the Instructor

- a. Notification to the Provost by the instructor must occur within 2 business days of informing the student. The instructor must fill out a "[Notification of Academic Dishonesty Form](#)" (pdf) available online at the website for the Office of the Registrar at www.uml.edu/docs/notificationofacademicdishonesty_tcm18-3543.pdf and email or fax this form to the Provost or designee. In lieu of the form, an email with the necessary information will suffice.
- b. The Provost or designee will send the student official notification of the sanction via certified mail and include notification of the right to appeal. Such official notification must be sent to the student within 5 business days of receipt of the "Notification of Academic Dishonesty Form."
- c. The Provost or designee also informs (in writing) the dean and chair of the complainant's department of the complaint and sanction.
- d. The office of the provost will maintain this information and record the sanction. The record will be kept until the student graduates UMass Lowell. If there is a record of multiple complaints the provost or designee may apply more severe sanctions including suspension and dismissal.

If the student does not appeal the charges, the process is complete and the sanction is imposed.

First level of Appeal: Academic Dean

If the student denies responsibility or believes that the sanction is too severe, the student may appeal the sanction to the Academic Dean of the college of the complainant's department or designee in writing, within five business days of receiving notification of the sanction from the office of the provost. During the appeals process the student is expected to continue attending the class in which the sanction has been issued unless prohibited by department policy. The Academic Dean or designee will commence a review of the issues raised in the appeal and forward the decision to the office of the Provost as soon as practicable.

The Provost or designee must notify the student, by certified mail, and other relevant parties of the outcome of the appeal process. If the appeal is sustained on the grounds that the charge is not adequately supported then all records of the incident are destroyed. If the appeal is not sustained then records of the incident are maintained in the office of the provost.

Second level of Appeal: Office of the Provost

The decision reached by the Academic Dean or designee may be appealed to the Provost or designee if the student believes that he or she did not receive due process.

Grounds for Appeal of Due Process

An appeal shall be limited to a review of supporting documents and the process and outcome of the Academic Dean or designee for one or more of the following grounds:

- Bias by the Instructor, Academic Dean, or designee substantially influenced the outcome of the process to the detriment of the student.
- If new, relevant information has come to light that was not available at the time of the hearing by the Academic Dean.
- If unusual procedures were followed or if the procedures outlined herein were not followed, to the detriment of the student.

Appeals may be filed by the student or complainant to the Provost or designee within three business days of receipt of the decision. Such appeals shall be in writing and shall be delivered to the Provost or designee, and must be based on the "Grounds for Appeal" (above). The Provost or designee may decide to uphold the decision of the Academic Dean or designee or convene the Academic Integrity Appeals Board ("Board"). All decisions by the Provost or designee are final and may not be appealed. Such decisions will be made as soon as practicable.

The Provost or designee must notify the student, by certified mail, and other relevant parties of the outcome of the appeal process. If the appeal is sustained on the grounds that due process was not followed then all records of the incident are destroyed. If the appeal is not sustained then records of the incident are maintained in the office of the provost.

Academic Integrity Appeals Board

Membership : The Academic Integrity Appeals Board is chaired by the Provost or designee. The Provost or designee will vote only in the case of a tie. The Board consists of a minimum of three faculty members chosen by the Provost or designee with no two members selected from the same College and cannot include a faculty member within the department initiating charges of academic dishonesty.

Right to an Advisor : A student may elect to be accompanied at all proceedings of the disciplinary process by an advisor of his or her choice. The advisor must be a current member of the faculty, staff, or student body of the University. The role of the advisor in all cases is limited to advising the student during the academic dishonesty proceedings. The advisor may not speak on behalf of the student, or examine or cross-examine a witness, or address the process publicly during proceedings.

Accommodations for Students with Disabilities : The University of Massachusetts Lowell is committed to providing appropriate accommodations to students with documented disabilities so that all students have meaningful access to all UMass Lowell programs and services, including the Academic Integrity Process.

All those with disabilities who are involved in the Academic Integrity Process, including accusers and accused students, advisors, and witnesses may seek accommodations for any stage of the Academic Integrity Process. Any student requesting an accommodation must do so far enough in advance to allow the request to be reviewed and an appropriate accommodation identified and implemented.

A request for accommodation can be made to the Director of Disability Services ("Director"), the designated Academic Dean, or the Provost. The requests will be reviewed by the Director, who will apply appropriate legal standards and University policies and procedures to determine what accommodation, if any, is appropriate. The student will be given an opportunity to have an interactive role in the review process (i.e., to discuss the request with the Director, before the Director completes the review). The Director may require the student to provide appropriate documentation from qualified health care professionals to support the request. In addition, the Director may consult, as appropriate, with the Academic Dean or the Provost, or another expert of the Director's choosing. The Director will make a decision in light of the student's particular disabilities and the nature of the Academic Integrity Process, upon reviewing any consultations, relevant documentation and relevant previous accommodations provided to the student. The student will be given an explanation of the Director's determination.

If the student requesting accommodations disagrees with the Director's determination on appropriate accommodations, he may appeal the determination to the Office of ADA Compliance (Office of Equal Opportunity and Outreach) within five working days of the Director's decision.

Appeal of Provost Sanctions (Suspension or Dismissal)

Any additional sanctions applied by the Provost following multiple incidents of academic dishonesty must be appealed to an Academic Integrity Appeals Board as described above. The Board will be chaired by a designee of the Provost who has not participated in the process leading to the charges.

The Provost or designee must notify the student, by certified mail, and other relevant parties of the outcome of the appeal process. If the appeal is sustained on the grounds that the charge is not adequately supported then all records of the incident are destroyed. If the appeal is not sustained then records of the incident are maintained in the office of the provost.

Academic Standing

[Warning Notice](#)

[Probation](#)

[Academic Dismissal and Reinstatement](#)

[Graduate Fresh Start](#)

GPA Minimum

No more than 6 course credits of grades below a B may be counted toward the master's degree; no more than 9 credits of the same grades may be counted toward the doctorate. **No graduate degree will be awarded to any student whose overall cumulative grade point average falls below 3.0.**

Academic Standing

Students on academic warning or academic probation after the Spring semester and who are registered for a Summer I course at the University of Massachusetts Lowell will have the grade for that course included in evaluating the academic standing. The academic standing will be adjusted to include the grade(s) received during Summer I session.

The consequences of the academic standing of warning or suspension will not apply for students completing degree requirements for that semester.

Warning Notice

Any graduate student whose semester grade point average (GPA) falls below 3.0 will automatically receive a **warning** notice which will also be sent to the graduate coordinator, and filed with the student's record in the Registrar's Office. The student will be strongly advised to meet with the graduate coordinator or his/her designee within 30 days of receipt of the warning notice and develop an academic plan to bring his or her GPA to a level above 3.0.

Probation

Any graduate student whose semester GPA falls below 3.0 for a second time, will automatically receive a letter of **probation** from the Vice Provost for Graduate Education. Copies of the letter will be sent to the graduate coordinator, chairperson, college dean, and also placed on file with the student's record in the Registrar's Office. Within 30 days, the department graduate committee, chaired by the graduate coordinator or his/her designee, will meet with the student and decide whether to recommend loss of degree candidacy. Such a decision or other course of action will be fully documented in writing with copies sent to the chairperson, and college dean. A recommendation of loss of degree candidacy and dismissal are subject to the approval of the college dean.

Academic Dismissal and Reinstatement

Any student whose semester GPA falls below 3.0 for a third time, and whose cumulative GPA is below 3.0, will automatically be **dismissed** from his or her graduate program and the University. Reinstatement will be considered if the student provides a detailed justification and academic plan concerning how he or she will correct this academic deficiency. The plan must be attached to a Graduate Academic Petition and approved by the graduate coordinator, chairperson, the college dean, and the Vice Provost for Graduate Education or his/her designee. **If any of the above individuals disapproves of the reinstatement, the dismissal will remain in effect and no subsequent appeals will be considered.**

Independent of the the warning/probation/dismissal system, the dean of the college where the student's degree program resides may at any time examine the performance of any student not meeting the academic standard expected of graduate students within that college and recommend to the appropriate graduate committee a course of action including dismissal.

For the procedure for formal adjudication of any academic issues (non-misconduct) which may arise, please see University Appeals Process Regarding Academic (non-misconduct) Issues of Graduate Students.

Graduate Fresh Start

Master and Doctoral degree candidates and non-degree students who have been absent from the University for four years or longer may be readmitted under the program Graduate Fresh Start. If admitted into a degree granting program, under the terms of Graduate Fresh Start, a returning graduate student will be treated as if s/he were a new student. A maximum of two courses (six credits) at the 500 level or higher completed during earlier periods of enrollment with grades of "B" or better may, with the approval of the degree granting

department, be transferred into the degree program. These courses must be transferred via an academic petition and will be accepted toward graduation but not included in the cumulative grade point average (GPA). Thesis and dissertation research credits are ineligible for transfer. Courses completed during earlier periods of enrollment with grades below "B" are not eligible for transfer. A student may be readmitted under the Graduate Fresh Start program only once at the graduate level.

Students who wish to be considered for the Graduate Fresh Start Program must follow the normal procedures for admission to the University and file a . Academic Petitions for transfer credits must be approved by the appropriate graduate coordinator and/or department chair of the degree granting department, and must be filed with the University Registrar. In addition, the student must submit a personal statement which addresses personal and professional growth during the period of time in which the student was absent from the University which supports the student's potential for academic success. If admitted, credits and GPA start at zero. Transfer courses may count towards the degree, but are not included in the GPA.

All courses taken and grades achieved during earlier periods of enrollment will appear on the transcript along with a notation that they are not included in the cumulative grade point average. Once this change is made to the academic record, the change can NOT be reversed.

Acceptance of Foreign or American Master's Degree toward Doctoral Requirements

Students accepted into a doctoral program who hold a master's degree in the same or a closely related discipline from a U.S. or foreign academic institution will have their transcripts and supporting documentation reviewed by the department graduate committee.

The committee may choose one of the following actions:

1. Approve all coursework and thesis for the master's degree up to the total number of credits granted by the University of Massachusetts Lowell department for its master's degree, and thereby require the student to complete only "beyond the master's" course/thesis credits for the doctorate.
2. Accept the U.S. or foreign master's degree, but because of deficiencies in the student's master's program, require a limited number of graduate courses to be added to the total credits required for doctoral degree completion "beyond the master's".
3. Require that a student with a U.S. or foreign master's degree obtain a University of Massachusetts Lowell master's degree before proceeding to the doctorate.

All coursework for U.S. or foreign master's degrees considered for approval by the department must be at a grade level of B or better. Official, documented verification of the degree awarded must also be provided.

Commencement

[Commencement](#)

[Conferring of Degrees](#)

[Academic Honors](#)

[Replacement Diploma](#)

Commencement

Graduation exercises are held once a year at the end of the spring semester. Students who have completed degree requirements during the previous summer term or fall semester are permitted to attend commencement exercises, and their names are listed in the commencement booklet. Attending commencement exercises is not compulsory. An individual who wishes to receive a diploma by mail must notify his/her college dean and file a corrected address through student self service if he or she anticipates moving from a previously reported permanent address.

Conferring of Degrees

Diplomas are awarded three times a year:

1. In June for students completing degree requirements during the spring semester.
2. In October for students completing degree requirements during the summer term.
3. In February for students completing degree requirements during the fall semester.

Individuals who wish to submit verification of degree completion to employers or to graduate schools during the period between the end of their final grading period and the awarding of diplomas may obtain a letter of completion from the Registrar's Office.

Academic Honors

Due to the many fields and diversity of study at UMass Lowell, academic honors for graduate students are discipline-based and vary within respective colleges. Honors for graduate students are not listed on transcripts.

Replacement Diploma

Replacement diplomas may be ordered through University Alumni Relations for an additional fee.

Course Credit

[Maximum Semester Credit Limit](#)

[Graduate Credit for Undergraduate Courses](#)

[Undergraduate Credit for Graduate Courses](#)

Maximum Semester Credit Limit

The usual course load for full-time graduate students is 9 credits/semester. Depending upon the program requirements and abilities of the student, individuals may carry more than 9 credits each semester. However, the absolute maximum number of total credits (combined undergraduate and graduate) for which a graduate student will be allowed to register is 18 credits/semester. The maximum number of thesis or dissertation credits for which a student may enroll in any semester is nine credits.

Graduate Credit for Undergraduate Courses

UMass Lowell courses at the 400 level are designed for seniors but under certain circumstances may be taken by graduate students for graduate credit. A maximum of 6 credits of 400 level courses may be used for credit toward the graduate degree with the permission of the degree granting department. Three hundred level courses and below are never counted toward a graduate degree. If a graduate student takes certain undergraduate courses to make up for background deficiencies or to satisfy language requirements, the course credit hours are not used as part of the graduate degree program but will appear on the graduate transcript.

Undergraduate Credit for Graduate Courses

A qualified junior or senior may take a course at the 500 level for undergraduate credit in accordance with the policy and procedures of the department or college in which the course is offered. The grade received in any such course is used in calculating the undergraduate's cumulative grade point average. Counting of graduate credits for both the bachelor's and master's degrees is subject to departmental requirements.

At no time may grades computed in an undergraduate GPA be used toward a graduate GPA.

Course Designations

[Course Numbering System](#)

[Continuing Graduate Research](#)

[Course Prefixes](#)

[Audit](#)

Maximum Semester Credit Limit

The usual course load for full-time graduate students is 9 credits/semester. Depending upon the program requirements and abilities of the student, individuals may carry more than 9 credits each semester. However, the absolute maximum number of total credits (combined undergraduate and graduate) for which a graduate student will be allowed to register is 18 credits/semester. The maximum number of thesis or dissertation credits for which a student may enroll in any given semester is nine credits.

Course

Numbering System and Designation:

400-499 - Undergraduate courses usually designed for juniors or seniors; no more than six credits may be taken for graduate credit with the permission of the graduate coordinator.

500-599 - Courses for graduate credit, but which may be taken by advanced undergraduates with the advisor's permission.

600-699 - Graduate courses which are open only to graduate students.

700-799 - Seminars, special topic courses, projects, or thesis research for advanced candidates in master's and doctoral degree programs.

Each course offering is designated by a two-digit prefix and a three-digit course number (e.g., 81.529).

Continuing Graduate Research

Once a student has completed the required number of credits for master's or doctoral thesis/dissertation research with grades of PR or S (see summary of degree credit requirements), he or she will not be allowed to sign up for additional thesis/dissertation research credits. Instead, if required for teaching/research assistantships or immigration/visa purposes, the student may enroll in 3, 6, or 9 credits of Continuing Graduate Research designated __763, 766, or 769 __ where the first two blanks represent the departmental designation, 3, 6, and 9 indicate the respective number of credits, and the last three blanks are the standard numbers which code to a particular faculty member in the department.

The two digit college prefix identifies a college department and/or special area. The three-digit course number identifies the course level.

Course Prefixes

Each college department and/or special subject area has been assigned an identifying two digit number within the numerical ranges specified as follows:

Education - 01-09
Engineering - 10-18 & 20-28
Health - 19 & 29-39
Humanities/Social Sciences, Fine Arts - 40-59, 70-79
Management - 60-69
Science and Math - 80-99
Biomedical Engineering - IB
Marine Science - IM

Audit

A graduate student may, upon approval of the advisor and the instructor, register for a course on an audit basis, but must pay the full amount of tuition and fees. An audit student is not required to take tests or the final examination. A change in registration from audit to credit or credit to audit must be done during the add/drop period. Under no circumstances can a course taken for audit be given credit at a later date.

Equal and Fair Treatment

Under federal and state laws, all students are protected from discrimination based on race, color, religion, national origin, disability, gender, (including sexual harassment), age, sexual orientation, marital or veteran status. If you feel that you have been discriminated against based upon any one of these areas, you must contact Equal Opportunity and Outreach (EOO). These protections also include retaliation for filing complaints of discrimination. Concerns regarding course offerings, instructor and student attitudes should also be directed to EOO staff at 978-934-3565.

Students are responsible for adhering to the policies of the University regarding equal and fair treatment.

General Regulations for Graduate Students

Each University student is subject to two sets of academic regulations - those of the University as a whole, which are cited in this section, and the academic rules of the college and program in which he or she is enrolled. The academic rules of colleges and programs are listed in sections devoted to college programs.

In registering for courses, each student assumes full responsibility for knowledge of and compliance with the definitions, regulations, and procedures for the University, as set forth in this publication. Moreover, in accepting admission to the University, each student assumes responsibility for knowledge of and compliance with the definitions, regulations, and procedures of the University pertaining to his or her student status as set forth in the appropriate UML publications.

Students who have questions about the interpretation or application of University academic policy should consult the dean of their college or the Vice Provost for Graduate Education.

Graduate Grading Policies

[Grading System](#)
[Grade Exclusion](#)
[Grades for Projects, Theses/Dissertations and Seminars](#)
[Incompletes](#)
[Course Listing on the Graduate Transcript](#)
[Audited Courses](#)

Grading System

The grading system uses grades:

A+(4.0), A(4.0), A-(3.7)
B+(3.3), B(3.0), B-(2.7)
C+(2.3), C(2.0)
F(0.0).

The following special grades are also used:

INC (Incomplete),
S (Satisfactory, B or better),
U (Unsatisfactory) for projects, theses/dissertations, and seminars only
AU (Audit)
W (Withdrawal from a course or from the University)
X (Withdrawal because of illness or personal emergency)

Y (Administrative dismissal),

Q (Never attended but did not withdraw. This grade requires a letter from the instructor to the University Registrar stating the student never attended the class.)

PR (In Progress for theses or dissertations)

NC (No Credit for theses or dissertations where no progress has been made).

A student registering for research will do so each semester up to the total number recommended. No graduate degree will be awarded to a student whose cumulative average for course work in his or her program is below 3.0. Some programs may require a higher grade point average for graduation. The cumulative grade point average is computed from all graduate level courses taken for a grade at the University of Massachusetts Lowell.

Grade Exclusion

A request may be submitted to omit a specific course (grade and credits) from the GPA for matriculated students. Such a request must be presented on an Academic Petition, provide detailed justification for the specific action, and certify that the action has been approved by a majority of the departmental graduate committee. Only one grade exclusion in total, including a grade for a repeated course, will be permitted for each degree sought by the student as recommended by the departmental graduate committee. However, the official transcript will list grades for all undergraduate and graduate courses taken at the University with the notation that the grade and credits are excluded from the GPA. Grade substitutions are not permitted.

Grades for Projects, Theses/Dissertations and Seminars

- **Projects** (Enrollment Restricted to Matriculated Graduate Students):
Only one of three grade designations will be allowed for projects:
S for projects completed at a satisfactory level
U for unsatisfactory completion of a project (no credit toward degree requirements)
INC Incomplete
- **Theses/Dissertations** (Enrollment Restricted to Matriculated Graduate Students):
PR will be given for thesis/dissertation research if the student has made satisfactory progress during the semester.
NC will be given if the student has made no progress during the semester on thesis/dissertation research.
U Unsatisfactory (no credit toward degree requirements)

After successful defense of the thesis/dissertation, a grade of "S" (Satisfactory) will be given for all semesters of the thesis/dissertation research. Only the Registrar's Office can issue this grade.

- **Seminars:**

S - Satisfactory

U - Unsatisfactory (no credit toward degree requirements)

INC - Incomplete

Under no circumstances will letter grades (A, B+, etc.) be allowed for projects, theses/dissertations, or seminars.

Incompletes

If, because of unusual circumstances, a student is unable to meet all the requirements of the course by the end of a semester, the grade of Incomplete (INC) may be given. Responsibility for making arrangements with an instructor to complete all outstanding coursework rests entirely with the student, who must complete all outstanding coursework by the date listed on the (). Under no circumstances will a student be allowed to graduate with incomplete(s) on his or her transcript.

Prior to completion of the missing work, the incomplete will not be computed into the grade point average (GPA). If the student completes the missing work within the specified period, the instructor must evaluate the work and turn in a grade change form to the Registrar's Office before the deadline for instructors to submit final grades for incomplete courses as specified on the (). However, if the student does not complete the missing work by the specified date and no grade change form is submitted by the instructor, the student's grade will automatically change to a grade of "F" and be computed into the GPA.

Course Listing on the Graduate Transcript

All graduate courses for which a student registers (including repeated courses) are listed on the transcript and are used to calculate the student's grade point average whether or not they are taken to fulfill degree requirements. In addition, undergraduate courses which a student takes to fulfill prerequisite requirements before or during matriculation in a graduate program, or courses taken for personal enrichment, will also be listed on the transcript.

Audited Courses

A graduate student may, upon approval of the advisor and the instructor, register for a course on an audit basis, but must pay the full amount of tuition and fees. An audit student is not required to take tests or the final examination. A change in registration from audit to credit or credit to audit must be done during the add/drop period. Under no circumstances can a course taken for audit be given credit at a later date.

Graduate Clearance

Applying for graduation is a two step process for graduate students.

First, the student must file a with the Registrar's Office. The Registrar's Office will mail the Graduate Clearance Form to students.

When the student receives the "Graduation Clearance" form, it must be completed, approved by all appropriate faculty and submitted to the Registrar's Office by the date listed in the Graduate Academic Calendar.

The registrar's office will verify course credit credit, grade and GPA requirements, and submission of thesis/dissertation (if applicable) prior to the awarding the degree.

Additional Requirements for Students Completing a Thesis or Dissertation

All students who are completing a thesis or dissertation must also submit one clean copy (NOT the original) of the signature page for the thesis or dissertation. The signature page must be signed and dated by the thesis/dissertation advisor and all committee members. Copies of the Thesis or Dissertation must be submitted to the Library for binding and microfilming by the deadline dates listed for degree clearance. In addition, doctoral students are required to submit a completed "Survey of Earned Doctorates" at the time of earned doctorates. Unless the Registrar's Office receives the completed signature page which verifies that a student has successfully defended the thesis/dissertation on or before the "last day to submit clearance forms" in the Graduate Academic Calendar and confirms that the thesis/dissertation has been submitted to the library, the student will not be eligible to graduate.

Graduate Grade Appeal Process for Students

The instructor of the class is the primary authority with respect to a student's proficiency and final grade in that course. A student who believes that his or her final grade reflects an erroneous, capricious, arbitrary, or prejudiced academic evaluation may appeal the grade. The academic judgment used in determining the merits of the grade to be awarded shall not be reviewable. This process does not apply to cases of academic dishonesty, which are adjudicated through the "academic dishonesty process."

1. The student may file an appeal of his or her complaint, in writing, to the instructor within 30 days after a final grade is posted to the student's record. The instructor must respond within 14 days of receiving the appeal.
2. If the student remains dissatisfied by the decision of the instructor under step (1), he or she may, within 14 days after formal receipt of the instructor's final decision, appeal, in writing, to the chairperson of the program (or the Dean of the College if the instructor is the chairperson) in which the course or other exercise or activity is offered. The chairperson must respond within 14 days of receiving the appeal. The decision may be: (a) that the appeal be dismissed; (b) if there is demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the chairperson will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or (c) that another appropriate remedy be administered.
3. If no satisfactory resolution is reached in step (2) then the student or the instructor may appeal, in writing, to the Dean of the College within 14 days after formal receipt of the chairperson's final decision.
4. The Dean, after discussion with the appropriate parties, may resolve the grievance by agreement or render a decision within 21 days of receipt of the written appeal. The decision may be: (a) that the appeal be dismissed; (b) if the student provides demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the Dean will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or (c) that another appropriate remedy be administered.
5. The decision of the Dean is final and not subject to additional appeal by either student or instructor. The appeals process ends at this step.
6. The Department chair or his/her designee is responsible for keeping a record of the appeal on file in accordance with University Records Retention Policy.

Registration and Enrollment Policies

- [Continuous Registration](#)
- [Dropping Classes and Refund Policy](#)
- [Changes in Registration](#)
- [Change of Program](#)

Continuous Registration

In order to maintain continuity of enrollment, a matriculated student must register each fall and spring until the program of study is complete and the degree has been earned. A graduate student who plans to receive his/her graduate degree in the summer term (awarded in October) must register during the previous summer session in order to maintain continuous matriculation.

If for any reason a student is not registered for a course (because of a leave of absence or because the thesis or dissertation has been successfully defended, but the final manuscript has not been submitted to the library), the student must register for CM.601.201 (Continued Matriculation) in order to maintain continuous registration. Since students are not allowed to register if they have outstanding financial obligations to the university, it will be necessary for them to clear their financial record in order to register for Continued Matriculation.

Continued Matriculation does not entitle a student to any use of university facilities, services or resources, but only maintains an active

record and provides for appropriate mailings. Students who are engaged in academic work necessary to complete their thesis or dissertation, participate in a required full time internship or curricular practical training, or otherwise engage in or make use of University facilities or other resources must register for a minimum of 1 credit. (Note: Specific internship/CPT requirements will vary by department and students may be required to register for 3, 6, or 9 credits depending upon their program of study.)

The rules regarding the Statute of Limitations for the completion of master's and doctoral degrees still apply to students registered for Continued Matriculation.

All international students on F-1 or J-1 visas must register as full-time students (9 credits) each semester until their degree requirements are completed. Any variance from this policy must be approved by the International Student and Scholars Office.

A student who fails to maintain continuous matriculation loses the status of a degree candidate and must reapply to the () for readmission and for renewal of candidacy.

Dropping Classes and Refund Policy

Graduate students may drop courses during the first ten days of classes and receive a refund. No refund will be given after these time periods. To formally withdraw from a course during this period, or thereafter, the student must drop the course through self service (). If the student fails to officially drop a course, he or she will remain enrolled and be required to pay for tuition and fees. In addition, if the student does not drop a course and does not attend classes, he or she will receive an "F" on the official transcript.

Changes in Registration

Courses may be added or dropped through self-service in (). In addition, students may change from audit to credit or from credit to audit during this period. Courses dropped during the first 10 academic days will not appear on the student's permanent record. No new courses may be added and no course may be changed from audit to credit after the tenth academic day. Thereafter, a student wishing to drop courses must do so by the date indicated in the Graduate Academic Calendar (). No refund of tuition and fees is allowed after the tenth day of the semester. The grade for these courses will appear as W on the student's record.

Change of Program

A graduate student wishing to change departments or transfer to a doctoral program upon completion of his or her master's degree must follow the steps listed below:

1. No transfers will be considered until the student has been in the original department in which he or she was accepted for at least one semester.
2. All sections of a new application sheet must be completed.
3. If so desired, the student may request that all test scores, letters of recommendation, etc., in his or her original file be used as part of his or her new application package.
4. The student must specify on the application form when his or her master's degree will be completed and when he or she will actually begin doctoral studies (for students applying to a doctoral program).
5. A check made payable to University of Massachusetts Lowell to cover the application fee must be included, or payment must be made by credit card when applying online.

Right of Access to Student Records

[Access](#)

[University Student Records](#)

[Release of Student Records](#)

[Release Exclusions](#)

[Additional Information](#)

Access

The Family Educational Rights and Privacy Act of 1974 (FERPA) grants any student currently in attendance, or any former student, the right of access to inspect or review his or her educational files, records, or data. Students who wish to inspect their records must file a Right of Access form with the office or department in which the desired record is kept. Right of Access forms are available in the Office of Student Services or through student self service. Wherever practicable, within ten days of receipt of the Right of Access form, the office or department will notify the student as to the date, time, and location when the desired record will be available for inspection. If a student believes that circumstances effectively prevent inspecting and reviewing the records at the designated date, time and location, he or she may request alternative inspection arrangements or copies of the records instead, subject to a fee for copies. The Dean of Students or the Dean's designee will consider the request.

University Student Records

The University maintains the following general records on students:

Admission File - -

Permanent Academic Records - -

Financial Aid Records - -

Health Records - -

Account and Payment Records - -

Campus Conduct Records - -

The file of each student must contain a record of all non-University affiliated individuals or organizations requesting access to information in the file, plus statements that specify the legitimate educational purposes for which access was requested.

Except as otherwise permitted under FERPA, information or records concerning individual students may not be released to any individual or agency without the student's written permission. Any request for such information received without such written permission will not be honored and will be returned with a request for a written release from the student.

Release of Student Records

FERPA allows release of a student's education records without the student's written permission under certain circumstances, including the following:

1. To personnel of the University, i.e., faculty, administrators, or staff for legitimate educational purposes only.
2. To officials of other institutions in which the student seeks admission or intends to enroll, provided that the student is notified of the release.
3. To federal or state officials in connection with the audit and evaluation of programs funded by federal or state governments, with the enforcement of legal requirements that relate to such programs, or in connection with the student's application for or receipt of financial aid.
4. To accrediting organizations in order to carry out their accrediting functions.
5. To parents who claim the student as a dependent on their IRS statement.
6. In connection with an emergency, to appropriate persons if revealing such information is necessary to protect the health or safety of the student or other persons.
7. In response pursuant to a validly issued subpoena, subject to advance notification of the student unless such notice is prohibited by court order.
8. As otherwise permitted under or consistent with FERPA.

The following data are considered informational in nature and may be released without the permission of the student, at the discretion of the University: student's name, major, acknowledgement of a student's participation in officially recognized activities and sports, weight and height of members of athletic teams, date(s) of attendance; degrees, certificates, awards received; the most recent previous educational agency or institution attended by the student and appointment as a Resident Assistant or Community Development Assistant. For graduate students who are teaching credit courses, work department, office address, and employments category are also defined as directory information.

Release Exclusions

Any student who wishes to have some or all of his or her directory information excluded from release by the University without prior permission must complete the appropriate selections available thru . ()

Additional Information

Any student who believes that his or her records are inaccurate or misleading may request a hearing with the Dean of Students to discuss the contents of such records and whether or not they need to be changed. Additional information on procedures or policies relating to University compliance with the Family Rights and Privacy Act can be obtained from the Office of Student Services or the Registrar's Office.

Statute of Limitations (Time Limit for Degree Completion)

A graduate degree, at either the master's or doctoral level, implies a significant mastery of a discipline within a specified time period. A well designed curriculum is not a mere collection of classes that add up to a set number of credits. It is, rather, a coherent selection of courses with an overall educational achievement that is greater than the sum of its parts. However, this coherence is lost if the program is completed over a long time span.

Master's degree requirements must be completed within a **five-year** period from the semester of admission. For those master's programs requiring 45 or more credits, the time limit is six years.

The doctoral degree must be completed within an **eight-year** period beginning with the semester of admission as fully matriculated or matriculated with conditions.

A student may obtain an extension of one year by filing an () signed by his or her coordinator, department chair, and college dean, and which is then submitted to the Registrar's Office.

Time Extension Appeal Procedure

In exceptional cases, an additional extension may be granted by the Graduate Policy and Affairs Committee (GPAC). In this case, the

student must submit an (), a letter of explanation accompanied by a detailed schedule for degree completion, and a letter from the student's coordinator or thesis advisor in support of the request.

Transcripts

In order to obtain a transcript, a student may print an unofficial transcript or order an official copy through self-service in (). If ISIS is not available, a transcript may be ordered by filling out a () and submitting it to the University of Massachusetts Lowell Registrar's Office at 883 Broadway Street, Lowell, MA 01854.

Course Listing on the Graduate Transcript

All graduate courses for which a student registers (including repeated courses) are listed on the transcript and are used to calculate the student's grade point average whether or not they are taken to fulfill degree requirements. In addition, undergraduate courses which a student takes to fulfill prerequisite requirements before or during matriculation in a graduate program, or courses taken for personal enrichment, will also be listed on the transcript.

Transfer Credit

The following are minimal guidelines for transfer of credit. Individual departments are free to impose more stringent requirements. Only courses completed elsewhere within five years prior to the date of admission to a graduate degree program at the University of Massachusetts Lowell may be considered by the faculty of the department for transfer in accordance with the following regulations.

1. A maximum total of 12 graduate credits earned with a grade of B or better taken at another accredited institution may be transferred to a master's degree program (see individual programs for further restrictions, if any). A maximum of 24 credits with a grade of B or better may be transferred to a doctoral program. The limits of 12 credits toward a master's and 24 toward a doctoral degree do not apply to any credits earned at UMass Lowell by students while in a non-degree or undergraduate BA/MA or BS/MS status, provided the courses were taken within the department offering the master's or doctoral degree.
2. Grades of C or better for courses taken at UMass Lowell when the student held non-degree status may also be transferred (by Academic Petition) into a degree program. However, the 6 and 9 credits with grades below a B (graduation limit) for master's and doctoral degrees, respectively, (see Retention Policy) and calculation of the cumulative grade point average based on all graduate courses taken at the University (see Academic Grades) remain in effect.
3. An official transcript and description of the course(s) must be submitted with the written request.
4. The courses presented must be from an accredited U.S. or Canadian institution authorized to grant graduate degrees.
5. The courses presented for a master's degree must not have been used in earning another master's degree.
6. The courses presented must be appropriate to the degree program for which the applicant is applying.
7. The courses presented must be graduate level.
8. Transfer credit may not be granted for research seminars, clinical courses, practica, internships, or special projects.
9. Transfer credit from another U.S. or Canadian institution must not exceed equivalent course credit (typically 3) at UMass Lowell, and will be based on UMass Lowell's standard of 37.5 semester contact hours being equal to 3 credits. One and two course credit transfers will also be considered providing they are proportional to the 37.5 semester contact hour standard.
10. Students who wish to transfer credit must file (within the first semester of matriculation) the Academic Petition form available from the Registrar's Office.
11. With the approval of the department, a maximum of 6 credits of 400 level courses taken at the University of Massachusetts Lowell with grades of C or better, not used for the baccalaureate degree, may be considered for transfer and counted toward the graduate degree.

University Appeals Process Regarding Academic (Non-Grade Appeal and Non-Misconduct) Issues

The underlying purpose of the University's appeals procedure is to guarantee due process and to protect the rights of both students and faculty in graduate programs.

The following procedure provides a mechanism for formal adjudication of any academic issues (non-misconduct and not related to grade appeal) which may arise. (For information regarding the process for grade appeals, see the Graduate Grade Appeal Process.)

Responsibility for initiation of each of the steps belongs to the appellant.

Step 1. If an informal discussion between the student and the instructor or individual with whom the student has a conflict does not resolve the issue, the resolution of an academic appeal of a student should begin within the department. The first step in the resolution of a problem or disagreement should be a discussion between the instructor, the student, and his/her faculty advisor or the coordinator of the program.

Step 2. If the matter cannot be resolved after such a discussion, a formal appeal, in writing and containing the pertinent facts, should be presented by the student to the chairperson/head of the department within two months of the occurrence that precipitated the appeal. Any appeal made outside this time period shall not be considered by any University body. The chairperson of the department will appoint committee composed of faculty members in the department. Within seven working days, this committee shall convene and discuss the appeal with the student and the instructor, coordinator, or individual with whom the student has a conflict. The student may be accompanied by his or her advisor or a faculty representative during the discussion of the appeal. The committee, by a majority vote after deliberations with only members of the committee present, shall render a decision within five working days and notify the appropriate parties in writing with the rationale for the decision included in the

notification.

Step 3. If the decision of the departmental committee is not satisfactory to all parties, the appeal may be forwarded to the College Dean within two weeks of the decision of the departmental committee. The Dean will appoint a college committee composed of area coordinators of all graduate programs within the college or a suitable committee of faculty. The committee will be chaired by the college dean, or his/her designee. Within seven working days, the committee shall convene and discuss the appeal with the student. At this level the student may request to be present at the committee meetings, that discussions or proceedings be tape recorded, and that a transcript be prepared from the tape. The request for a recording must be made at the time the appeal is made to the college committee. The college committee shall render a decision by majority vote after deliberations with only members of the college committee present within five working days and notify the appropriate parties in writing with the rationale for the decision included in the notification.

Step 4. If the decision of the college committee is not satisfactory to all parties, the appeal may be forwarded to the Graduate Policy and Affairs Committee (GPAC) within ten working days after the decision of the college committee. The committee shall convene within 10 working days after the GPAC chairperson has received a written request for a hearing from the appellant, and discuss the appeal with the student and faculty advisor or representative. A request for recording and preparing a transcript of the discussions with the student present may be made at the time of appeal. The committee shall render a written decision within five working days and notify the appropriate parties. The decision of the Graduate Policy and Affairs Committee shall be final, and the information accumulated during the appeal procedure shall be forwarded to the Provost to be kept on file. If any decision involving the awarding of a degree is made and the official deadline for graduation exercises has passed during the appeal, the degree date will reflect the initiation of the appeal.

The above time periods define working days as days when classes are in session for the fall and spring semesters. Efforts will be made to honor the same time periods during intercession and June - August although some flexibility must be accepted by the appellant because of potential difficulties in assembling committee members during these periods.

The GPAC chairperson may modify the Step 4 hearing time framework at his/her discretion to coincide with regularly scheduled GPAC meetings. In either of the above cases, the appellant must be notified in writing by the hearing officer (along with an explanation) of any modification of the hearing time schedule. The chairperson may recommend that final voting/discussion of Step 4 cases be done in Executive Session with only committee members present.

University Disciplinary Procedures for Graduate Students

Academic Dishonesty -

Administrative Dismissal from the University

Administrative dismissal may be invoked when a student fails to comply, after due notice, with an administrative regulation of the University. Examples of some conditions which justify administrative dismissal are listed in the Undergraduate Catalog at and apply to all students, undergraduate and graduate.

Non-Academic Misconduct

Improper conduct or behavior of graduate students is subject to the University of Massachusetts Lowell Student [Conduct Code and Judicial Process](http://www.uml.edu/student-services/DOS_Documents/Student%20Conduct%20Code%20&%20Discipline%20Process.pdf) (www.uml.edu/student-services/DOS_Documents/Student%20Conduct%20Code%20&%20Discipline%20Process.pdf). Copies of this document may be obtained from the Dean of Students Office.

Withdrawal Policies

[Withdrawal from a Course](#)

[Withdrawal from the University](#)

Withdrawal from a Course

A student finding it necessary to withdraw from a course must do so within the time specified in the graduate (). The student's permanent record will indicate a grade of W for the course(s) from which he or she has withdrawn unless the withdrawal has taken place within the first 10 class days of the semester during which time no record will be kept. (See in this Catalog for information on dropping a course.)

Withdrawal from the University

A student who wishes to withdraw from the University must submit his/her request in writing to the Registrar's Office. This procedure ensures that the student's academic and financial obligations are cleared before leaving the University. If a student officially withdraws from the University by the withdrawal date indicated in the graduate academic calendar, the permanent record will indicate a grade of W. If the student fails to follow the official withdrawal procedure and does not withdraw in good standing, the student will not be permitted readmission to a graduate program at the University except under extenuating circumstances.

All previous application materials will remain on file for a two year period. At any time during this period, a student who has officially withdrawn may request readmission by completing and submitting only the cover page of the graduate application and paying the application fee. After two years, a student must file a new, complete application and submit the appropriate fee to the () in order to be

readmitted.

Admission to Upper Division

All BSBA students must apply to be admitted to the upper division program in a concentration of their choice upon completion of the filter courses listed below. Minimum criteria for admission to upper division are an overall grade point average of 2.000/4.000.

- 60.201 Accounting/Financial
- 49.201 Economics I
- 49.211 Statistics I
- 92.122 Management Calculus
- 42.101 College Writing I
- 42.102 College Writing II
- 47.101 General Psychology
- 48.101 Intro to Sociology

For students transferring from another institution, a course deemed equivalent to any of the above courses by the Manning School of Business will be used to meet this requirement.

Application for admission is submitted directly to the Office of the Dean. The application must include: a completed change of major form obtained from the Office of Enrollment Services, the Office of the Dean of the School, or any department in the School.

Admission to the Manning School of Business upper division is guaranteed for transfer students if they have completed an Associate in Science, Business Transfer Option, and the above mentioned courses.

Students who are not eligible to declare a concentration after earning 60 credits but who satisfy University retention requirements may file for intercollegiate transfer within the university. Students who are ineligible to file for intercollegiate transfer or are denied admission to another college following application for intercollegiate transfer are dismissed from the University.

Graduation Requirements

In addition to satisfying degree requirements listed in this catalog under "University Academic Policies" and under "Manning School of Business," MSB majors must also satisfy the following requirements:

A. Residency Requirement

MSB majors must take all required upper division courses in residence in the day programs of MSB. Any exceptions to this (for international study, etc.) must be approved by the appropriate department chairperson and the Dean or her designee prior to enrolling in such courses. No approvals for transfer credit of any required course taken at any other institution will be granted after the course has been completed except as noted above for transfer students.

B. Degree Requirements

In order to qualify for a Bachelor's Degree offered by the Manning School of Business, undergraduate students must satisfy all course requirements applicable to the major and their area of concentration and must earn a cumulative grade point average of 2.200 at completion of the baccalaureate program.

Policies for Undergraduate Programs

Please review the following:

-
-
-
-
-

Special Academic Policies for Undergraduates

The following rules govern the applicability of courses satisfying curriculum requirements in any Manning School of Business concentrations:

A. Students may transfer a course that COM offers in its upper division (junior and senior years) if the course was taken at a school accredited by the AACSB, and a grade of 'C' or better was earned.

B. Upper division Manning School of Business courses (300 and 400 level) are restricted to matriculated students who have been admitted to the upper division program and have completed all prescribed prerequisites. Transfer students may not count any courses that require validation or which are not creditable to the MSB concentration towards this requirement.

C. MSB upper division courses are restricted to:

1. juniors and seniors enrolled in MSB;
2. juniors and seniors enrolled in another college of the University whose major requires completion of specific business courses;
and
3. special students who meet appropriate prerequisites.

D. An unrestricted (free) elective (designated non-MSB) for MSB students is any course satisfying one of the following criteria:

1. a 100 or above level course from any college offered in the day program;
2. a course listed as satisfying a University area distribution requirement;
3. a course allowed by an approved academic petition.

Any course taken in violation of these rules may not be used to fulfill MSB curriculum requirements regardless of the grade

Undergraduate Admission Requirements

Students entering the University as freshmen in the Manning School of Business must be registered as Business Administration (BA) if pursuing the BSBA degree. Upon completion of the first semester of the sophomore year, BA students may apply to be admitted to the upper division program and to declare a concentration. The College offers concentrations in Accounting, Finance, Management, Marketing, and Management Information Systems (MIS).

Transfer students may apply for admission to the Manning School of Business according to the transfer rules described in sections II and III below. Business Administration students may apply for admission to upper division MSB programs described in section III.

Undergraduate Transfer Rules

The Manning School of Business welcomes transfer students from Massachusetts community colleges and other regionally accredited institutions to the BSBA program. All MSB students including transfer students from other accredited institutions and from other colleges of University of Massachusetts Lowell initially enter the BSBA program as Business Administration students. After completing the filter courses, students apply to be admitted to the upper division and to declare a concentration according to the upper-division admission policies stated in section III. Students entering UMass Lowell with an associate degree may apply to be admitted directly to the upper division. Transfer students who have not earned an associate degree and transfer more than 45 credits toward the BSBA program may apply to be admitted to the MSB upper division after completion of the filter courses. All students must complete at least 60 academic credits in residence at University of Massachusetts Lowell subject to exceptions specified in this catalogue.

Transfers from:

- [Other Institutions](#)
- [Other UMass Lowell Departments](#)
- [Other MSB Departments](#)

A. Transfer From Other Institutions

Students transferring to the Manning School of Business from any program not included in the Commonwealth Transfer Compact, with or without an associate degree, must have a cumulative grade point average of at least 2.500/4.000. Students may not transfer any course in which they earned a grade of less than C- (1.700 on a 4.000 scale). Courses at a level below the first MSB requirements, such as algebra or the first semester of a two semester precalculus sequence, are not transferable. Only Business Courses taken at other AACSB accredited institutions may transfer as upper division (junior and senior level) MSB courses.

Transfer from Massachusetts Community Colleges

Students transferring with an Associate in Science, Business Transfer Option, from a member of the Commonwealth Transfer Compact can transfer all courses up to a maximum of sixty-six (66) credits. Although all transferred courses are listed on the student's transcript, due to differences in program requirements of different institutions, some courses may not apply to minimum degree requirements of the Manning School of Business. Courses at a level below the first COM requirements, such as algebra or the first semester of a two-semester precalculus sequence, are examples of such courses. However, the student transferring with an associate degree, Business Transfer Option, will be eligible to take upper level courses in the College of Management subject to the stated prerequisites for each course. Courses taught by the School as part of its upper division core that are not acceptable for transfer may be validated by departmental exam. Courses that are equivalent to courses taught by the School in the upper division (junior and senior level) which are not a part of the COM core requirements cannot be used to satisfy the minimum degree requirements of the BSBA degree in the Manning School of Business. Students transferring to the Manning School of Business with an associate degree are prohibited by University policy from pursuing further off-campus study.

B. Intercollegiate Transfer

Intercollegiate transfer students to the Manning School of Business must be in good standing and have completed at least 15 credits at the University of Massachusetts Lowell. Upon acceptance, students will be listed as Business Administration (BA) and will usually be permitted to enroll only in lower division courses.

The transfer request is normally initiated by the students and is submitted to the Manning School of Business. Students must submit a completed change of major form obtained from the Office of Enrollment Services, the Office of the Dean of the School, or any department in the School.

University of Massachusetts Lowell students intending to apply for intercollegiate transfer to the College of Management should do so preferably before completing 60 credits (prior to completing the sophomore year). This will minimize delays in completing their educational objectives since MSB upper division courses are restricted to juniors and seniors in the College of Management with appropriate prerequisites who have been admitted to upper division according to rules stated in Section III of the Policies for Undergraduate Admissions.

The Manning School of Business reserves the right to limit intercollegiate transfer activity if student enrollment capacities are met.

C. Transfer from Other MSB Departments

Once admitted to the Manning School of Business upper division program, students can choose to enroll in any concentration within MSB. Depending on the number of unrestricted electives available in the curriculum of the concentration students are entering and the number of credits completed by the students at the time of transfer, some courses may not be usable in the students' new program, requiring students to take courses above and beyond the University's minimum graduation credit requirements. All courses stay on the students' transcripts at the University and are included in the determination of the cumulative grade point average as specified by University policies. Students shall not be permitted more than two intercollegiate transfers.

AFROTC Requirements

Uniforms, equipment, and textbooks required for AFROTC will be supplied. Students in the POC or on scholarship receive a monthly subsistence allowance of \$250 to \$400. Competitive scholarships are available for academically qualified cadets in the program. Students who successfully complete the POC are commissioned as second lieutenants in the United States Air Force and are required to serve on active duty in the Air Force for a minimum of four years.

Field Training

AFROTC field training is offered during the summer months at selected Air Force bases throughout the United States. Students in the four-year program participate in four weeks of field training, usually between their sophomore and junior years. Students applying for entry into the two-year program must successfully complete six weeks for field training prior to enrollment in the Professional Officer Courses. The major areas of study in the four-week field training program include junior officer training, aircraft and aircrew orientation, career orientation, survival training, base functions and Air Force environment, and physical training. The major areas of study included in the six week field training program are essentially the same as those conducted at four-week field training and in the General Military Course, including leadership laboratory.

Leadership Laboratory

AFROTC field training is offered during the summer months at selected Air Force bases throughout the United States. Students in the four-year program participate in four weeks of field training, usually between their sophomore and junior years. Students applying for entry into the two-year program must successfully complete six weeks for field training prior to enrollment in the Professional Officer Courses. The major areas of study in the four-week field training program include junior officer training, aircraft and aircrew orientation, career orientation, survival training, base functions and Air Force environment, and physical training. The major areas of study included in the six week field training program are essentially the same as those conducted at four-week field training and in the General Military Course, including leadership laboratory.

University Policies Concerning Aerospace Courses

Both General Military Courses (AS 100 and AS 200) and Professional Officer Courses (AS 300 and AS 400) in Aerospace Studies may be used as undesignated or unrestricted elective courses in a student's baccalaureate program. Grades for all AFROTC courses are applicable to the determination of grade-point averages. Students should consult the regulations of the college in which they are matriculating concerning the number of AFROTC courses which may be included as part of their programs of study. In the event that such elective courses are insufficient to accommodate all the AFROTC courses, students wishing to pursue the AFROTC program will be required to fulfill program requirements on an overload basis. Consequently, AFROTC credit toward graduation requirements will vary from six (minimum to meet AFROTC/University of Massachusetts Lowell contract requirements) to sixteen credits dependent on the student's particular college and degree program. Some colleges allow AFROTC courses to be substituted for technical general electives.

Academic Honors

Academic honors are of three types: University honors, honors in major fields, and dean's list (semester honors). Undergraduate students may qualify for University honors and the dean's list. Honors in major fields are available at the option of the major departments.

University Honors

The University recognizes baccalaureate graduates who have attained exceptional scholastic distinction. To be eligible for such recognition a student must achieve a minimum grade point average of 3.25 for all courses completed at the University and must have earned a minimum of 60 credits from the University of Massachusetts Lowell. A total of nine (9) credits of departmental exam and/or courses graded "S" may be used toward the 60 credits needed to be considered for University Honors. Credits taken on a Pass/Fail basis may not be counted toward the 60 credit requirement.

Three levels of distinction are noted at commencement:

Summa Cum Laude 3.85 - 4.0

Magna Cum Laude 3.500 - 3.849

Cum Laude 3.250 - 3.499

University honors are officially entered on the permanent record of students.

Honors in Major Fields

In addition to honors awarded by the University, honors in major fields may be awarded by the colleges in which students are enrolled or (in the case of Continuing Studies students) by the colleges that exercise academic jurisdiction over the program in which they are enrolled. Recommendations for such honors are made by the faculty of the student's major department (or by interdisciplinary committees that exercise academic jurisdiction over the student's major studies) for outstanding achievement in the major field. In order to qualify for such honors, the student must fulfill the following requirements:

- complete a minimum of 24 credits in the major field at the University of Massachusetts Lowell;
- fulfill any honors requirement specified by colleges, departments, or interdisciplinary committees in the major field;
- achieve a certain grade-point average as specified below.

High Honors

4.00 in all courses that are taken in the major field at the University of Massachusetts Lowell.

Honors

3.50 to 3.99 in all courses that are taken in the major field at the University of Massachusetts Lowell with no course grade in such courses less than B.

Honors in the major field are not noted on the permanent records of students.

Dean's List (Semester Honors)

At the end of the fall and spring semesters, the dean of each college issues a list of undergraduate students who have achieved distinguished semester records. The dean's list recognizes students who have completed full-time programs (at least 12 credits of which must have been qualitatively graded) with a minimum gpa of 3.25, no grade less than C, and with no grades of INC [incomplete] (Please note that students who are approved through Disability Services for a reduced course load in accordance with the American Disabilities Act (ADAAA) will be exempt from the 12 credit minimum).

University Honors Program

Undergraduate students enrolled in the University Honors Program who complete all program requirements graduate as Commonwealth Honors Program Scholars.

Academic Integrity

The integrity of the academic enterprise of any institution of higher education requires honesty in all aspects of its endeavor. ? Maintaining academic integrity is therefore the responsibility of all faculty, staff, and students at the University of Massachusetts Lowell.?

Academic dishonesty is prohibited in all programs of the University. ?Sanctions may be imposed on any student who has committed an act of academic dishonesty.?

Definitions of Academic Dishonesty

Academic dishonesty includes but is not limited to:?

Cheating - use, or attempted use, of trickery, artifice, deception, breach of confidence, fraud, or misrepresentation of one's academic work. Submission of the same work in its entirety for credit in two courses without obtaining the permission of the instructors constitutes cheating. Collaborating with others when not explicitly allowed by the instructor constitutes cheating.

Fabrication - falsification or invention of any information or citation in any academic exercise.?

Plagiarism - representing, whether intentionally or unintentionally, the words or ideas of another as one's own work in any academic exercise.?

Facilitating dishonesty - helping or attempting to help another commit an act of academic dishonesty, including substituting for another in an examination, misrepresenting oneself, or allowing others to represent as their own one's papers, reports, or academic works.?

INITIATING CHARGES OF ACADEMIC DISHONESTY

Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. The procedures outlined below are intended to provide the process by which sanction may be imposed if it appears that academic dishonesty has occurred, and by which students may appeal such sanctions.

These procedures apply to all students participating in academic classes and programs, including all graduate, undergraduate, and CSCE programs. The procedures associated with this policy are the only official procedures for making allegations of, issuing sanctions because of, or appealing charges of academic dishonesty.

Any instructor may initiate charges of academic dishonesty by following the procedures outlined below.

Determining Sanctions and Notification of Students

- When academic dishonesty is suspected, the instructor (complainant) should bring the case to the attention of the complainant's chair and discuss an appropriate course of action/sanction.
- Possible sanctions include a reduction in grade in an assignment or exam; a zero or failing grade in an assignment or exam; a forced repeat of an assignment or exam; a reduction in grade in a course; a recommendation of a grade of FX (non-deletable failure); recommendation of suspension; or recommendation of dismissal.
- If a sanction is to be applied, the instructor must notify the student, in writing or orally, of the incident observed and the sanction that will be imposed. Such notification should be made within a reasonable period, not more than 14 days after recognizing the incident.
- The instructor must maintain a record of the notification.

Notification to the Provost by the Instructor

- Notification to the Provost by the instructor must occur within a reasonable period, not more than 10 days after informing the student. The instructor must fill out a "[Notification of Academic Dishonesty Form](#)" (pdf) available online on Office of the Registrar's website at www.uml.edu/docs/notificationofacademicdishonesty_tcm18-3543.pdf and email or fax this form to the Provost or designee. In lieu of the form, an email with the necessary information will suffice.
- The Provost or designee will send the student official notification of the sanction via certified and electronic mail and include notification of the right to appeal. Such official notification must be sent to the student within a "reasonable" time frame, not to exceed 21 days of receipt of the "Notification of Academic Dishonesty Form."
- The Provost or designee also informs (in writing) the dean and chair of the complainant's department of the complaint and sanction.
- The Office of the Provost will maintain this information and record the sanction. The record will be kept until the student graduates the University of Massachusetts Lowell. If there is a record of multiple complaints the provost or designee may apply more severe sanctions including suspension and dismissal.

If the student does not appeal the charges, the process is complete and the sanction is imposed.

First level of Appeal: Academic Dean

If the student denies responsibility or believes that the sanction is too severe, the student may appeal the sanction to the Academic Dean of the college of the complainant's department or designee in writing, within 7 days of receiving notification of the sanction from the office of the provost. During the appeals process the student is expected to continue attending the class in which the sanction has been issued unless prohibited by department policy. The Academic Dean or designee will commence a review of the issues raised in the appeal and forward the decision to the office of the Provost as soon as practicable.

The Provost or designee must notify the student, by certified and electronic mail, and other relevant parties of the outcome of the appeal process. If the appeal is sustained on the grounds that the charge is not adequately supported then all records of the incident are destroyed. If the appeal is not sustained then records of the incident are maintained in the Office of the Provost.

Second level of Appeal: Office of the Provost

The decision reached by the Academic Dean or designee may be appealed to the Provost or designee if the student believes that he or she did not receive due process.

Grounds for Appeal of Due Process

An appeal shall be limited to a review of supporting documents and the process and outcome of the Academic Dean or designee for one or more of the following grounds:

- Bias by the Instructor, Academic Dean, or designee substantially influenced the outcome of the process to the detriment of the student.
- New, relevant information has come to light that was not available at the time of the hearing by the Academic Dean.
- Unusual procedures were followed or if the procedures outlined herein were not followed, to the detriment of the student.

Appeals may be filed by the student or complainant to the Provost or designee within 7 days of receipt of the decision. Such appeals shall be in writing and shall be delivered to the Provost or designee, and must be based on the "Grounds for Appeal" (above). The Provost or designee may decide to uphold the decision of the Academic Dean or designee or convene the Academic Integrity Appeals Board ("Board"). All decisions by the Provost or designee are final and may not be appealed. Such decisions will be made as soon as practicable.

The Provost or designee must notify the student, by certified and electronic mail, and other relevant parties of the outcome of the appeal process. If the appeal is sustained on the grounds that due process was not followed then all records of the incident are destroyed. If the appeal is not sustained then records of the incident are maintained in the Office of the Provost.

Academic Integrity Appeals Board

Membership: The Academic Integrity Appeals Board is chaired by the Provost or designee. The Provost or designee will vote only in the case of a tie. The Board consists of a minimum of three faculty members chosen by the Provost or designee with no two members selected from the same College and cannot include a faculty member within the department initiating charges of academic dishonesty.

Right to an Advisor: A student may elect to be accompanied at all proceedings of the disciplinary process by an advisor of his or her choice. The advisor must be a current member of the faculty, staff, or student body of the University. The role of the advisor in all cases is limited to advising the student during the academic dishonesty proceedings. The advisor may not speak on behalf of the student, or examine or cross-examine a witness, or address the process publicly during proceedings.

Accommodations for Students with Disabilities: The University of Massachusetts Lowell is committed to providing appropriate accommodations to students with documented disabilities so that all students have meaningful access to all University of Massachusetts Lowell programs and services, including the Academic Integrity Process.

All those with disabilities who are involved in the Academic Integrity Process, including accusers and accused students, advisors, and witnesses may seek accommodations for any stage of the Academic Integrity Process. Any student requesting an accommodation must do so far enough in advance to allow the request to be reviewed and an appropriate accommodation identified and implemented.

A request for accommodation can be made to the Director of Disability Services ("Director"), the designated Academic Dean, or the Provost. The requests will be reviewed by the Director, who will apply appropriate legal standards and University policies and procedures to determine what accommodation, if any, is appropriate. The student will be given an opportunity to have an interactive role in the review process (i.e., to discuss the request with the Director, before the Director completes the review). The Director may require the student to provide appropriate documentation from qualified health care professionals to support the request. In addition, the Director may consult, as appropriate, with the Academic Dean or the Provost, or another expert of the Director's choosing. The Director will make a decision in light of the student's particular disabilities and the nature of the Academic Integrity Process, upon reviewing any consultations, relevant documentation and relevant previous accommodations provided to the student. The student will be given an explanation of the Director's determination.

If the student requesting accommodations disagrees with the Director's determination on appropriate accommodations, he may appeal the determination to the Office of ADA Compliance (Office of Equal Opportunity and Outreach) within 7 days of the Director's decision.

Appeal of Provost Sanctions (Suspension or Dismissal)

Any additional sanctions applied by the Provost following multiple incidents of academic dishonesty must be appealed to an Academic Integrity Appeals Board as described above. The Board will be chaired by a designee of the Provost who has not participated in the process leading to the charges.

The Provost or designee must notify the student, by certified and electronic mail, and other relevant parties of the outcome of the appeal process. If the appeal is sustained on the grounds that the charge is not adequately supported then all records of the incident are destroyed. If the appeal is not sustained then records of the incident are maintained in the Office of the Provost.

Academic Policies

Each University student is subject to two sets of academic regulations—those of the University as a whole, which are cited in this section, and the academic rules of the college and program in which he or she is enrolled. The academic rules of colleges and programs are listed in sections devoted to college programs.

In registering for courses, each student assumes full responsibility for knowledge of and compliance with the definitions, regulations, and procedures for the University, as set forth in this publication. Moreover, in accepting admission to the University, each student assumes responsibility for knowledge of and compliance with the definitions, regulations, and procedures of the University pertaining to his or her student status as set forth in the appropriate University of Massachusetts Lowell publications.

Students who have questions about the interpretation or application of University academic policy should consult the dean of their college or the Office of the Provost.

Academic Standing

Academic standing and eligibility for a degree are determined by the quality of the student's course work.

[Determination of Academic Standing](#)

[Appeal of Suspension](#)

[Academic Probation](#)

[Extended Academic Probation](#)

[Academic Dismissal](#)

[Fresh Start Program](#)

Determination of Academic Standing

To ascertain the student's academic standing, the University uses a point system, each qualitative grade having an equivalent numerical value.

A 4.0
A- 3.7
B+ 3.3
B 3.0
B- 2.7
C+ 2.3
C 2.0
C- 1.7
D+ 1.3
D 1.0
F 0.0

Quality points are computed by multiplying the number of course credits by the numerical value of the qualitative grade assigned. For instance, a three-credit course with a grade of B+ would carry 9.900 quality points (3 x 3.300). Grade-point averages and cumulative grade-point averages are obtained by dividing the number of quality points earned by the number of credit hours attempted.

Specified grade-point averages are computed solely on the basis of those courses attempted at the University of Massachusetts Lowell which have been qualitatively evaluated with the following letter grades: A, A-, B+, B, B-, C+, C, C-, D+, D, and F.

Academic Standing

Students who are on Academic Warning or Academic Suspension after the Fall semester and are registered for a Winter Intersession course at the University of Massachusetts Lowell will have the grade for that course included in evaluation of their Academic Standing. The Academic Standing will be adjusted to include the grade received during Winter Intersession.

Students who are on Academic Warning or Academic Suspension after the Spring semester and are registered for Summer 1 classes offered May through June at the University of Massachusetts Lowell will have the grade(s) for those courses included in evaluation of their Academic Standing. The Academic Standing will be adjusted to include the grade received during the Summer 1 session.

The consequences of the academic standing of warning or suspension will not apply for students satisfying all degree requirements that semester.

All students are required to maintain at least a 2.000 average throughout their academic career. Academic records are evaluated at the end of each semester. No student, however, will be academically suspended without having at least one semester of academic warning.

The academic status of a student is one of the following categories:

Satisfactory Academic Standing

A student whose semester grade-point average is at least 2.000 and whose cumulative grade-point average is at least 2.000 is in Satisfactory Academic Standing.

Academic Warning

Beginning with the Fall 2011 semester, a first-semester freshmen whose grade point average (GPA) falls below 2.0 will not be placed on Academic Warning but will be notified that he or she is considered to be academically at risk and strongly advised to seek help through appropriate University Resources. After the first semester at the University the student will be subject to the following *Academic Standings*:

A student whose semester GPA is below 2.000 is placed on Academic Warning. A student on warning is still considered to be in acceptable academic standing, and may register for the following semester and participate in campus and athletic activities. Certain campus programs and activities may choose to prohibit the participation of students on Academic Warning. At the end of the student's warning semester the student's cumulative grade point average must equal or exceed 2.000 to continue in Satisfactory Academic Standing.

Academic Suspension:

A student who was on Academic Warning at the end of the previous semester and whose cumulative GPA falls below 2.000 is placed on Academic Suspension. A student who is on Suspension may not enroll in the succeeding semester, and therefore may not represent the University in athletic programs nor participate in campus activities.

Academic Dismissal:

A student who was on Academic Suspension at the end of the previous semester and whose cumulative GPA at the end of the probationary semester is below 2.000 is automatically dismissed from the University.

Appeal of Suspension

A suspended student may submit a written appeal to the College Dean requesting permission to continue enrollment for an additional semester on academic probation. If permission to continue is granted, the program of study that must be undertaken and the minimum semester grade-point average that must be attained during the additional semester of academic warning will be made explicit.

Entering freshmen and transfer students who are permitted to initiate their University studies with summer school day courses should note that credits attempted in University summer sessions are included in grade-point averages. Subsequent to preliminary evaluations for retention purposes, the records of all students (including probationary students) are evaluated at the end of each semester.

Grades earned during summer session or winter intersession may be used to change a student's academic status prior to the beginning of the following semester. A student who has been suspended is prohibited from enrolling in any credit-bearing program of the University, including credit courses offered by continuing studies, in summer sessions, or in winter intersession. If a suspended student chooses to enroll in another accredited degree-granting institution, earns credit at that institution, and subsequently seeks to return to the University of Massachusetts Lowell, such credit may or may not be accepted in transfer at the University of Massachusetts Lowell, depending upon the specific circumstances.

Students who enroll in University summer school and/or continuing studies courses after they have been notified by the Office of the Registrar that they are suspended from the University for unsatisfactory academic standing are in defiance of University regulations. Grades received by such students will not be credited to University baccalaureate programs, even if the students are subsequently reinstated as probationary students or achieve satisfactory academic standing after reinstatement.

Academic Probation

A student who has been suspended from the University is entitled to apply to the suspension hearing office for immediate readmission as a probationary student in accordance with procedures enumerated under the admission policy heading Probationary Readmission.

Students who have been suspended and decide to remain un-enrolled for four semesters or more must apply for readmission on probation through the Office of the Registrar whenever they decide that they are prepared to undertake such a probationary period. The student will receive a letter that specifies the conditions of their probation, and the semester average that they must achieve during their probationary semester in order to achieve satisfactory academic standing.

Probationary students are prohibited from holding student offices or running for elective office and from representing the University in athletic or other activities.

A student who achieves the required minimum semester grade-point average during his or her probation is automatically reinstated as a student in satisfactory academic standing.

Extended Academic Probation

Students whose academic performance during a probation semester has significantly improved, but whose cumulative grade average is still slightly below 2.0, may apply to the suspension hearing office for an extended period of probation. Students who are granted such extensions will be notified in writing prior to the beginning of classes for the following semester that they have been granted an additional semester to achieve satisfactory academic standing.

Students who fail to achieve satisfactory academic standing and are not granted extensions of their probations by the Provost and students who are granted such extensions and fail to achieve satisfactory academic standing are dismissed from the University.

Students readmitted on probation should not withdraw from any course unless they withdraw from the University for emergency or medical reasons. A probationary student who withdraws from any course may thus be unable to satisfy the conditions of his or her probation and may be dismissed from the University at the end of the current semester of enrollment.

Probationary students who receive course evaluations of INC (incomplete) and who fail to make up their work prior to the beginning of the next semester are advised that they may not qualify for extension of their probation and may not register for or attend University courses (including continuing studies courses) until such time as a final determination of their status has been made. Probationary students who have received permission from the suspension hearing office to extend their make-up period should understand that such extension does not waive the requirement for a final determination of academic standing that is based upon grades for all probationary courses.

Academic Dismissal

Students on academic probation who fail to achieve satisfactory academic standing during their probationary semester and are not granted extensions of their probation by the suspension hearing office and students who are granted such extensions and fail to achieve satisfactory academic standing are dismissed from the University and are subsequently barred from attending both day and evening courses.

While on dismissal, students are not allowed to make progress toward a University degree. Students who have enrolled in University summer school and/or continuing education courses after they have been notified by the Office of the Registrar that they are dismissed for unsatisfactory academic standing are in defiance of University regulations. Grades received by such students will not be credited to University baccalaureate programs even if the students are subsequently reinstated as probationary students or achieve satisfactory academic standing after reinstatement.

The University recognizes that dismissal from the institution for reasons of academic failure need not be permanent. Under the following circumstances readmission is possible.

Freshman and sophomore students [attempted less than 60 credits] who have been academically dismissed may qualify for readmission to the university as follows: 1) under the provisions of the Massachusetts Transfer Compact after completion of an associate's degree at a Massachusetts Community College; and 2) after a lapse of two years, under the provisions of the Fresh Start program.

Students of junior or senior standing at the time of dismissal may reapply to the University after an absence of at least two years, under the provisions of the Fresh Start program.

The procedure for readmission of academically dismissed students begins with filing an application with the Office of the Registrar. The final decision to readmit an academically dismissed student rests with the dean of the college in which the student was enrolled at the time of dismissal from the University.

Fresh Start Program

Students who have been absent from the University for two years or longer may be readmitted under the terms of the Fresh Start program. Under this program, a returning student will be treated as if he or she were a transfer student. Courses completed during earlier periods of enrollment with grades of C or above will be accepted toward graduation but will not be included in the cumulative average. Courses completed during earlier periods of enrollment with grades below C will not be counted toward graduation or included in the cumulative average.

A maximum of 75 earlier the University of Massachusetts Lowell transfer credits will be accepted toward graduation, and after readmission under Fresh Start the student must earn a minimum of 45 credits in residence at the University of Massachusetts Lowell in a matriculated program of study.

Courses taken in the academic major during earlier periods of enrollment must be approved by the major department before those courses can be counted toward the requirements of the major. (This provision is especially important in majors that undergo regular curriculum revision).

Students may opt to use the Fresh Start Program only once in their career at the University of Massachusetts Lowell.

Administrative Dismissal

A student may be administratively dismissed from the University through cancellation of registration for due cause, through suspension or expulsion for academic dishonesty (cf. Academic Dishonesty, Cheating and Plagiarism), and through disciplinary procedures for violations of good conduct. For information concerning procedures that govern violations of campus conduct contact the Dean of Students.

Administrative dismissal may be invoked when a student fails to comply, after due notice, with an administrative regulation of the University. Official notification of an administrative dismissal is noted on the permanent record card by the symbol X, which is entered for each course carried by the dismissed student.

Reinstatement of a student who has been administratively dismissed may be made only by application for readmission with the Office of the Registrar and only when the condition that has necessitated administrative dismissal can be ameliorated to the satisfaction of University officials. Examples of some conditions that may justify administrative dismissal are:

- forgery or fraudulent use of University records, documents, or forms; unauthorized entry into University records (including computerized records);
- non-payment of tuition, board, room charges, student fees, library fines, overdue University loans, and other official University fiscal obligations;
- failure to comply with a duly authorized administrative order relating to the safety of persons or the protection of University property;
- failure to submit required health forms to University Health Services.

Attendance Policies

Although the University does not require class attendance as a matter of institutional policy, course instructors may establish required attendance in their courses and specify penalties for student violations of such attendance requirements. Colleges also have this option and sometimes have adopted attendance policies for introductory courses and special learning situations.

Instructor Attendance Policies

At the beginning of each course, the instructor will inform students of any specific attendance regulations which apply.

Attendance Requirements of the Veterans Administration

In compliance with the requirements of the Veterans Administration (VA), all recipients of Veterans benefits, including eligible children of veterans, must certify their attendance at the University, under penalty of perjury through directions received with the students benefits.

Absence of Students for Religious Beliefs

Chapter 375, Acts of 1975 of the Commonwealth of Massachusetts, requires recognition of student religious beliefs as noted.

"Any student...who is unable, because of his religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be excused from any such examination or study or work requirements, and shall be provided with an opportunity to make up such examination, study, or work requirement which he may have missed because of such absence on a particular day; provided, however, that such make up examination or work shall not create an unreasonable burden upon such school. No fees of any kind shall be charged by the institution for making available to the said student such opportunity. No adverse or prejudicial effects shall result to any student because of his availing himself of the provisions of this section."

Students should inform the course instructor in writing of the day(s) when they will be absent. This should be done as early as possible in the semester and always prior to the day(s) the student will be absent for religious reasons.

Bachelor's Degrees

Undergraduate programs that are offered by the University of Massachusetts Lowell lead to one of the following degrees: Bachelor of Arts, Bachelor of Fine Arts, Bachelor of Liberal Arts, Bachelor of Science, Bachelor of Music, Bachelor of Science in Business Administration, Bachelor of Science in Industrial Management, Bachelor of Science in Engineering, Bachelor of Science in Engineering Technology, and Bachelor of Science in Industrial Technology. The complete list of bachelor's degrees can be found at?

Commencement

Graduation exercises are held once a year at the end of the spring semester. Undergraduates who have completed degree requirements during the previous summer term or fall semester are permitted to attend commencement exercises, and their names are listed in the commencement booklet. Attending commencement exercises is not compulsory, but all seniors are required to pay the specified graduation fee, which covers the cost of the diploma, academic attire, and incidental graduation expenses. An individual who wishes to receive a diploma by mail must notify their college dean and file their corrected address through student self service if he or she anticipates moving from a previously reported permanent address.

Conferring of Degrees

Diplomas are awarded three times a year: 1) in June for students completing degree requirements during the spring semester, 2) in October for students completing degree requirements during the summer term, and 3) in February for students completing degree requirements during the fall semester. Individuals who wish to submit verification of degree completion to employers or to graduate schools during the period between the end of their final grading period and the awarding of diplomas may obtain a letter of completion from their college dean. Duplicate diplomas are not issued for any reason.

Course Descriptions

Each course offering is designated by a two-digit or 2-4 alpha designated prefix and a three-digit course number. The digit or alpha designated prefix identifies a college department and/or special area. The three-digit course number identifies the course level.

Each college department and/or special subject area has been assigned an identifying digit or alpha designation. View the () on the Office of the Registrar's website.

Course Numbers

A course number consists of the three digits that follow the course/department prefix (for example, 92.131). Courses numbered 001-099 are pre-freshman and special undergraduate courses and do not carry baccalaureate degree credit. Those numbered 100-299 are lower-division undergraduate courses and those numbered 300-499 are upper-division undergraduate courses. The 400 level courses are generally limited to juniors and seniors majoring in a field but are open, with permission, to other advanced undergraduates and to graduate students.

Directed studies courses and practicum experience courses are generally limited by departmental policy to students majoring in the area in which such courses are offered.

Courses numbered 500-599 are graduate courses open to upper division undergraduates with the consent of instructors and chairpersons. Courses numbered 600 and above are graduate courses open only to graduate students.

Course Restrictions

Special course pre-requisites, co-requisites, and enrollment restrictions are indicated at the end of the course description. A course listed as a pre-requisite must have been completed and passed prior to taking the course for which the pre-requisite is specified.

A course listed as a co-requisite must be taken during the same semester as the course for which the co-requisite is specified. Subject to college or department policy to the contrary, exceptions may be granted by the designated department chair.

Courses that carry such notations as "open for majors only" and "sophomore status required" are restricted to the specified students. Courses that carry the notation "permission of instructor" require instructor's approval. Approved students will be given permission numbers to enroll through self-service.

Courses at the 100-300 levels that do not carry pre-requisite, co-requisite, and enrollment restrictions are open for election by all students unless general restrictions have been listed under the department or course area heading, or unless policy of the college or

department in which the student is matriculated prohibits such registration.

Course Equivalency Examinations

The University recognizes two types of course equivalency for which credit is awarded. These are 1) College Level Examination Program (CLEP) examinations, and 2) departmental examinations. Restrictions, where applicable, are noted below.

Subject to specified policies of academic departments, unusually qualified degree candidates are given the opportunity to demonstrate their special competencies and receive University credit for such competencies through established course equivalency procedures without having to fulfill classroom or faculty course requirements.

Students may demonstrate their special competencies through subject examinations of the CLEP and through departmental equivalency examinations. Credits granted through course equivalency procedures are so noted on the student's permanent record. However, no grades for equivalency examinations are recorded and examination credit so granted is not included in grade-point averages.

The purpose of course equivalency procedures is to provide credit for existing competencies — that is, those competencies which students possess prior to their applications for equivalency credit and prior to their registration for a University course.

Students may not receive credit for a specific proficiency examination if they have registered at the University in the same course for which the examination covers, if they have previously received a University grade either for that course or a course in sequence above the course for which they wish to take an examination, or if they have previously attempted an equivalent course at another institution.

Credit for general examinations of CLEP may not be granted to students after their admission to the University as matriculating students. University departments reserve the right to refuse to grant by examination for those courses which are presented by a student for his or her major(s) and to deny recognition of previously granted credit for students who, prior to their declaration of major field, have received equivalency credit in their subsequently declared major.

Subject to the additional limitations of the college and program in which the student is enrolled, the maximum number of credits that a matriculating student may earn through course equivalency procedures is 30 semester credits. Students who have transferred to the University may not apply for equivalency credit in excess of a number determined by subtracting all course equivalency and transfer credits accepted by the University from the maximum of 90 total credits permitted for both transfer and equivalency credit. Nor may transfer students present equivalency credits in fulfillment of the major field residency requirement of 15 credits in University courses.

Course Requirements

Within the policies listed below, faculty members are permitted to establish their examination and course requirements.

Course Examination Policies

Final examinations are required for all undergraduate courses of the University unless exemptions have been granted by the department chairperson and the dean of the college. Exemption requests must be made by the end of the first month of the semester. Final examinations may not be given at a place or time other than those which have been specified by the Student Records Office.

There shall be no final examinations other than those administered during the final examination period. No hour examination shall be administered during the last five academic days of the semester unless exemption has been allowed by the college dean. Final take-home examinations may be submitted to instructors during the final examination period only. Take-home examinations may be submitted only on the day and time at which the Student Records Office has scheduled the final examination for the course in question.

Instructor Course Requirements

By the end of the first full week of classes, instructors must distribute a written statement of requirements, pre-requisites and co-requisites for each course and section to all students and to the department chairperson. This statement must include a specification of the number and types of course evaluations to be employed throughout the semester (including approximate date and nature of the first evaluation), special requirements for completing assignments and taking examinations, and a definition of course attendance policy.

A minimum of three evaluations of student progress (written or oral examinations, written reports, recitations, laboratory techniques and reports, jury or performance evaluations) should be made in each course, with at least one evaluation being required during each half semester. Upon the request of a student, an instructor is required to provide a statement of the student's course progress.

Appeals of grades or grading policies arising from alleged violations of established or published policies must follow procedures cited under the heading Grading Policies. The terms "grade" and "grading policy" refer 1) to all grades awarded, 2) to the computation of grades examinations including final examinations, tests, quizzes, papers, essays, laboratory reports, practicum experiences, and any other kind of academic activity for which a grade of any kind is awarded, and 3) the final course grade which is submitted to the Student Records Office.

Declaration or Change of Major

- [Declaration of Major](#)
- [Declaration of Second Major](#)
- [Dual Degree Programs](#)
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Declaration of Major

Students who have declared a major at the time of their admission to the University are officially enrolled in the college in which their designated major is offered and are referred by the college dean to the chairperson of the designated major for assignment of a faculty advisor.

Although the University does not require students to declare their major fields until they have achieved 60 semester credits, an early decision by students will greatly facilitate the selection of appropriate prerequisite courses for major fields.

Students enrolled in the College of Fine Arts, Humanities and Social Sciences are strongly encouraged to declare their major fields by the end of the freshman year. Students contemplating majors in chemistry or environmental sciences should initiate prerequisite course work immediately upon entrance to the College of Fine Arts, Humanities and Social Sciences and should make a declaration of major at this time or prior to the end of their freshman year.

Students in the College of Health Sciences should not delay declaration of major beyond their freshman year.

Additional course work beyond the minimum degree requirement and extension of the normal four-year period of study may be expected when individuals declare a major later than recommended above.

Students who make no declaration of major prior to the end of their sophomore year are listed as undeclared students for their first two years. Individuals who wish to designate a major which is offered by the college in which they are enrolled as undeclared students must secure the signature of the appropriate department chairperson (or the chairperson of the committee which exercises jurisdiction over an interdepartmental major) on a declaration of major form and must file the completed form with the Office of the Registrar. Individuals who wish to designate a major which is not offered by the college in which they are enrolled as undeclared students must file an approved form for intercollegiate transfer and declaration of major with the Office of the Registrar. This form requires the signatures of the dean of the college to which the student transfers and the appropriate department chairperson.

Undeclared students are advised that openings may be limited or unavailable in some programs and that different admission criteria may be applied to program or college applicants when staffing or facilities render it necessary to establish limits upon enrollments.

Students seeking professional advice regarding selections of majors, second majors, and minors should consult a college dean or a faculty advisor.

Declaration of Second Major

Students who wish to declare a second major should consult with their college dean to determine if a second major can be completed within specified degree requirements or will require additional study beyond the minimum degree requirements and extension of the regular period of baccalaureate study. Students who wish to declare a second major in the college in which they are enrolled as degree candidates ordinarily may do so by filing an approved declaration of second major with the Office of the Registrar. Students who wish to declare such a major in another college of the University may do so only when regulations of that college and the college in which they are enrolled as degree candidates both permit. Such declarations require the approval of both college deans. Students who are permitted to carry two majors are assigned an advisor in each major department.

Individuals who are matriculating for the Bachelor of Arts degree may not count more than 72 credits in their two academic majors combined toward the minimum degree requirement of 120 credits. Students who present more than 72 credits in the two majors combined may not present less than 48 semester credits outside the two major fields in satisfying the minimum degree requirement of 120 credits. Accordingly, students who present more than 72 credits in the two majors combined must present a number of credits beyond the minimum degree requirement of 120 credits that equals the number of credits by which they exceed the combined major credit maximum.

Except as noted under the heading Dual Degree Program, students who elect academic majors in more than one college are candidates for one degree only; and they are considered to be degree candidates in the college of their initial major unless they indicate to the contrary by filing for intercollegiate transfer at the time they make a declaration of second major. Accordingly, a student who pursues academic majors in two colleges is subject to all degree requirements as specified by the college of his or her initial academic major and is subject only to major course requirements (including collateral and prerequisite courses for the major) as specified by the department of his or her second academic major. Individuals who pursue double majors within different degree programs will receive the degree that is designated for their initial academic major unless they also filed for intercollegiate transfer when they filed their declaration of second academic major.

Professional programs in business administration, engineering, health education, clinical laboratory sciences, nursing, exercise physiology, industrial management, industrial technology and Bachelor of Music programs may be designated as degree majors only. Although students in these programs may be permitted to pursue a second major in an academic field offered by another college, they are subject to all degree requirements as specified by the college for their professional major.

Dual Degree Programs

Students who wish to pursue a dual degree program must establish simultaneous matriculation in both programs and designate their candidacy for two degrees. The curricula for dual degree programs are approved by participating college faculties and must be completed as prescribed. It is therefore imperative that a student who wishes to pursue an approved dual degree program obtain a copy of the specified curriculum that enumerates the specific semester-by-semester course requirements. Students interested in this program must receive authorization from all relevant chairs and deans. The minimum credits to receive two degrees is 150.

Change of Major

Once students have begun a program of major studies, they may change their major field only by filing an approved change of major form with the Office of the Registrar. Students who make substantial changes in their plans of study after the beginning of their sophomore year, regardless of major, may find it difficult to complete degree requirements within the normal four-year period of study.

Change of Major within College of Enrollment

Students who wish to change their declaration of major within the college in which they are enrolled as degree candidates are required to file an approved change of major form with the Office of the Registrar. This form requires the approval of the chairperson of the major department to which the student desires to transfer and should be filed by November 1 for spring semester transfer and by April 1 for fall semester transfer to insure proper advising during the periods of fall and spring registration. Filing after the recommended dates may be permitted by the chairperson of the department with jurisdiction over the new major.

Change of Major with Intercollegiate Transfer

Students desiring to transfer from a baccalaureate continuing studies program to a baccalaureate day program, to transfer from a baccalaureate day program to a baccalaureate continuing studies program, must complete appropriate paperwork in the Admission Office.

An individual seeking an intercollegiate transfer must file a change of major form with the chairperson and dean having jurisdiction over the program to which transfer is desired. Following endorsement by both the chairperson and the dean, this form must be filed with the Office of the Registrar. Individuals petitioning for intercollegiate transfer are required to satisfy and maintain the admission requirements of their desired college and program.

Individuals seeking transfer from one college to another are advised that openings may be limited or unavailable in some programs, that different admission criteria may be applied to program or college applicants when staffing or facilities render it necessary to establish limits on enrollments, and that the completion of degree requirements within the customary four-year period may not be possible since the correction of deficiencies cannot always be accommodated within the schedule of course offerings.

The official date of intercollegiate transfer is the first day of the semester following approval of a student's application. Since course registration may be conducted prior to the official date of transfer, students should make immediate arrangements for advising with the dean of the college to which they will transfer. Subsequent to approval of a student's application for transfer and prior to the official date of transfer, the college dean will review the academic record of the student to determine the applicability of previously completed courses to the requirements of the college and, if appropriate, to the new major.

Departmental Examinations

Students who are interested in taking departmental examinations may obtain applications for such examinations from the Office of the Registrar at any time during the fall and spring semesters, but they must initiate the application process in sufficient time to permit the completion of examinations and the processing of examination results prior to the final deadline for filing course grades during the semester in which they are examined. Applications for departmental course-equivalency examinations are filed with the chairperson of the student's major department, the chairperson of the department in which the examination is to be administered, and the faculty examiner.

Students may not repeat departmental equivalency examinations and, except for documented medical reasons or personal emergencies, they may not reapply for such examinations in the event that they fail to keep an examination appointment.

Examinations must be wholly or substantially written unless the nature of the course makes more appropriate an oral or performance examination. Departments may authorize instructors to administer end-of-semester examinations that are scheduled during the final examination period when such examinations are adequate measures of total course requirements. After the student has completed an authorized examination, the faculty examiner must file his or her recommendation for course credit with the Office of the Registrar by the final deadline for filing semester grades.

General Degree Requirements

To qualify for University degrees, baccalaureate candidates are required to obtain a minimum of 2.000 (C) average in their total course of study; to present a minimum of 120 semester credits; to fulfill the minimum residency requirement; to satisfy the regulations and academic standards of the colleges that exercise jurisdiction over the degree for which they are matriculating; to complete all curriculum requirements specified by the college in which they are enrolled and department(s) in which they are majoring; and to complete the University general education requirements.

[General Education Requirements](#)

[Residency Requirements](#)

[Residency Requirement for Active Duty Service Members, their Spouse and College-age Children](#)

[Dual Degree Program](#)

General Education Requirements

For students who enrolled in September, 2000 and subsequently...

Residency Requirements

Please note that all credits transferred may not be used to satisfy requirements in your program of study.

All candidates for baccalaureate degrees, must meet the residency requirement by completing a minimum of 60 semester credits at the University of Massachusetts Lowell except as indicated below. The following residency options apply, as specified, to candidates for baccalaureate degrees:

1. Complete three years at the University of Massachusetts Lowell, earning not less than 90 credits, and an approved junior or senior year program at another accredited baccalaureate institution, earning not more than 30 semester credits or the number of semester credits specified for juniors or seniors by those prescribed courses of study that are listed in this catalogue.
2. Complete an associate's degree at a Massachusetts community college under the provisions of the Mass Transfer agreement and complete the last two years at the University, earning not less than 60 credits at the University of Massachusetts Lowell. An exception to this residency requirement, not to exceed 15 credits, may be granted by the Department Chair of the major field with the approval of the College Dean at the time of initial matriculation at the University of Massachusetts Lowell.
3. Complete up to the first two years in an accredited two-year institution, earning not more than 60 semester credits with grades of C- (1.700 on a 4.000 scale) or better, and the remaining years in the University, earning not less than 60 semester credits. An exception to this residency requirement, not to exceed 15 credits, may be granted by the Department Chair of the major field with the approval of the College Dean at the time of initial matriculation at the University of Massachusetts Lowell.
4. Complete up to the first three years of a baccalaureate program in an accredited four-year institution, earning not more than 90 semester credits, with grades of C- (1.700 on a 4.000 scale) or better, and the remaining year(s) in full-time study in University classes, earning not less than 30 credits.

An individual who has been admitted to day courses of the University as a non-matriculating (special) student is not considered a student in residence. If subsequently admitted as a matriculating student, such an individual must petition the college dean for recognition of non-matriculated courses. Up to 15 credits of non-matriculated day courses may be recognized for application to the minimum residency requirements of 30 semester credits of University courses.

Off Campus Study

Once students have matriculated at the University of Massachusetts Lowell, they are expected to complete their coursework at the University of Massachusetts Lowell. Such coursework may also include credits earned through approved study-abroad programs. In some cases, in order to clear a deficiency or to remain on track for graduation, a student may seek permission for off-campus study to take a course at another accredited institution. Even when authorization for off-campus study is granted, all students are required to fulfill their University of Massachusetts Lowell residency requirements.

Matriculating students in satisfactory academic standing may be permitted to apply off-campus courses to their degree programs when they comply with established procedures. Students wishing to apply credits earned off-campus must obtain approval prior to off-campus enrollment, through an (pdf) form () available in the Office of the Registrar.

Off-campus courses may be taken in regionally accredited institutions only, and ordinarily should be taken at baccalaureate colleges or universities. Permission to pursue off-campus courses in regionally accredited associate degree institutions may be granted to students only for courses which are to be presented for lower-division requirements of University of Massachusetts Lowell curricula and provided that such courses do not lead to a violation of the University Residency Requirements. All off-campus courses must be taken under the regular grading system and may not be taken on a pass-no credit (pass/fail) basis.

To view the list of courses approved by departments for transfer into the University of Massachusetts Lowell, visit the Transfer Dictionary on the Registrar's Office website.

University Restrictions Concerning Off-Campus Study

Students are not permitted to pursue off-campus courses until an initial evaluation of their academic progress at the University has been made. Students who have transferred to the University with 60 or more semester credits, or who have been admitted from another institution with a baccalaureate degree to pursue a second bachelor's degree, are not permitted to pursue off-campus studies. Students who combine University courses with off-campus courses during the regular academic year are subject to University restrictions on semester course loads.

Residency Requirement for Major Fields

Baccalaureate degree candidates must complete at least 15 semester credits within the academic department(s) in which they are majoring for each major presented for a degree. Upon the approval of the appropriate college dean, the course requirement of 15 credits within the major department may be satisfied through satisfactory completion of courses in the University of Massachusetts Lowell Continuing Studies Division.

Residency Requirement for Active Duty Service Members, their Spouse and College-age Children

The University of Massachusetts Lowell will limit academic residency to twenty-five percent (30 credits for bachelors degree, 15 credits for associates degree) or less of the degree requirement for all degrees for active-duty servicemembers and their adult family members (spouse and college-age children). In addition, there are no "final year" or "final semester" residency requirements for active-duty servicemembers and their family members. Academic residency can be completed at any time while active-duty servicemembers and their family members are enrolled. Reservist and National Guardsmen on active-duty are covered in the same manner.

Dual Degree Program

Students who wish to pursue a dual degree program must establish simultaneous matriculation in both programs and designate their candidacy for two degrees. The curricula for dual degree programs are approved by participating college faculties and must be completed as prescribed. It is therefore imperative that a student who wishes to pursue an approved dual degree program obtain a copy of the specified curriculum that enumerates the specific semester-by-semester course requirements. Students interested in this program must receive authorization from all relevant chairs and deans. The minimum credits to receive two degrees is 150.

Grading Policies

The following qualitative letter grades are employed by faculty members to characterize the quality of a student's work in a course:

A	Superior Work: Highest Quality	4.0
A-	High Honors Quality	3.7
B+	High Quality	3.3
B	Basic Honors Quality	3.0
B-	Below Honors Quality	2.7
C+	Above Satisfactory Quality	2.3
C	Satisfactory	2.0
C-	Below Satisfactory Quality	1.7
D+	Above Minimum Passing	1.3
D	Minimum Passing	1.0
F	Failed	0.0
FX	Failed due to Academic Misconduct (may not be replaced or deleted)	0.0

In addition to the above qualitative letter grades, the following symbols are used to designate special enrollment provisions or course statuses and do not affect the student's academic average:

AU	Audit
W	Withdrawn
CR	Credit Only
INC	Incomplete
W	Voluntary withdrawal (before deadline-to-withdraw indicated on academic calendar)
X	Administrative withdrawal
NC	No credit
P	Satisfactory Grade C- or Above
S	Satisfactory Grade C or Above
U	Unsatisfactory Failed
T	Transfer Credit
Y	Administrative Dismissal

Midterm Grades

Midterm grades are not official and do not factor into grade point average and credits earned. Midterm grades do not appear on transcripts. The grade is submitted by the faculty to inform the student of their current grade status.

All grades listed above may be used for midterm grading along with the following two grades:

IDF In Danger of Failing
FN Fail Never Attended

Pass-No Credit Course Registration

Students may elect to register on a pass-no credit basis for a maximum of four unrestricted elective courses. A student may not change his or her enrollment status from letter grade to pass-no credit or from pass-no credit to letter grade after the established deadline for adding a course.

A pass-no credit course cannot be presented in fulfillment of University general education requirements, major programs, minor programs, or specifically designated courses (collateral requirements) of an established curriculum. A grade of P indicates that a student's performance merits an evaluation of C- or better. NC indicates that a course has been failed but that such failure is without

prejudice to the student's cumulative average. Although appropriate credits are granted to students when grades of P have been assigned, these credits are not qualitatively weighted and hence do not affect a student's academic average. The entry NC will not keep an otherwise qualified student from dean's list recognition.

Satisfactory-Unsatisfactory Course Registration

Certain courses (e.g., practicum experiences, advanced seminars, and directed studies) may be graded as satisfactory or unsatisfactory. A grade of S indicates that a student's performance merits an evaluation of C or better. U indicates a course evaluation of less than C. Although appropriate credits are granted to students when grades of S have been assigned, these credits are not qualitatively weighted and hence do not affect a student's academic average. A grade of U indicates that attempted course credits have not been granted and is awarded without prejudice to a student's cumulative average.

Incomplete Courses

The symbol INC (incomplete) is a temporary notation which is assigned for incomplete work in courses when the records of students justify the expectation that they will obtain a passing grade but for emergency reasons they have missed a minor part of the course requirement. Any missed final examination or other final course evaluation requires a student explanation within 48 hours so the instructor can file the proper course notation with the Office of the Registrar.

A student who has evidenced an unsatisfactory course record, who has failed to complete a major portion of an instructor's course requirements, or who fails to provide an instructor with a satisfactory reason for absence from a final examination or final course evaluation within the specified 48 hour period may not be assigned the letter symbol INC.

Responsibility for making arrangements with an instructor to complete all outstanding course work rests entirely with the student, who must complete all course work by the final week of classes for the succeeding semester.

At the end of the official make-up period (or, in the event of a substantiated student emergency, at the end of an extended make-up period), the Office of the Registrar will convert the temporary notation of INC to the appropriate permanent symbol. This permanent notation will be one of the following: 1) a letter grade which is filed by an instructor at the end of the make-up period to designate the final course standing of a student who has made up incomplete course requirements, 2) course work not completed by the final week of classes for the succeeding semester will convert to a grade of F, or 3) the letter symbol of X, which the dean of the college in which the student is enrolled as a degree candidate may authorize to designate that a student has withdrawn from the University after the end of the semester for documented medical or personal emergency (cf. University Withdrawal After the End of the Semester).

Limited extensions of the make-up period may be granted to students for serious medical reasons and for documented personal emergencies. Requests for such extensions are approved by the dean of the college in which students are enrolled as degree candidates and must be filed no later than one calendar week preceding the established deadline for instructors to submit final grades for incomplete courses.

Audited Courses

A student may enroll in credit courses as an auditor with appropriate approval. Forms and instructions for registration as an auditor may be obtained from the Office of the Registrar. No charge is levied on full-time students for audited courses. No credit or grade will be recorded for an audited course, but the symbol AU will be listed on the permanent record. A change from audit to credit status, or from credit status to audit, may not be made after the deadline for adding a course (10th class day).

Students who have audited a course subsequently may not earn credit in the same course through tests of the College Level Examination Program or through other authorized examination procedures for course challenge.

Grade Changes

At the end of each semester, grades are available to students via their self service account in ISIS. All course grades become a part of the student's official record upon instructor assignment and may not be changed except as specifically provided by University procedures. Corrections of grade-point averages automatically are authorized when grade reports are corrected by instructors and when specific courses are deleted from grade-point averages under provisions of University regulations governing repeated courses and course deletions.

Changes of grades other than the filing of grades for incomplete courses require the endorsement of the appropriate college dean. Grade changes may not be made on a student's permanent record after the deadlines cited in the academic calendar unless such changes have been authorized by appropriate college deans.

Course Grade Appeal Policy

The instructor of the class is the primary authority with respect to a student's proficiency and final grade in that course. A student who believes that his or her final grade reflects an erroneous, capricious, arbitrary, or prejudiced academic evaluation may appeal the grade. The academic judgment used in determining the merits of the grade to be awarded shall not be reviewable. This process does not apply to cases of academic dishonesty, which are adjudicated through the "academic dishonesty process."

1. The student may file an appeal of his or her complaint, in writing, to the instructor within 30 days after a final grade is posted to the student's record. The instructor must respond within 14 days of receiving the appeal.
2. If the student remains dissatisfied by the decision of the instructor under step (1), he or she may, within 14 days after formal receipt of the instructor's final decision, appeal, in writing, to the chairperson of the program (or the Dean of the College if the instructor is

the chairperson) in which the course or other exercise or activity is offered. The chairperson must respond within 14 days of receiving the appeal. The decision may be: (a) that the appeal be dismissed; (b) if there is demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the chairperson will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or (c) that another appropriate remedy be administered.

3. If no satisfactory resolution is reached in step (2) then the student or the instructor may appeal, in writing, to the Dean of the College within 14 days after formal receipt of the chairperson's final decision.
4. The Dean, after discussion with the appropriate parties, may resolve the grievance by agreement or render a decision within 21 days of receipt of the written appeal. The decision may be: (a) that the appeal be dismissed; (b) if the student provides demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the Dean will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or (c) that another appropriate remedy be administered.
5. The decision of the Dean is final and not subject to additional appeal by either student or instructor. The appeals process ends at this step
6. Department chairs are responsible for keeping a record of the appeal on file in the department until the student is no longer a student.

Language Requirements

Students enrolled in Bachelor of Arts programs in the social sciences and humanities (with the exception of Economics) are required to demonstrate intermediate level proficiency in a foreign language. Students with documented learning disabilities may be allowed to fulfill the language requirement through an alternate set of courses. Such students should file appropriate documentation with the office of Disability Services, at which time they will receive information on their alternative requirement.

For information on test scores that may be applied to the foreign language requirement, please consult .

Major Field Requirements

Candidates for the Bachelor of Arts degree may not be required to take more than 45 credits in their major fields. Candidates for the Bachelor of Science degree may not be required to take more than 60 credits in their major fields. However, candidates for either degree may elect to take additional courses in the major beyond the specified maximum providing that such additional courses are not presented for the minimum degree requirement of 120 credits.

Credits for each course may be counted only once in a student's program of studies. A course which is specified as a requirement for both a student's major and minor will satisfy both requirements, as stated, but course credits may not be counted more than once and may be applied to one category of a student's program of studies only. Individual departments may have a more restrictive policy.

Maximum Period of Bachelor's Degree Study

Depending on the nature of the subject and discipline, courses taken by a student may become obsolete for curricula of the University when they have been completed over a period of time that exceeds the customary period for bachelor's degree study. Accordingly, University departments reserve the right to delete courses from a student's program of study when such courses have been determined to be obsolete for the curriculum in which the student is enrolled.

Minor Area Requirements

The requirements for minors are established by University departments or by interdisciplinary committees. No minor program may consist of less than 18 semester credits in the minor field or more than 24 semester credits. At least six credits must be completed at the upper-division course level for all minor studies. Students are advised that an aggregation of courses that totals 18 or more credits may not constitute a minor field. Specific options for minor programs depend on the major field which a student has elected to pursue and the collateral course requirements specified by major departments. Individuals interested in electing a minor program should consult the relevant section for curriculum requirements and prerequisites.?

Credits for each course may be counted only once in a student s program of studies. A course which is specified as a requirement for both a student s major and minor will satisfy both requirements, as stated, but course credits may not be counted more than once and may be applied to one category of a student s program of studies only. ?Individual departments may have a more restrictive policy.

Students in the College of Fine Arts, Humanities, and Social Sciences should consult additional College policies on minors at the FAHSS Policies and Requirements section of the catalog.

?(<http://www.uml.edu/Academics/minors.aspx>)

Off-Campus Study

Once students have matriculated at the University of Massachusetts Lowell, they are expected to complete their coursework at the University of Massachusetts Lowell. Such coursework may include credits earned through approved study-abroad programs. In some cases, in order to clear a deficiency or to remain on track for graduation, a student may seek permission for off-campus study to take a course at another accredited institution. Even when authorization for off-campus study is granted, all students are required to fulfill their University of Massachusetts Lowell residency requirements.

Students wishing to apply credits earned off-campus must obtain approval prior to off-campus enrollment, through an Authorization of Off-Campus Courses form available in the Office of the Registrar.

Off-campus courses may be taken in regionally accredited institutions only, and ordinarily should be taken at baccalaureate colleges or universities. Permission to pursue off-campus courses in regionally accredited associate degree institutions may be granted to students for courses that are to be presented for lower-division requirements of University of Massachusetts Lowell curricula provided that such courses do not lead to a violation of the University Residency Requirements. All off-campus courses must be taken under the regular grading system and may not be taken on a pass-no credit (pass/fail) basis.

To view the list of courses approved by departments for transfer into the University of Massachusetts Lowell, visit the Office of the Registrar's website (<http://www.uml.edu/registrar/transfer/>).

University Restrictions Concerning Off-Campus Study

Students are not permitted to pursue off-campus courses until an initial evaluation of their academic progress at the University has been made. Students must comply with current . Students who combine University courses with off-campus courses during the regular academic year are subject to University restrictions on semester course loads.

Full-Time Off-Campus Study

Off-campus courses may be authorized on a full-time basis for those students who have completed (or who will complete prior to graduation) three years of full-time study at the University of Massachusetts Lowell (earning no fewer than 90 semester credits) and who wish to pursue a year abroad or who wish to complete a year as visiting students at another baccalaureate institution while completing a University of Massachusetts Lowell degree. Prior to departure, students planning to undertake full-time off-campus study should present to the dean of the college of their enrollment an academic petition that seeks authorization of the proposed course of study. Following a review of the petition and of the proposed course of study, the dean will endorse the petition, informing both the student and the Office of the Registrar of the acceptability of the course of study to the student's degree program.

Since some colleges of the University do not permit full-time off-campus study, students should ascertain the policy of their college before pursuing arrangements with other institutions. Students who wish to pursue full-time off-campus studies are advised that they must satisfy academic and residency requirements concerning courses in the major field (cf. General Degree Requirements: Residency Requirements)

Online & Continuing Education

Subject to University residency requirements and college regulations, the following categories of day students may be permitted to register for continuing studies courses at the University of Massachusetts Lowell and to have such courses credited to baccalaureate day programs:

1. individuals who have been admitted to day colleges for baccalaureate study;
2. individuals in satisfactory academic standing who are currently matriculating in day colleges of the University;*
3. previously matriculated students in day colleges who withdrew from the University while in satisfactory academic standing, and who have been readmitted to programs in which they were previously enrolled;
4. full-time undergraduate day school student tuition and fees do not cover courses offered by Online & Continuing Education. Full-time undergraduate students who register for OCE courses will be charged OCE tuition and fees as specified on the [OCE](#) website (a minimum \$900 per course);
5. In addition to the OCE tuition and fees, all students registered for OCE courses are charged a non-refundable \$30 OCE registration fee.

Individuals are warned that departments reserve the right to deny baccalaureate credit for the University of Massachusetts Lowell continuing studies courses which have been taken in violation of University residency requirements, curriculum requirements of their baccalaureate day programs, and/or special college regulations. Students who have been suspended or dismissed from day programs of the University are prohibited from enrolling in any program of the University. Students who combine University day courses with continuing education courses during the regular academic year are subject to all restrictions concerning semester course loads (cf. Registration and Course Enrollment Policies).

*Students on Academic Warning are permitted to register for continuing studies, winter intersession, and summer school courses; students who have been suspended are prohibited from enrolling in any course offered by the University.

For further information visit [Online & Continuing Education](#).

Programs of Study and Declaration of Intent to Graduate

All students are required to file with their advisor a copy of their final semester course registrations (including notification of course withdrawal) and an accurate account of courses taken, grades received, and changes of designated programs of study. Deadlines for conferring with faculty advisors concerning the completion of degree requirements and for filing final programs of study and declarations of intent to graduate with college deans are specified in the University calendar.

Each college has adopted a program of studies form that best reflects the nature of its degree programs. Forms employed by the College of Fine Arts, Humanities and Social Sciences and the College of Health Sciences have been standardized and designate three areas: University general education requirements, major requirements, and collateral programs (second majors, minors, and

unrestricted elective courses).

Credits for each course may be counted only once in a student's program of studies. A course which is specified as a requirement for both a student's major and minor will satisfy both requirements, as stated, but course credits may not be counted more than once and may be applied to one category of a student's program of studies only. Individual departments may have a more restrictive policy.

At the end of the semester following the filing of a declaration of intent to graduate, the college dean verifies course completions and required cumulative and major averages. The names of students who have satisfied all degree requirements are then forwarded to the appropriate college faculty for endorsement and, finally, to the Office of the Provost, which orders appropriate diplomas for conferral at graduation. Students who unofficially complete all degree requirements and fail to file either a declaration of intent to graduate or a program of studies will not be recommended to the Office of the Provost and conferral of the degree will be delayed until an approved declaration has been filed.

Registration and Course Enrollment Policies

Students are required to register for courses during periods which are officially designated for registration unless they have been authorized to make other arrangements by the dean of the college in which they are matriculated. Non-matriculated students are permitted to enroll for course loads only as specified by their conditions of admission and must comply with the policies (below) concerning semester course loads and reduced load status.

[Semester Registration](#)

[Semester Course Loads](#)

[Deadline for Changes of Course Enrollment Status](#)

Semester Registration

First time students are strongly encouraged to register in person. Returning students are required to register during the designated registration periods. They have satisfied the registration requirement when they have paid the required tuition and fees and have complied with the course drop and add process.

Students who pre-register for courses for which they subsequently fail to satisfy prerequisites must initiate changes of registration during the add-drop period. Students are not enrolled in classes for which they are not properly registered.

Student schedules are available through the university's self-service website (). Students who believe that errors have been made in their registrations should consult with the Office of the Registrar prior to the deadline for adding courses. Students who do not check their schedule and, accordingly, fail to correct scheduling errors by established deadlines may not expect to have University regulations waived for their benefit.

Course Additions

Students who wish to add a course during the first five days of classes may do so in person at the Office of the Registrar or through self-service.

Dropped Courses

A student who wishes to drop a course may do so in person at the Office of the Registrar or through student self-service during the first ten days of classes.*

There are only two cases for which a drop is not necessary:

1. if the course is cancelled by the University; or
2. if courses (or sections) carry no credit and will not appear on their transcript

*Courses dropped during the first ten days of classes will not show on the permanent record. Courses dropped from the eleventh to the fiftieth day of class will be assigned a grade of W and will appear on the permanent record.

Courses Cancelled by the University

Students are not required to drop courses or sections that are cancelled by the University. If students wish to replace a cancelled course with another, they must follow the procedures above for course additions.

Semester Course Loads

The typical course load expectation for full-time students is 15 credits. Professional curricula may specify credits in excess of this number, in which case such specifications are regarded as regular course loads.

Maximum Credit Loads

Students may enroll for course loads in excess of 15 credits but are advised that course loads in excess of the number of credits specified by recommended courses of study may not be in their academic interests when their grade-point averages are less than 3.000.

Unless specified as part of an established course of study, course loads in excess of 15 credits are recommended for enrichment purposes only and should be taken as no-credit courses. In any event, a student is prohibited from registering for course loads in excess of 20 credits unless such loads are required by established University curricula or unless special permission has been granted by the dean of the college in which the student has established matriculation.

Students who are enrolled in curricula which do not require a semester course load in excess of 20 credits and who wish to obtain permission to carry such an overload must file an academic petition with the dean of the college in which they have established matriculation. Students who register for course loads in excess of 20 credits (including continuing studies courses) without the prior authorization of the dean of the college in which they have established matriculation will not receive credit for more than 20 credits per semester, and the college dean will determine which course(s) shall receive the administrative symbol of Y. Permission to carry course loads in excess of stated maxima will be denied when resources of a college or program render it necessary to establish limitations on course enrollments.

Minimum Credit Loads

Matriculating students are classified as full-time when they carry the course credit load in University day programs that is specified by their curricula. Full-time students are required to register for a minimum of 12 credits of day courses each semester. Please note that students who are approved through Disability Services for a reduced course load in accordance with the American Disabilities Act (ADAAA) will be exempt from the 12 credit minimum to be considered full time.

Part-time Enrollment

A student enrolled on a part-time basis is charged by the credit hour for tuition and all applicable fees.

Students enrolled on a part-time basis should understand that part-time enrollment may have an impact on financial aid and on eligibility for insurance through non-University agencies. Students who enroll for fewer than six credits may be required to begin repayment of student loans. Varsity athletes and international students on I-20 permits must enroll for a minimum of 12 credits per semester and may not be part-time students.

Deadline for Changes of Course Enrollment Status

The last day for students to add a course is the fifth day of class of the semester. To change sections within a course, and to change enrollment status from audit to credit or from credit to audit and from pass-no credit to letter grade or from letter grade to pass-no credit is the tenth class day of the semester. The last day for dropping a course with a course notation of W is the fiftieth class day of the semester. Students dropping a course during this time are charged full tuition and fees.

Repeated Coursework/Course Deletions

Repeated Coursework/Course Deletions

Course repetition is permitted only in accordance with the policies cited below, the provisions of which are applicable only to courses taken at the University of Massachusetts Lowell and consequently do not apply to off-campus courses.

A course substitution is not permitted under the provisions of this regulation unless a course has been dropped as a University offering and an alternate course has been authorized as a suitable substitution by the chairperson of the department that offered the course. Once a student has reached the credit limitations cited below, no further courses may be replaced for the purpose of grade substitution, nor may a student who has used the maximum number of course repetitions for the purpose of grade substitution petition to revoke one or more of these substitutions in order to permit course repetition and grade substitution in an additional course or courses.

Grade Substitution/Deletion Rule

Students who entered the University of Massachusetts Lowell as freshmen or transfer to the University of Massachusetts Lowell with fewer than 60 semester credits are permitted a maximum of 15 semester credits for course repetitions/deletions to remove grades of C- or below earned in previously completed courses from their cumulative grade-point averages. Transfer students who enter the University with 60 or more credits are permitted a maximum of 7 semester credits of course repetitions for this purpose. The number of actual course repetitions permitted for any student depends on the number of credits allocated to the courses that he or she wishes to repeat.

Administrative Requirements

Repetition of Passed Courses

Except for courses of a professional nature, which regulations of a particular college may designate as being non-repeatable, students may repeat a course previously passed with a grade of C-, D+, or D within the provisions of the grade substitution rule cited above. When a course previously passed has been repeated within the provisions of this regulation, the cumulative grade-point average is appropriately corrected for the semester in which the course is repeated. If the grade for the repeated course is lower than the original grade in the course, the lower grade may be deleted under the provisions of the grade deletion rule (see above). Credit is never granted twice for a course that has been passed and subsequently taken again and passed for a second time.

Repetition of Failed Courses

Except for courses of a professional nature, which regulations of a particular college may designate as non-repeatable, students may

substitute passing grades for repeated failed courses in the computation of cumulative grade-point averages. Except for non-repeatable courses, students must repeat all required courses which they have failed. Courses in which F grades have been received must be repeated and passed before students may take courses for which those failed are prerequisites.

A course which is failed but is not required for a student's program need not be repeated, but other course work must be taken when a student's total degree program will fall short of the specified credit hours for degree requirements. Unless a failed course is repeated within the deadlines for grade substitution, cited above, both the original failing grade and the repeated course grade are counted in computing grade-point averages. Although the provisions of the grade substitution rule and the requirements for maintaining satisfactory academic standing may indirectly limit the number of failed courses which a student may repeat, no formal limitation is placed upon the number of failed courses that may be repeated.

Repetition of Transferred Courses

When competence is demonstrably inadequate, a student who has been granted transfer credit (and on this basis has been assigned to advanced courses for which the transferred course is a prerequisite) may be advised to repeat such transferred work at the University or to take a more elementary course than that which has been transferred.

Permission to repeat a transferred course is granted upon filing an academic petition form with the dean of the college. Since credit may not be granted more than once for the completion of any course, a condition for filing such a petition is the simultaneous filing of a request to revoke recognition of the previously transferred course.

Right of Access to Student Records

The Family Educational Rights and Privacy Act of 1974 (FERPA) grants any student currently in attendance, or any former student, the right of access to inspect or review his or her educational files, records, or data. Students who wish to inspect their records must file a Right of Access form with the office or department in which the desired record is kept. Right of Access forms are available in the Office of Student Services or through student self service. Wherever practicable, within ten days of receipt of the Right of Access form, the office or department will notify the student as to the date, time, and location when the desired record will be available for inspection. If a student believes that circumstances effectively prevent inspecting and reviewing the records at the designated date, time and location, he or she may request alternative inspection arrangements or copies of the records instead, subject to a fee for copies. The Dean of Students or the Dean's designee will consider the request.

The University maintains the following general records on students:

- Admission File
- Admissions Office
- Permanent Academic Records
- Office of the Registrar
- Financial Aid Records
- Financial Aid Office
- Health Records
- Health Services Office
- Account and Payment Records
- Business Office
- Campus Conduct Records
- Dean of Students Office
- Academic Dishonesty
- Office of the Provost

The file of each student must contain a record of all non-University affiliated individuals or organizations requesting access to information in the file, plus statements that specify the legitimate educational purposes for which access was requested.

Except as otherwise permitted under FERPA, information or records concerning individual students may not be released to any individual or agency without the student's written permission. Any request for such information received without such written permission will not be honored and will be returned with a request for a written release from the student.

FERPA allows release of a student's education records without the student's written permission under certain circumstances, including the following:

1. to personnel of the University, i.e., faculty, administrators, or staff for legitimate educational purposes only;
2. to officials of other institutions in which the student seeks admission or intends to enroll, provided that the student is notified of the release;
3. to federal or state officials in connection with the audit and evaluation of programs funded by federal or state governments, with the enforcement of legal requirements that relate to such programs, or in connection with the student's application for or receipt of financial aid;
4. to accrediting organizations in order to carry out their accrediting functions;
5. to parents who claim the student as a dependent on their IRS statement;
6. to in connection with an emergency, to appropriate persons if revealing such information is necessary to protect the health or safety of the student or other persons;
7. in response to pursuant to a validly issued subpoena, subject to advance notification of the student unless such notice is prohibited by court order; and
8. as otherwise permitted under or consistent with FERPA.

The following data are considered informational in nature and may be released without permission of the student, at the discretion of the University: student's name, major, acknowledgement of a student's participation in officially recognized activities and sports, weight and height of members of athletic teams, date(s) of attendance; degrees, certificates, awards received; the most recent previous educational agency or institution attended by the student and appointment as a Resident Assistant or Community Development Assistant. For graduate students who are teaching credit courses, work department, office address, and employment category are also defined as directory information.

Any student who wishes to have some or all of his or her directory information excluded from release by the University without prior permission must complete the appropriate selections available thru student self service.

Any student who believes that his or her records are inaccurate or misleading may request a hearing with the Dean of Students to discuss the contents of such records and whether or not they need to be changed. Additional information on procedures or policies relating to University compliance with the Family Rights and Privacy Act can be obtained from the Office of Student Services or the Registrar's Office.

Student Complaints

Student Complaints Arising from Grades and Grading Policy of a Faculty Member

Faculty members are expected, as a matter of right and professional standards, to recalculate any grade in which a computational error is alleged or suspected, provided that the student challenges the grade before the deadlines established by the policy on grade appeals (). Generally speaking grades may only be challenged when a faculty member is alleged to have violated University, college, or departmental academic regulations and policies, or to have violated the faculty member's own grading policy, as determined from the published course requirements for the course or section in question.

Complaints Concerning Classroom Matters Exclusive of Grades and Grading Policy

Students confronting classroom problems that are a source of legitimate concern are entitled to have their complaints heard and resolved according to the procedures specified below.

Classroom problems may include, but are not limited to, the following examples (but note that questions concerning grades and grading policies are reserved to the process specified above):

1. faculty failure to observe University policy and/or regulations, such as violating the regulation against scheduling examinations during the last week of the semester;
2. changing class schedules without the permission of the department chairperson and the college dean, or rescheduling final examinations (including setting a due date for take-home examinations) to a time and place other than that established by the Student Records Office;
3. terminating semester classes prior to the date specified by the University calendar;
4. failing to fulfill instructional obligations (such as unjustified cancellation of classes, frequent absenteeism, and lateness);
5. failing to provide and distribute a written statement of course requirements within the first 10 days of classes, which is mandated for all instructors;
6. failing to adhere to the written statement of course requirements; and
7. failing to post office hours or to maintain such hours.

Students normally should seek to resolve problems by discussion with the faculty member. If this is not feasible or if, after discussion, the matter cannot be resolved, the student must inform the faculty member in writing that he or she will initiate a formal complaint. This complaint must be in writing and addressed jointly to the chairperson of the department and the dean of the college in which the alleged problem and/or violation occurred.

After discussing the problem with the student and the faculty member, the chairperson and the dean determine whether the complaint is valid. (Should the subject of a formal complaint be a department chairperson, the review and determination will be made by the dean and the chairperson of another department.) Copies of the complaint, together with the written decision of the chairperson and the dean, will be sent to the student, the faculty member, the Provost, and the President of the MSP.

Formal complaints about classroom problems shall be initiated before the last day of semester examinations in the semester during which the violation is alleged to have occurred. The determination of the chairperson and the dean must be made within ten working days following receipt of the student complaint and, if unchallenged by the MSP, it is final.

Equal and Fair Treatment

Under federal and state laws, all students are protected from discrimination based on race, color, religion, national origin, disability, gender, (including sexual harassment), age, sexual orientation, marital or veteran status. If you feel that you have been discriminated against based upon any one of these areas, you must contact Equal Opportunity and Outreach (<http://www.uml.edu/equal/>). These protections also include retaliation for filing complaints of discrimination. Concerns regarding course offerings, instructor and student attitudes should also be directed to EOO staff.

Students are responsible for adhering to the policies of the University regarding equal and fair treatment.

Undergraduate Classification

Irrespective of the provisions of specific curricula and the number of full-time semesters completed by students, the University determines class standing on the basis of total credits earned (including AFROTC credits) in accordance with the following scales:

- Freshman standing 0-24 credits
- Sophomore standing 25-54 credits
- Junior standing 55-84 credits
- Senior standing 85 or more credits

Withdrawal from Courses

W and X are administrative symbols which indicate that a student has been authorized to withdraw from courses, or from the University. These symbols, which are entered upon the student's permanent record without prejudice, may be authorized only in accordance with established policies of the University. The grade of W signifies voluntary withdrawal from a course. It is initiated by the student and can only be applied prior to the deadline-to-withdraw indicated in the academic calendar, specified on the academic calendar. The grade of X signifies an administrative withdrawal from class. The grade of X is applied by the administration in circumstances where profound impact to academic performance due to a personal or immediate-family medical event, disability, death, or active military service is documented sufficiently. Disciplinary action may also result in administrative withdrawal from classes.

Students may not take more than two withdrawals (W's) in any given course.

Voluntary Course Withdrawal before the deadline-to-withdraw indicated on the Academic Calendar.

Students who desire to withdraw from courses with notations of W prior to the deadline-to-withdraw specified on the academic calendar may withdraw through ISIS self-service. Students who do not complete the process of withdrawal before the approved deadline will not be assigned course notations of W, will be subject to all instructor course requirements, and will receive final course grades assigned by the course instructors.

Students who voluntarily withdraw from all courses are withdrawn from the University.

Note that withdrawal from a course or courses may have implications for degree progress, veteran's benefits, health insurance, financial aid, and immigration status. Students are advised to consult their academic advisor as well as officials in appropriate offices prior to withdrawing from any course.

Administrative Course Withdrawal

Course withdrawal, with an assigned course notation of X, after the deadline-to-withdraw specified on the academic calendar for reason of a documented extended illness or critical personal emergency may be allowed and ordinarily requires withdrawal from the University, but partial withdrawal may be authorized if circumstances are warranted.

1. In order to apply for medical withdrawal the 'Request for Medical Withdrawal Form' with accompanying documentation from a licensed health service professional, must be submitted to the Office of Health Services. Health information is covered by HIPAA laws and medical information received by Health Services is strictly private and confidential. In consultation with the Office of the Registrar, the Office of Health Services submits recommendations to the Provost's Office for final review and approval.
2. Administrative withdrawal for non-medical reasons is initiated through an to the Office of the Provost with appropriate, verifiable documentation that corroborates the reason for withdrawal advanced on the petition.
3. Neither complete nor partial withdrawal will be authorized because a student anticipates a low or failing grade in the course (or courses) or because of the presumed effect of a low or failing grade on the student's cumulative grade-point average.
4. Faculty are notified when the grade of 'X' is retroactively applied to a course for which a grade was entered. Typically administrative withdrawal is applied to a whole semester rather than to isolated courses. Medical withdrawals occurring after the approved withdrawal period are not associated with financial reimbursement of tuition or fees.

Withdrawal from University

All students who desire to withdraw from the University are required to:

1. discharge all financial obligations to the University,
2. return all University property, and
3. file a written notification of withdrawal with the Office of the Registrar. Since the date of official withdrawal as recorded by the Office of the Registrar is one basis of any claim for tuition refund, and it may be of importance in determining subsequent legal or student insurance claims, students should process withdrawal papers in person prior to leaving the University.

Students who absent themselves from the University without officially withdrawing will remain on class rosters until they officially withdraw from the University or until the end of the semester. Students who remain on class rosters after the fiftieth class day will be assigned final course grades. The date on which a withdrawal request is filed with the Office of the Registrar is the date on which withdrawal is academically effective and constitutes the basis for final course notations.

The names of students who have withdrawn from the University for any reason are removed from all rolls. Students who have withdrawn must be reinstated. This is accomplished through the Office of the Registrar.

Students who are recipients of benefits from the Veterans Administration may not process withdrawals from the University that violate their declarations of classroom attendance. Recipients of veterans benefits are advised that they must receive course grades when their

requests to withdraw from the University have been filed after deadlines of the Veterans Administration for processing changes of declared benefit status or when their dates of withdrawal will conflict with declarations of classroom attendance.

University Withdrawal before Deadline-to-Withdraw specified on Academic Calendar

Students who register for courses and withdraw from the University prior to the first day of classes of a semester are withdrawn without record. Students who register for courses and who withdraw from the University before the deadline-to-withdraw specified on the academic calendar are withdrawn with course notations of W.

University Withdrawal After the Deadline-to-Withdraw specified on the Academic Calendar

A student who withdraws from the University after the Deadline-to-Withdraw specified on the academic calendar must be graded by all course instructors unless the student is authorized to withdraw for documented reasons of extended illness or critical personal emergency.

A student who wishes to withdraw from the University after the deadline-to-withdraw specified on the academic calendar must file an academic petition, together with appropriate documentation specifying the cause for the withdraw, with the Office of the Provost. Following a review of the academic petition and verification of attached documentation, the Office of the Provost may permit the student to withdraw from all courses with course notations of X.

Withdrawal from courses may have implications for degree progress, veteran's benefits, health insurance, financial aid, and immigration status. Students are advised to consult their academic advisor as well as officials in appropriate offices prior to withdrawing from class.

University Withdrawal After the End of the Semester

A student who has unofficially withdrawn from the University (i.e., has ceased attending classes) for reasons of extended illness or critical personal emergency and was unable to officially withdraw from the University before the end of the semester may petition to withdraw from all courses with course notations of X. Such a student must file an academic petition, together with supporting documentation, no later than one calendar month from the beginning of the following semester. This petition must be filed with the Office of the Provost. Following a review of the academic petition and verification of attached documentation, the Office of the Provost will notify the student and the Office of the Registrar of the decision. Faculty are notified when the grade of 'X' is retroactively applied to a course for which a grade was entered.

Readmission

Students who have withdrawn from the University may apply for re-admission through the Office of the Registrar. The form for re-admission may be found at

Pass-No Credit Course Registration

Students may elect to register on a pass-no credit basis for a maximum of four unrestricted elective courses. A student may not change his or her enrollment status from letter grade to pass-no credit or from pass-no credit to letter grade after the established deadline for adding a course.

A pass-no credit course cannot be presented in fulfillment of University general education requirements, major programs, minor programs, or specifically designated courses (collateral requirements) of an established curriculum. A grade of P indicates that a student's performance merits an evaluation of C- or better. NC indicates that a course has been failed, but that such failure is without prejudice to the student's cumulative average. Although appropriate credits are granted to students when grades of P have been assigned, these credits are not qualitatively weighted and hence do not affect a student's academic average. The entry NC will not keep an otherwise qualified student from dean's list recognition.

Satisfactory-Unsatisfactory Course Registration

Certain courses (e.g., practicum experiences, advanced seminars, and directed studies) may be graded as satisfactory or unsatisfactory. A grade of S indicates that a student's performance merits an evaluation of C or better. U indicates a course evaluation of less than C. Although appropriate credits are granted to students when grades of S have been assigned, these credits are not qualitatively weighted and hence do not affect a student's academic average. A grade of U indicates that attempted course credits have not been granted and is awarded without prejudice to a student's cumulative average.

Incomplete Courses

The symbol INC (incomplete) is a temporary notation which is assigned for incomplete work in courses when the records of students justify the expectation that they will obtain a passing grade, but for emergency reasons they have missed a minor part of the course requirement. Any missed final examination or other final course evaluation requires a student explanation within 48 hours so the instructor can file the proper course notation with the Office of the Registrar.

A student who has evidenced an unsatisfactory course record, who has failed to complete a major portion of an instructor's course requirements, or who fails to provide an instructor with a satisfactory reason for absence from a final examination or final course evaluation within the specified 48 hour period may not be assigned the letter symbol INC.

Responsibility for making arrangements with an instructor to complete all outstanding course work rests entirely with the student, who must complete all course work by the final week of classes for the succeeding semester.

At the end of the official make-up period (or, in the event of a substantiated student emergency, at the end of an extended make-up period), the Office of the Registrar will convert the temporary notation of INC to the appropriate permanent symbol. This permanent notation will be one of the following: 1) a letter grade which is filed by an instructor at the end of the make-up period to designate the final course standing of a student who has made up incomplete course requirements, 2) course work not completed by the final week of classes for the succeeding semester will convert to a grade of F, or 3) the letter symbol of X, which the dean of the college in which the student is enrolled as a degree candidate may authorize to designate that a student has withdrawn from the University after the end of the semester for documented medical or personal emergency (cf. University Withdrawal After the End of the Semester).

Limited extensions of the make-up period may be granted to students for serious medical reasons and for documented personal emergencies. Requests for such extensions are approved by the dean of the college in which students are enrolled as degree candidates and must be filed no later than one calendar week preceding the established deadline for instructors to submit final grades for incomplete courses.?

Audited Courses

A student may enroll in credit courses as an auditor with appropriate approval. Forms and instructions for registration as an auditor may be obtained from the Office of the Registrar. No charge is levied on full-time students for audited courses. No credit or grade will be recorded for an audited course, but the symbol AU will be listed on the permanent record. A change from audit to credit status, or from credit status to audit, may not be made after the deadline for adding a course (10th class day).

Students who have audited a course subsequently may not earn credit in the same course through tests of the College Level Examination Program or through other authorized examination procedures for course challenge.

Grade Changes

At the end of each semester, grades are available to students via their self service account in SIS. All course grades become a part of the student's official record upon instructor assignment and may not be changed except as specifically provided by University procedures. Corrections of grade-point averages automatically are authorized when grade reports are corrected by instructors and when specific courses are deleted from grade-point averages under provisions of University regulations governing repeated courses and course deletions.

Changes of grades other than the filing of grades for incomplete courses require the endorsement of the appropriate college dean. Grade changes may not be made on a student's permanent record after the deadlines cited in the academic calendar unless such changes have been authorized by appropriate college deans. ?

Course Grade Appeal Policy

The instructor of the class is the primary authority with respect to a student's proficiency and final grade in that course. A student who believes that his or her final grade reflects an erroneous, capricious, arbitrary, or prejudiced academic evaluation may appeal the grade. The academic judgment used in determining the merits of the grade to be awarded shall not be reviewable. This process does not apply to cases of academic dishonesty, which are adjudicated through the academic dishonesty process.

1. The student may file an appeal of his or her complaint, in writing, to the instructor within 30 days after a final grade is posted to the student's record. The instructor must respond within 14 days of receiving the appeal.?
2. If the student remains dissatisfied by the decision of the instructor under step (1), he or she may, within 14 days after formal receipt of the instructor's final decision, appeal, in writing, to the chairperson of the program (or the Dean of the College if the instructor is the chairperson) in which the course or other exercise or activity is offered. The chairperson must respond within 14 days of receiving the appeal. The decision may be:?
 - o (a) that the appeal be dismissed;?
 - o (b) if there is demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the chairperson will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or?
 - o (c) that another appropriate remedy be administered. ?
3. If no satisfactory resolution is reached in step (2) then the student or the instructor may appeal, in writing, to the Dean of the College within 14 days after formal receipt of the chairperson's final decision.?
4. The Dean, after discussion with the appropriate parties, may resolve the grievance by agreement or render a decision within 21 days of receipt of the written appeal. The decision may be:?
 - o (a) that the appeal be dismissed;?
 - o (b) if the student provides demonstrable evidence of an erroneous, arbitrary, capricious, or prejudiced academic evaluation, then the Dean will recommend appropriate remedies that a grade be changed or the student be allowed an opportunity to retake an examination or other exercise; or?
 - o (c) that another appropriate remedy be administered.?
5. The decision of the Dean is final and not subject to additional appeal by either student or instructor. The appeals process ends at this step?
6. Department chairs are responsible for keeping a record of the appeal on file in the department until the student is no longer a student.

Athletic Academic Policy

UMass Lowell Policy on Scheduling of Games and Practices?

Preamble

The University of Massachusetts Lowell, first and foremost, is dedicated to the promotion of learning and scholarship, and to meeting the public need for educated citizens. The University achieves that goal by completing its three-fold mission of teaching, research, and public service. UML also values the role played by athletics in the life of the community. Student-athletes are representatives of the University in intercollegiate competition, and their athletic and academic excellence brings credit to UML. The University recognizes that student-athletes must balance the demands of their sport with the academic obligations they assume when they enter an institution of higher learning. The following policy is designed to acknowledge that challenge, and to assist the student athletes, as well as faculty members, coaches, and administrators, in managing conflicts that could arise between the legitimate demands of both academics and athletics.

Policy on Games During Academic Semester

1. UML student-athletes have the responsibility of notifying each of their instructors before the end of the period for adding classes about any possible conflict between scheduled class meetings, exams, or assignment due dates, and scheduled athletic contests, especially those involving travel off campus. Such notification shall be in writing or by electronic mail, and shall include specific information about the dates the student will not be in class, nor available for an exam. Student-athletes are responsible for completing all reading, and acquiring all lecture notes and other material introduced in the class during their absence.
2. UML faculty are requested to be flexible and offer reasonable accommodations for student-athletes whose schedule of intercollegiate athletic contests requires them to be absent from class, or miss scheduled quizzes, exams, or assignment due dates. The specific accommodation offered shall be determined by the faculty member, but might include make-up quizzes, alternate due dates, or rescheduling of exams. The faculty member retains the right to make the final determination about course scheduling, academic requirements, and assignment due dates. However, given that student-athletes represent the University when participating in competition away from campus, absence by a student-athlete resulting from his/her travel to, or participation in a regularly-scheduled intercollegiate athletic contest, about which the faculty member has been properly notified, shall not incur an academic penalty (i.e., lower grade), even when a portion of the grade in a course is based on attendance. This policy shall not apply to laboratory sections or clinical sections.
3. Except for absences resulting from travel to, or participation in regularly-scheduled intercollegiate athletic contests about which the instructor has been properly notified, UML student-athletes shall have the responsibility of attending class, sitting for exams, and meeting assignment due dates on the same schedule as other students enrolled in the same course, and may be penalized for absences other than those resulting from such travel or participation.

Passed by the UMass Lowell Faculty Senate 4/6/2014.

Pre-Law Advising and Programs

Law schools do not require any particular undergraduate degree or program when admitting students. The American Bar Association, in fact, recommends that students prepare for law school by taking a variety of courses in the social sciences and humanities, and even the sciences and mathematics. Students, of course, can take courses in law-related subjects as part of their overall general education, but law schools do not give it any additional weight. Law schools do, however, give weight to students who challenge themselves with difficult curriculum choices. Students interested in law school following graduation from the University should consult with one of the University pre-law advisors. Dr. Francis Talty, Assistant Dean in the College of Fine arts, Humanities and Social Sciences, serves as principal Pre-law Advisor for the University of Massachusetts Lowell (francis_talty@uml.edu). Legal Studies lecturer Walter Toomey, also serves as a pre-law advisor (walter_toomey@uml.edu). A student run Pre-law Society provides a extracurricular activity for students interested in the law. The Pre-law Society conducts information sessions, forums on various aspects of the law and legal occupations as well as sponsoring the UMass Lowell Mock Trial Team which competes in the American Mock Trial Association tournament each winter and a number of other invitational tournaments.

Medical/Dental School Requirements

The Council and Association of American Medical Colleges have established minimum requirements for admission to an approved medical school. These include general and organic chemistry, biology, physics, and mathematics. These are minimums and many medical colleges require course work beyond the minimum. For this reason, it is imperative that a pre-medical student plan his or her college program in close consultation with the faculty advisor for pre-medical students. The advisor for pre-medical students is located in the Department of Biological Sciences, Olsen Hall 604.

Most medical and dental schools prefer a broad, liberal education in addition to specific course requirements. They do not advocate a particular major or majors and the field of concentration is not a determining factor in admission as long as the specified course requirements are met. Many pre-medical students will major in biology or chemistry, but a major in the areas of humanities and social sciences allows sufficient electives to meet the requirements of most schools. Medical and dental schools require an aptitude examination, which is ordinarily taken in the spring semester of the junior year.

Teaching Careers

The Department of Music offers an undergraduate concentration in music studies for teacher preparation and the degree of Master of

a complete discussion of declaration of major, declaration of second major, and change of major with intercollegiate transfer.

Transfer Policies

Students transferring to the College of Fine Arts, Humanities & Social Sciences from other colleges of the University or from other institutions may expect recognition of previously completed college level courses that are applicable to the degree requirements of the college. Courses of a professional nature that are not relevant to the academic orientation of the student's major program may not be credited to the minimum degree requirement of 120 credits, and, regardless of any previous recognition by the Office of Admissions or by other colleges of the University, they may not be credited to degree requirements in the College of Fine Arts, Humanities & Social Sciences. Students wishing to transfer to Bachelor of Music programs are required to demonstrate their vocal or instrumental ability during an audition before the music faculty and are required to complete placement testing in music theory.

Language Requirement After 2015

For incoming students fall 2015.

Starting in the fall 2015, incoming students in the College of FAHSS who declare a major with a language requirement may choose between two tracks to fulfill it.

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Important: Students enrolled at UMass Lowell prior to fall 2015 are required to follow the requirements of their catalog year (see above) when they entered the university.

World Languages Track (12 credits- 4 courses)

Completing twelve (12) credits (4 courses) of the same foreign language, with the exiting minimum competency of an intermediate-mid level according to ACTFL. All of the language courses will typically be taken in the Department of World Languages and Cultures or through an accredited study abroad program that is recognized by our university.

This track is required for students minoring or majoring in a language.

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For information about the department's placement test, please email MLP_Exam@uml.edu.

World Ready Track (15 credits- 5 courses)?

Completing fifteen (15) credits: six (6) credits (2 courses) of the same foreign language taught in the Department of World Languages and Cultures at UMass Lowell, starting at a level above current language proficiency level AND nine (9) cultural credits (3 courses) in English offered by other departments in the College of FAHSS, focusing for instance on culture, civilization, philosophy, literature, history, politics, and/or social context of the region(s) of the world where the chosen language being studied is spoken. These (9) credits can be enrolled in a number of departments across the college as long as the relevant course has been approved by the *World Ready Steering committee* as fulfilling the World Ready requirement. Limit of? 1 course in the student's major.

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Students may also complete these nine credits through an accredited study abroad program that is recognized by our university. For more information on study abroad, please visit the and contact them at: studyabroad@uml.edu or . ??

Declaring a Language Requirement Track

Students who are admitted beginning of fall 2015 must declare a language requirement track as soon as possible by completing an electronic form located at this link:

- [Language Requirement FAHSS Form](#)

Courses from Other Institutions

The Office of Admissions initially evaluates courses that are transferred from other institutions when a student is admitted to the University. Courses are evaluated by major departments in terms of college and program requirements. Courses that are transferred to the University under provisions of the Commonwealth Transfer Compact and that are not creditable to requirements of the College of Fine Arts, Humanities & Social Sciences or as unrestricted elective courses will be listed on the student's permanent record but will not apply to the minimum degree requirements. In the event that a student who has transferred to the University subsequently makes an intercollegiate transfer to the College of Fine Arts, Humanities & Social Sciences, all previously completed courses, including transferred courses from other institutions, will be reevaluated in terms of their applicability to degree requirements of the College of Fine Arts, Humanities & Social Sciences.

Repetition of Transfer Courses

A student who has been granted transfer credit, and on this basis has been assigned to advanced courses for which the transferred course is a prerequisite, may be advised to repeat such transferred work at the University or to take a more elementary course than that which has been transferred when the competence of the student has been demonstrably inadequate. Permission to repeat the transferred course is granted by filing an academic petition form through the office of the college dean. Since credit may not be granted more than once for the completion of any course, a condition for filing such a petition is the simultaneous filing of a request to revoke recognition of the previously transferred course.

Intercollegiate Transfer to the College of Fine Arts, Humanities & Social Sciences

Students wishing to transfer from another college of the University or from baccalaureate continuing education programs of the evening school must file an academic petition, together with a transcript, with the appropriate chairperson and the Dean of Fine Arts, Humanities and Social Sciences by November 1 for spring semester transfer and by April 1 for fall semester transfer. Students are referred to University policies concerning intercollegiate transfers, which appear elsewhere in this publication under the heading for further procedural details. Records of students who are approved for transfer are reviewed by the Office of the Deans of the College of Fine Arts, Humanities & Social Sciences and, irrespective of grades previously received in other college programs, all courses that may not be applied to college or program requirements are deleted from the student's cumulative grade-point average.

Pre-Professional Training

The curricula for the Bachelor of Arts and the Bachelor of Science degrees do not prescribe patterns of courses for specific vocational goals. The students in these programs receive a broad general education in the liberal arts and sciences that will prepare them for further study in professional fields at the graduate level. Students planning to enter professional fields should seek the advice of faculty advisors in the area in which they are interested, as listed below.

Academic Advising

Students in the College of Health Sciences are assigned an academic advisor from their major upon admission. Students may verify their advisor's name on their student SiS account. Advisors are available during scheduled office hours each week to meet with students to provide advice and counsel about course selection, academic progress, student concerns and availability of University resources for students. Students are responsible for making an appointment with their advisors during registration periods in fall and spring semesters. Students who fail to avail themselves of this opportunity and who register for incorrect courses, or who withdraw from courses in the schedule that they have developed with their advisor, may find it necessary to extend their period of study and may be ineligible to continue in their major. All seniors are required to consult with their advisors prior to the university established deadline for filing DIG Forms (Declaration of Intent to Graduate) with the Office of the Dean. DIG Forms summarize senior-level status with respect to requirements of the curriculum, grade point averages and documents that all stated requirements for graduation are satisfied.

Academic Requirements

Candidates for the baccalaureate degree in the College of Health Sciences must satisfy the general university requirements for graduation, complete all courses and credits as required by the specific program of study, and meet the academic requirements of the school as specified.

Grading policies for undergraduate catalog, effective September 1, 2005

All students must maintain ongoing cumulative grade point averages, semester grade point averages, science grade point averages and professional course grade point averages as identified on specific department websites.

Appeals Procedure for Reinstatement

Students who have been dismissed from their major for academic or non-academic reasons will receive a notification letter from their department. Students who are eligible to appeal for reinstatement, must submit a written appeal to the appropriate Departmental Professional Review Committee for re-evaluation of their status. This appeal must be received no later than the date specified in the letter and should explain those factors which led to unsatisfactory academic performance and identify the student's plan to address these factors in order to attain academic success.

The Department Professional Review Committee will review the student's appeal and vote to grant the appeal with probation, grant the appeal without probation or deny the appeal. If a student is placed on probation, specific terms of probation will be explained in a letter to the student. If the appeal is denied, the student must transfer to another major.

Declaration of Program and Change of Program

Students entering the College of Health Sciences are required to declare a major at the time of admission. Transfers into any major in the College of Health Sciences are granted on a space available basis only to students who have met departmental requirements. Specific cumulative G.P.A., science G.P.A. and other requirements are posted on .

Organization and Governance

The College of Health Sciences is organized into five departments and is administered by a dean who is assisted by an executive committee. Each department is responsible for developing programs of study and course offerings. Although the faculty of the College has overall responsibility for all academic policies of the School, the academic standards committee is responsible for enforcing the academic standards of the School and also serves as a review body for suspended students seeking readmission with probationary status. In addition, each department has its own professional review committee that evaluates appeals from students who have not met the criteria for retention in their specific programs. Such appeals to professional review committees may be submitted only once, and all

decisions of the faculty are final.

Leadership Committee

Shortie McKinney, Dean
Susan Houde, Associate Dean
Pauline Ladebauche, Assistant Dean
Eugene Rogers, Chairperson, Clinical Laboratory and Nutritional Sciences
Nicole Champagne, Chairperson, Community Health & Sustainability
Karen Devereaux Melillo, Interim Dean, Nursing
Lisa Abdallah, Chairperson, Nursing
Deirdra Murphy, Chairperson, Physical Therapy
Bryan Buchholz, Chairperson, Work Environment

Requirements for Continued Matriculation

Student Responsibility

It is the responsibility of each student to be aware of and comply with current policies and procedures. Students who need reasonable academic accommodations based on documented disabilities are encouraged to consult with the Office of Disability Services.

Academic Requirements

To qualify for continued matriculation in programs of the College of Health Sciences students must meet the academic requirements of the university and of the college and program in which the student is enrolled. Academic requirements for cumulative GPA, semester GPA, science GPA and GPA for professional courses are listed on each department's website. Students are advised to review the Appeals Procedure for Reinstatement in the College of Health Sciences.

Professional Skills/Technical Standards

All students in the College of Health Sciences must demonstrate a level of professionalism and a state of emotional and physical health which will enable them to provide safe, competent practice in their chosen professional field. All students are expected to demonstrate essential skills necessary to work accurately and safely with peers, faculty, staff, other members of the health care team and patients/clients in a variety of settings. Students must demonstrate professional behavior in all theory, practicum and pre-practicum courses. Specific Professional Competencies, Technical Standards &/or Essential Functions are listed on each department's website. Failure to meet these Competencies and Technical Standards including professional skills in observation and examination, communication, motor function, critical thinking and behavioral/social function will result in course failure and may jeopardize continued matriculation in the student's major.

Retention and Continuance in School Programs

Irrespective of the classification policies of the university, students shall not be admitted to professional courses of the College of Health Sciences unless they have satisfactorily completed all courses which are specified in their programs of study for the first two semesters and have achieved a cumulative grade-point average of 2.50 or better (Nursing 2.70 or better) for all such courses. Students enrolled in exercise physiology, medical technology, and nursing also are required to achieve at this time a cumulative grade-point average of 2.50 or better (Nursing 2.70 or better) in their required science courses.

To qualify for continued matriculation in programs of the College of Health Sciences, all students must maintain on-going cumulative averages of 2.50 (2.70 for Nursing) or better by achieving the following averages the end of the freshman year and at the end of each semester thereafter:

- a semester average of 2.50 (2.70 for Nursing) or better
- not less than a grade C in any professional major course and
- a semester average of 2.50 (2.70 for Nursing) or better for professional courses attempted in the major.

Students enrolled in exercise physiology, medical technology, and nursing must maintain a cumulative grade point average of 2.50 (2.70 for Nursing) or better in their required science courses. Students who fail to satisfy these academic requirements will be dismissed from their respective programs. Such students may seek reinstatement to programs by filing a petition with the professional review committee of their respective departments. Students who are granted a one-time probationary period must maintain all College criteria for remainder of time in their major. Failure to do so will result in dismissal from the program. Students whose petitions for reinstatement are denied may seek transfer to another major within the University if they qualify under university policies as students with satisfactory academic standing. Students who do not qualify for such standing may be dismissed from the university at the time they are dismissed from the College of Health Sciences and are ineligible for readmission as probationary students in the College.

All students in the College of Health Sciences must demonstrate a level of professionalism and a state of emotional and physical health which will enable them to provide safe competent practice in their chosen professional field. In special cases, at the request of the professional review committee of the student's major department, an individual may be required to present statements of physical and/or mental health from appropriate physicians or psychiatrists who are fully licensed by the Commonwealth of Massachusetts. On the basis of a review of such statements, the professional review committee may recommend to the chairperson of the student's major department that the individual be denied admission to or continuance in the major program. Students must demonstrate professional behavior in all practicum/pre-practicum courses. Students must successfully meet the course objectives of the practicum/pre-practicum courses.

Failure to meet course objectives or standards of practice in clinical or practicum/pre-practicum courses, will result in course failure regardless of academic grades in non-practicum courses.

Special Requirements

Professionalism

Students are expected to adhere to the policies and procedures of the university and the College of Health Sciences. Failure to stay informed of the policies and procedures is not an acceptable excuse for non-compliance. All students are expected to adhere to the Professional Competencies, Technical Skills and Essential Functions in both clinical and classroom settings. Students are advised to review these competencies, skills and functions on their departmental websites.

Students in the College of Health Sciences are expected to act with honesty, integrity, and respect for the privacy rights of others. Students are advised to review the College of Health Sciences Social Media Policy. Failure to adhere to this policy may result in probation, suspension or dismissal from the College of Health Sciences.

College of Health Sciences students are required to be aware of their rights and responsibilities under the Massachusetts Right to Know Law regarding chemical hazards in the workplace.

Liability Insurance

The university maintains a Comprehensive General Liability Policy that provides coverage for professional liability of non-licensed students, while they are serving in a supervised internship program in satisfaction of course requirements, or while acting at the direction of, or performing services for, or on behalf of the university. Nursing, Exercise Physiology, Physical Therapy, Nutrition, Clinical Laboratory Science, Medical Laboratory Science and Community Health Education non-licensed students who perform services as part of their education program are covered under this policy. Registered Nurse students must provide their own professional liability insurance.

Health and CPR

Health requirements mandated by the university for all students are listed in the Undergraduate Admissions section of this catalog. Additional specific requirements for students in the College of Health Sciences are listed on departmental websites. Documentation of health requirements is required by individual departments and by Student Health Services. These requirements are mandated by State Law and contractual agreements with our clinical sites and other affiliations. Students are advised to review health requirements posted on UMass Lowell Health Services website. Failure to comply with health and CPR requirements may jeopardize continued matriculation and enrollment in clinical courses.

Uniforms/Attire

Students are expected to present a professional appearance in all clinical activities. Students are advised to review Uniform Policy and Dress Codes on departmental websites.

Clinical Placements and Transportation

Final decisions regarding clinical placements are the responsibility of the faculty of each respective department. All students must provide their own transportation to clinical placements. Car pools are often arranged among students.

Criminal Background Check

By law, certain agencies have the right to require a criminal record check on any student affiliating at their institutions. College of Health Sciences students are advised that any student whose course-work, placement, community service, voluntary activity or service learning related to the university that requires direct and unmonitored access to children, elderly, patients, disabled people or other at risk populations may be required to undergo a national CORI (Criminal Offender Record Information) and/or SORI (Sex Offender Record Information). Depending on the individual agency's policy, students may be expected to pay for the cost of the CORI or SORI check. Students who refuse to consent to a CORI and/or SORI will be deemed ineligible for placement and continued matriculation in their program may be jeopardized. Personnel who are authorized to request, access and review CORI and/or SORI reports are identified in the UMass. Lowell CORI Policy for Students available on the UML Human Resource web site. Failure to pass a CORI and/or SORI check may also jeopardize a student's continued matriculation, clinical placements, and state licensure. The process and standard of review for determining a student's eligibility for engagement in covered activity based on the CORI and/or SORI report, including whether any criminal offenses may disqualify an individual, is also available on the UML Human Resource website.

If a College of Health Sciences student is cleared for a clinical practicum experience but SHE subsequently discovers a violation on the student's CORI (from any state) or a violation of any criminal background check required by an agency, the student will immediately be removed from their clinical practicum experience pending further investigation, which may include a delay in a return to the practicum experience or possible academic probation or academic dismissal from the program or from the College of Health Sciences.

College of Health Sciences students who receive a new violation on their record while in a clinical practicum experience but do not notify the Assistant Dean of the College of Health Sciences within 5 business days of the violation may be subject to additional disciplinary actions. These may include, but are not limited to, academic probation or academic dismissal from the program or from the College of Health Sciences.

The purpose of the CORI check is to ensure public safety and to avoid unacceptable risk to vulnerable populations. As most agencies sponsoring a clinical/practicum experience require CORI, SORI or other background checks prior to offering a practicum experience to

students, the College of Health Sciences cannot guarantee a practicum experience to a student if a sponsoring agency refuses to accept the results of any CORI/SORI or other criminal background check required by the sponsoring agency. Students found to have criminal convictions or pending actions which represent unacceptable risk to vulnerable populations will be presumed ineligible for practicum experiences.

Clinical Affiliate Random Drug Screening

Students enrolled in College of Health Sciences programs may also be required to undergo and pass a drug screening analysis in order to be eligible for placement in an off campus learning experience. Per the university's contractual obligations with certain external agencies, students assigned to clinical educational experiences at some facilities may be required to undergo and pass random drug screening analysis in order to remain at that clinical facility. Test results obtained during testing will be held in confidence and treated as medical information. If a student tests positive and further action is required, only those personnel with a need to know will be provided access to test results. Depending on the individual agency's policy, students may be expected to pay for the cost of drug screening. Students who do not have a negative drug screen or refuse to consent to a drug screen analysis will be deemed ineligible for clinical placement which may affect their ability to progress in the program.

Social Media Policy

The College of Health Sciences recognizes that all involved in health care have a moral, ethical and legal responsibility to maintain individual's rights to privacy. HIPPA protects patient privacy by law and includes individually identifiable patient information in oral or recorded form where the information could identify an individual by name, medical condition, demographic data or other means. Students in the College of Health Sciences are expected to act with honesty, integrity and respect the privacy rights of others. All students in the College of Health Sciences are expected to meet their professional responsibilities when using social media and other electronic networks including but not limited to blogs, instant messaging, social networking sites, email, public media sites and photographs. This policy prohibits posting written material or photographs that identify patients, health care agencies, educational institutions or other students in clinical sites or patient related activities. This policy applies whether using university devices and computers or personal equipment. In addition, all College of Health Sciences students are required to abide by clinical policies related to the use of social media and technological resources. Failure to adhere to this policy may result in probation, suspension or dismissal from the College of Health Sciences and/or legal prosecution under the requirements of HIPPA.

Transfer Policies

Qualified students may transfer from other colleges in the university into specified degree programs in the College of Health Sciences, on a space available basis, provided they meet the departmental requirements. Students who wish to transfer to one of the majors in the College of Health Sciences are advised that admission to these majors is competitive and transfer students must meet department specific cumulative grade point averages and science grade point averages. Students are advised to review transfer admission requirements on each department's website.

- [Transfer from Other Institutions](#)
- [Transfer Policies for Certified Laboratory Technicians](#)
- [Repetition of Transfer Courses](#)
- [Intercollegiate Transfer to the College of Health Sciences](#)

Transfer from Other Institutions

Courses transferred from other institutions are initially evaluated by the Office of Admissions in terms of general university requirements. When students are admitted to the university, they are also evaluated by the professional department in terms of school and program requirements. Courses transferred to the university which are not equivalent to those of the College of Health Sciences or are determined to be unrestricted elective courses will be listed on students transcripts but may not apply to the minimum degree requirements. All previously completed courses, including transferred courses from the compact institution, will be re-evaluated in terms of their applicability to degree requirements of the College of Health Sciences. Decisions regarding admission to the department are made by the chairperson of the department and is on a space available basis for qualified students. All students must satisfy all general education, prerequisite and co-requisite requirements, plus all courses in the major to be eligible for the Bachelor of Science degree from the College of Health Sciences.

The applicability of grades earned in transferred courses for the determination of the grade-point average of students majors at the university is determined by policies of each of the colleges. The policy of the College of Health Sciences is to count such grades for required science courses for the purpose of determining the students science grade-point average in their professional majors. These course grades will not be counted in overall grade point average. Students who retake required science courses to improve science cumulative average will have the highest grade earned considered when that cumulative average is calculated.

Transfer Policies for Certified Laboratory Technicians

Current practitioners in the field including associate degree graduates with MLT (ASCP) certification may seek entry to the department of Clinical Laboratory & Nutritional Sciences through transfer of credits acceptable to the university. Comparable didactic courses are available for challenge in the clinical practice and upper division courses.

Repetition of Transferred Courses

Students who have been granted transfer credit, and, on this basis, have been assigned to advanced courses for which the transferred course is a prerequisite, may be advised to repeat such transferred work at the university or to take a more elementary course than that

which has been transferred when the competence of the student has been demonstrably inadequate. Permission to repeat a transferred course is granted by filing an academic petition form through the Office of the Dean. Since credit may not be granted more than once for the completion of any course, a condition for filing such a petition is the simultaneous filing of a request to revoke recognition of the previously transferred course.

Intercollegiate Transfer to the College of Health Sciences

Students wishing to transfer from another college of the university, or from baccalaureate continuing education programs of the university, must file a petition, together with a current transcript, with the appropriate chairperson and the Dean of the College of Health Sciences. Students should refer to university policies concerning intercollegiate transfer for further procedural details.

Policies

Please refer to the following policies:

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Change of Program

Students who wish to change their declarations of program within the College of Engineering are required to follow the procedure stipulated under . It should be noted that College of Engineering students who change their programs within the College of Engineering after the first semester of the sophomore year should expect to have to take semester credits beyond the minimum degree requirement, and thus extend the normal four-year period of study.

Students who wish to change from engineering to a major that is offered by another college within the University of Massachusetts Lowell must apply for an intercollegiate transfer. These procedures are described under .

Qualified students from other colleges in the University of Massachusetts Lowell may transfer into degree programs of the College of Engineering using the same procedure. However, these students may expect to extend their period of study beyond the normal four-year period, particularly if they transfer after the first semester of the sophomore year.

Declaration of a Second Major

Candidates for degrees in the College of Engineering may be permitted to elect additional majors offered in other colleges of the University, provided that all curriculum requirements in engineering are satisfied.

Engineering students who wish to take on a second major that is offered by the College of Engineering or by another college must formalize this intent by the start of the junior year. At that time the student is also required to submit for approval his or her intended program of study to the advisor in the department offering the second major. It should be noted that in most cases, the election of an additional major will extend the normal four-year period of undergraduate study. Students who elect to take a second academic major in another college are candidates for one degree in the College of Engineering only. A student who pursues an academic major in the College of Engineering and another college or two majors in the College of Engineering is subject to all degree requirements of the College of Engineering and is subject only to major course requirements specified by the department of the secondary major. For a complete statement of University Policy on double majors, refer to .

Degree Requirements

Each candidate for the undergraduate degree must satisfy the general requirements of the University of Massachusetts Lowell in order to graduate. The student must also meet the specific academic requirements of the College of Engineering as indicated in this section, as well as complete all credits and courses required by the department in which the student majors. The number of credits required for the completion of each College of Engineering program is established by the department offering the program.

Courses taken by freshmen entering any engineering discipline are for the most part similar and include calculus, physics, chemistry, college writing, and engineering design.

Introduction to Engineering I (25.107) introduces first-year students to the engineering design process for solving open-ended problems. Introduction to Engineering II (25.108) is department-specific and continues with computer tools and applications to department-specific problems.

Students who have completed their freshman programs with a grade-point average of 2.50 or better automatically qualify for admission to the sophomore program of their choice. Students who fail to achieve that required average will be admitted to the sophomore year of engineering programs only upon the recommendation of appropriate departmental committees.

Please refer to the university grade-point average policy for satisfying retention and graduation requirements.

Individuals who are not granted continued matriculation in the College of Engineering but who satisfy university retention requirements may file for intercollegiate transfer within the university. Students who are dismissed from the College of Engineering and who are ineligible to file for intercollegiate transfer, or who are denied admission to another college following application for intercollegiate transfer, are dismissed from the university.

Transfer Policies

- [General Policies](#)
- [Transfer from Other Institutions](#)
- [2+2 and 2+3 Transfer Programs](#)
- [Repetition of Transferred Courses](#)
- [Intercollegiate Transfer to the College of Engineering](#)

General Policies

It is the policy of the College of Engineering to accept transfer students from other institutions as well as from other colleges within the University of Massachusetts Lowell. Such students may expect recognition of previously completed courses if these are equivalent to those that are specified by the curricula of the College of Engineering. Transfer students are required to have at least a 2.5 grade-point average in order to be admitted to the College of Engineering.

Transfer from Other Institutions

UMass Lowell participates in the Joint Admissions Program of the Massachusetts Community Colleges and the University of Massachusetts. According to this program, a student from one of these community colleges is guaranteed admission to UMass Lowell provided the student is enrolled in a designated transfer program and earns an associate degree with a 2.5 or higher cumulative grade point average.

Courses that are transferred from other institutions are initially evaluated by the Office of Admissions in terms of general University of Massachusetts Lowell requirements. Professional courses are subsequently evaluated by the departments in which the student has been accepted. Credit is given for completed courses where the grade is C (2.000 on a 4.000 scale) or better.

The University of Massachusetts Lowell also subscribes to the Commonwealth Transfer Compact. Under this compact, the holder of an associate degree from a compact institution receives up to 66 credits for this work toward a Bachelor of Science in engineering or technology. Courses which are transferred to the University of Massachusetts Lowell under the provisions of the Commonwealth Transfer Compact, but which do not meet the credit requirements of the College of Engineering, or which are not acceptable as unrestricted elective courses, will be listed on the student's transcript, but will not apply to the minimum degree requirements.

In the event that a student has first transferred to some other college in the University of Massachusetts Lowell under the Commonwealth Transfer Compact and subsequently makes a transfer to the College of Engineering, all previously completed courses, including transferred courses from other compact institutions, will be re-evaluated in terms of their applicability toward degree requirements of the College of Engineering.

The policies of each of the colleges in the university determine the applicability of grades received in transfer to the grade-point average of the student's major at the University of Massachusetts Lowell. It is the policy of the College of Engineering not to count such grades for the purpose of determining the student's grade-point average in his or her professional area.

2 + 2 and 2 + 3 Transfer Programs

The College of Engineering has been a leader in the development and implementation of 2 + 2 and 2 + 3 Programs in the Commonwealth of Massachusetts. More and more students who are interested in earning a Bachelor of Science degree in one of the engineering disciplines pursue their first two years of the curriculum at selected community and state colleges and complete the degree requirements during two to three final years at the University of Massachusetts Lowell. The program is ideal from the standpoint of the student who is not ready to enter a four-year college, allowing the participant to ease into college life while still remaining close to home and within the environment of a smaller college.

The contractual agreements among participating schools require an on-going review of coursework normally offered in the first two years. Curricula and other requirements are carefully established and examined by faculty at both institutions.

Transfer agreements vary with each institution participating in the 2 + 2 or 2 + 3 programs. Some participating colleges offer programs that prepare students for transfer to mechanical and electrical engineering; programs in other schools lead to entry into chemical, civil or plastics engineering. High school students who are considering this program should consult the office of admissions at the University of Massachusetts Lowell for information about available programs in participating institutions.

Repetition of Transferred Courses

A student who has been granted transfer credit from another institution, and on this basis has been assigned to advanced courses for which the transferred course is a prerequisite, may be subsequently advised to repeat such transferred work at the University of Massachusetts Lowell. Such cases arise when preparation of the student is demonstrably inadequate to allow successful performance.

To repeat a transferred course a student must file an academic petition with the Dean of the College. Since credit may not be granted more than once for the completion of any course, a condition for filing such a petition is the simultaneous filing of a request to revoke recognition statement to dispose of the previously transferred course credit.

Intercollegiate Transfer to the College of Engineering

Students wishing to transfer to the College of Engineering from another college within the University of Massachusetts Lowell, or from a baccalaureate (degree granting) Division of Continuing Education program, must file a form for change of major together with a transcript, with the Dean of the College of Engineering and with the appropriate engineering department head. Petitions for transfer must be filed no later than November 1 in order to transfer in the spring semester, and no later than April 1 in order to transfer in the fall semester.

Any student who wishes to transfer from another college in the University to the College of Engineering must have a minimum grade-point average of 2.500. Irrespective of the grade received, all courses that may not be applied to the College of Engineering program requirements will be deleted from the student's cumulative grade-point average.

For further procedural details about the university's policies concerning intercollegiate transfers, students are referred to .

Policies

Please review the following policies:

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Facilities

Special Facilities

Special facilities of the UMass Lowell College of Sciences include science laboratories, computer laboratories, undergraduate and graduate research facilities, a greenhouse, a nuclear reactor and a linear accelerator.

Departmental Facilities

The faculty offices, including those of department chairpersons, are housed in the following locations:

On UMass Lowell North:

Biological Sciences	Olsen Hall
Chemistry	Olsen Hall
Computer Science	Olsen Hall
Environmental, Earth, and Atmospheric Sciences	Olsen Hall
Mathematics	Olsen Hall
Physics	Olsen Hall

Honor & Professional Societies

Several departments with the College of Sciences host chapters of national honor societies in their disciplines. These honor societies encourage and acknowledge high achievement by students. Departments hosting honor or professional societies include:

- Association for Computing Machinery (Computer Science)
- American Chemical Society
- American Meteorological Society
- Optical Society of America (Physics)
- Pi Mu Epsilon (Mathematics)
- Radiological Health Physics Society
- Sigma Gamma Epsilon (Earth Sciences Honor Society)
- Sigma Xi (Scientific Research)

Mission of the College of Sciences

The mission of the College of Sciences is to foster critical and creative thinking for future solutions to environmental, economic, and human problems while helping students to develop the capacity to respond to a changing world. Faculty members emphasize quality instruction, research, and creative activity as well as service to the community. Through activities, such as applied research and student internships in which students and faculty use their expertise in the community, the College serves the economic and social needs of the Merrimack Valley region and beyond.

Organization and Governance

The College of Sciences contains six departments.

Policies & Requirements

To qualify for University degrees, baccalaureate candidates are required to obtain a 2.00 (C) average in their total course of study; to complete a minimum of 120 semester credits; to fulfill the minimum residency requirement designated for University day courses and for each major; to satisfy the regulations and academic standards of the colleges that exercise jurisdiction over the degrees for which they are matriculating; to complete all curriculum requirements and minimum averages in majors specified by the college in which they are enrolled and department(s) in which they are majoring; and to complete the University general education requirements.

- [Second Majors and Minors](#)
- [Approved Minors](#)
- [Declaring and Changing Major](#)
- [Transfer Policies](#)
- [Courses from Other Institutions](#)
- [Repetition of Transfer Courses](#)
- [Intercollegiate Transfer](#)
- [Pre-Professional Training](#)
- [Law School Requirements](#)
- [Medical/Dental School Requirements](#)
- [Teaching Careers](#)

Second Majors and Minors

Options for second majors and minor studies are permitted as specified below:

1. Students may elect a second major that is offered by the College of Sciences or, upon approval of the Dean, they may elect a second major that is offered by other colleges of the University.
2. Students who elect academic majors in more than one college are candidates for one degree only, and they are considered to be degree candidates in the college of their initial major unless they indicate to the contrary at the time they make a declaration of second major by filing for intercollegiate transfer. Accordingly, a student who pursues academic majors in the College of Sciences and another college is subject to all degree requirements as specified by the college of his or her initial major and is subject only to major course requirements (including any collateral and prerequisite courses for the major) as specified by the department of his or her second major. For a full discussion of University requirements concerning second majors, students should consult the relevant section of this publication, which appears under the heading .
3. In accordance with the requirements of established minor programs, students who matriculate for degrees in the College of Sciences may undertake a minor from those areas cited below that are distinct from the disciplines comprising their majors. The curriculum committee of the College will from time to time review and, when appropriate, approve new minors in addition to those listed below. Students should consult with their advisors concerning additions to the approved listing of minors. Specific options for minor programs will depend on the major field that a student has elected to pursue and the collateral course requirements that have been specified by their major departments. Students are advised that an aggregation of courses that total 18 or more credits does not constitute a minor area and they are referred to University policies, which appear elsewhere in this publication under the heading for further discussion. Students who wish to elect a minor program in colleges other than the College of Sciences should refer to the appropriate section of this publication concerning prerequisites, restrictions, and prescribed sequences of courses.
4. With the approval of their faculty advisors, matriculating students in the College of Sciences may develop programs of elective courses for the purpose of providing greater personal and professional relevance to their major fields. Such programs may be developed from among those disciplines that are listed above as areas in which elective courses may be authorized for matriculating students of the College of Sciences.
5. Matriculating students in the College of Sciences who do not choose to take a second major or a minor must present at least six semester credits in courses that are on or above the ?300? level among those elective courses offered in fulfillment of collateral degree requirements. These courses may not be taken on a pass/fail basis.

Declaring and Changing Major

Students who are matriculating for degrees in the College of Sciences are required to designate degree majors in the college. Students who are admitted to Bachelor of Science programs in the sciences or mathematics are advised to declare their major fields during their freshman year and are required to make such declaration at the end of the sophomore year. Students should consult policies listed elsewhere in this publication under the heading for a complete discussion of declaration of major, declaration of second major, and change of major with intercollegiate transfer.

Transfer Policies

Students transferring to the College of Sciences from other colleges of the University or from other institutions may expect recognition of previously completed college level courses that are applicable to the degree requirements of the college. Courses of a professional nature that are not relevant to the academic orientation of the student's major program may not be credited to the minimum degree

requirement of 120 credits, and, regardless of any previous recognition by the Office of Admissions or by other colleges of the University, they may not be credited to degree requirements in the College of Sciences. Students wishing to transfer to Bachelor of Music programs are required to demonstrate their vocal or instrumental ability during an audition before the music faculty and are required to complete placement testing in music theory.

Courses from Other Institutions

The Office of Admissions initially evaluates courses that are transferred from other institutions when a student is admitted to the University. Courses are evaluated by major departments in terms of college and program requirements. Courses that are transferred to the University under provisions of the Commonwealth Transfer Compact and that are not creditable to requirements of the College of Sciences or as unrestricted elective courses will be listed on the student's permanent record but will not apply to the minimum degree requirements. In the event that a student who has transferred to the University subsequently makes an intercollegiate transfer to the College of Sciences, all previously completed courses, including transferred courses from other institutions, will be reevaluated in terms of their applicability to degree requirements of the College of Sciences.

Repetition of Transfer Courses

A student who has been granted transfer credit, and on this basis has been assigned to advanced courses for which the transferred course is a prerequisite, may be advised to repeat such transferred work at the University or to take a more elementary course than that which has been transferred when the competence of the student has been demonstrably inadequate. Permission to repeat the transferred course is granted by filing an academic petition form through the office of the college dean. Since credit may not be granted more than once for the completion of any course, a condition for filing such a petition is the simultaneous filing of a request to revoke recognition of the previously transferred course.

Intercollegiate Transfer to the College of Arts and Sciences

Students wishing to transfer from another college of the University or from baccalaureate continuing education programs of the evening school must file an academic petition, together with a transcript, with the appropriate chairperson and the Dean of Sciences by November 1 for spring semester transfer and by April 1 for fall semester transfer. Students are referred to University policies concerning intercollegiate transfers, which appear elsewhere in this publication under the heading for further procedural details. Records of students who are approved for transfer are reviewed by the Office of the Dean of the College of Sciences and, irrespective of grades previously received in other college programs, all courses that may not be applied to college or program requirements are deleted from the student's cumulative grade-point average.

Pre-Professional Training

The curricula for the Bachelor of Science degrees do not prescribe patterns of courses for specific vocational goals. The students in these programs receive a broad general education in the sciences that will prepare them for further study in professional fields at the graduate level. Students planning to enter professional fields should seek the advice of faculty advisors in the area in which they are interested, as listed below.

Law School Requirements

Pre-law work should include social sciences (especially history, economics, and political science), humanities (especially literature and philosophy), and basic courses in physical sciences and mathematics. Law schools do not specify particular majors for applicants and the field of concentration is not a determinant in admissions. Law schools do, however, vary in specific requirements and the student should, therefore, become familiar with those requirements of the schools to which he or she is planning to apply. The pre-law advisors are Dr. Francis Talty, Director of Academic Programs and Advisor to the Pre-law Society, and Professor William Burke, Legal Studies Coordinator, Falmouth Hall, 302.

Medical/Dental School Requirements

The Council and Association of American Medical Colleges have established minimum requirements for admission to an approved medical school. These include general and organic chemistry, biology, physics, and mathematics. These are minimums and many medical colleges require course work beyond the minimum. For this reason, it is imperative that a pre-medical student plan his or her college program in close consultation with the faculty advisor for pre-medical students. The advisor for pre-medical students is located in the Department of Biological Sciences, Olsen Hall 604.

Most medical and dental schools prefer a broad, liberal education in addition to specific course requirements. They do not advocate a particular major or majors and the field of concentration is not a determining factor in admission as long as the specified course requirements are met. Many pre-medical students will major in biology or chemistry, but a major in the areas of humanities and social sciences allows sufficient electives to meet the requirements of most schools. Medical and dental schools require an aptitude examination, which is ordinarily taken in the spring semester of the junior year.

Teaching Careers

The Department of Music offers an undergraduate concentration in music studies for teacher preparation and the degree of Master of Music in Teaching, leading to initial licensure for teaching music in the Massachusetts public schools. More information about this program is available from Dr. Gena Greher or Dr. Alex Ruthmann in the Department of Music.

For those students interested in teaching subjects other than music, the Graduate School of Education offers graduate degree programs designed to prepare elementary and secondary school teachers. These programs provide the course work and the apprentice teaching experience required for initial licensure in Massachusetts and in many other states. See the Graduate Catalog, the web site, or the Office of the Dean, Graduate School of Education, for programs and the requirements for admission.

Policies

Information about the College of Sciences:

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Declaration of Program

Students enrolled in the Manning School of Business are required to specify their degree program upon enrollment. Students pursuing the Bachelor of Science in Business Administration degree follow a core program for the first two years and after completing specific filter courses must apply to be admitted to the upper division and to declare a concentration. During the first semester of their senior year, students are required to file a Declaration of Intention to Graduate (DIG) form with their advisor or the department's designated DIG officer.

Financial Aid Policies

The Financial Aid Office provides students and parents with financial planning resources and administers financial aid funds to qualified students to reach their educational goals. Financial aid award packages may consist of a combination of grants, scholarships, tuition waiver, work study and loans from federal, state and institutional sources. Financial aid award packages are made on a yearly basis and are dependent upon federal state and institutional funding.

The information provided covers all matters relating to University expenses (including state, federal, and University policies governing fees, residency and non-residency tuition rates, payment schedules, tuition waivers, the New England Regional Program, and financial requirements for international students) and to financial aid programs (including V.A. benefits and scholarship, loan and work-study programs).

For further information, visit the website.

Academic Progress

In accordance with Title IV, Financial Aid regulation 34 CFR 668.16(e), the University of Massachusetts Lowell monitors the academic progress of all Title IV financial aid applicants. This policy also extends to university and state financial aid awards. Satisfactory academic progress (SAP) is reviewed on a yearly basis at the end of the spring semester grading period. All financial aid applicants will be reviewed using a quantitative measure (percentage of coursework completed) and a qualitative measure (cumulative grade point average), in accordance with federal regulations. Students must maintain a minimum cumulative grade point average of 2.0, and earn the necessary credits hours to reach graduation within six years (150% of published length of undergraduate program).

A student failing to meet the established guidelines will at minimum receive a probationary notice. If a student does not meet the academic standards defined by the financial aid office, the student may become ineligible to receive federal, state and institutional funding. A student has a right to appeal that decision. To appeal, a student must send a written letter to the Financial Aid Office stating the reason for the appeal. To regain financial aid eligibility, a student must achieve acceptable status or have the appeal granted in writing by a financial aid counselor. Please contact the financial aid office for more information.

Applying for Financial Aid

The university requires students to file a Free Application for Federal Student Aid (FAFSA). Students may apply for the FAFSA online at www.FAFSA.ed.gov. It is recommended that students and parents save time by requesting personal identification numbers called Federal Student Aid PINs before the student applies for aid. The PIN can be used to electronically sign the FAFSA, electronically sign certain loan contracts, and access online information about federal student aid the student has received. The PIN must be requested online at www.pin.ed.gov.

The FAFSA should be completed as early as possible beginning January 1st for each upcoming aid year. Students are strongly encouraged to file the FAFSA by the university's priority deadline of March 1st. Incoming students accepted to the University who complete their FAFSA by the March 1st priority deadline will receive notification of their awards by the end of March. Returning students registered for the upcoming semester who complete their FAFSA by the March 1st priority deadline will receive notification of their awards in early June. Students applying after March 1st receive aid as funds become available.

Copies of students and parents federal income tax, W2 forms and other forms may be requested by the Financial Aid Office to verify information provided on the FAFSA. Many forms requested are available on the website. All information requested by the Financial Aid Office is required to complete the application process and is held in strictest confidence.

Determining Financial Need

Demonstrated financial need is the difference between the cost of attendance and the expected family contribution. The cost of

attendance (COA) includes direct expenses such as tuition and fees, and also includes indirect such as room, board, books and transportation. The expected family contribution (EFC) is determined by the federal needs analysis formula and is calculated by completing a Free Application for Federal Student Aid (FAFSA).

Eligibility Requirements

To receive financial aid from the various student aid programs, a student must:?

- Have demonstrated financial need to qualify for need-based aid programs.? Need is defined as the cost of attendance minus the expected family contribution derived from filing the FAFSA.? Students may also be eligible for non-need based aid programs, such as the Federal Direct Unsubsidized Loan program and meritorious awards.
- Be a U.S. citizen or eligible non-citizen.
- Have a valid Social Security Number.
- Make satisfactory academic progress.
- Have a high school diploma or a General Education Development (GED) certificate, pass a test approved by the U.S. Department of Education, meet other standards the state of Massachusetts establishes that are approved by the U.S. Department of Education, or complete a high school education in a home school setting that is treated as a home school or private school under state law.
- Be a matriculated student enrolled in a degree granting or approved certificate program.? Students enrolled in non-degree programs are not eligible for financial aid.?
- Be enrolled at least half-time (6 credits) each semester.? Undergraduate students enrolled less than half time may qualify for Federal Pell grant in limited cases.
- Cannot be in default or in overpayment on a federal student loan.
- Register with the Selective Service, if required (www.sss.gov).

Need-Based Aid Programs

Federal Pell Grant: Federal grant awarded to students pursuing their first undergraduate degrees with exceptional need.? For 2008-2009, awards range from \$523 to \$4731, depending on eligibility.? The Federal Pell Grant is gift aid and does not need to be repaid.

Federal Supplemental Educational Opportunity Grant (FSEOG): Federal grant awarded by the University to students pursuing their first undergraduate degrees with exceptional need.? Awards range from \$200 to \$2000, depending on available funds and number of eligible applicants. The Federal SEOG award is gift aid and does not need to be repaid.

Academic Competitiveness Grant (ACG): Federal grant that provides up to \$750 for the first year of undergraduate study and up to \$1,300 for the second year of undergraduate study to full-time students who are U.S citizens, eligible for a Federal Pell Grant, and who had successfully completed a rigorous high school program, as determined by the state or local education agency and recognized by the Secretary of Education. Second year students must also have maintained a cumulative grade point average (GPA) of at least 3.0. The program is available for first year students who graduated from high school after January 1, 2006 and for second year students who graduated from high school after January 1, 2005.? The ACG award is gift aid and does not need to be repaid.

National Science and Mathematics Access to Retain Talent (SMART) Grant: Federal grant that provides up to \$4,000 for each of the third and fourth years of undergraduate study. In order to be eligible for this Grant a student must be a full-time U.S. citizen, eligible for a Federal Pell Grant, and majoring in Computer Science, Engineering, Critical Foreign Languages, Life Sciences, Mathematics, Physical Sciences, Technology, or Multidisciplinary Studies. A complete list of eligible majors can be found online at <http://ifap.ed.gov/dpccletters/attachments/GEN0706MajorChangeLetter.pdf>

MASSGrant Program: State funded grant program administered by the Commonwealth of Massachusetts.? Awards are based on demonstrated financial need. Awards are available to students pursuing their first undergraduate degree, enrolled full-time, and filed a FAFSA the state deadline of May 1st.? Non-residents should contact their state scholarship office to determine eligibility requirements and if an award is transferable to University of Massachusetts Lowell.

MASS Part-Time Grant: State funded grant program administered by the Commonwealth of Massachusetts.? Awards are based on demonstrated financial need, depending upon funding and number of eligible applicants. Awards are available to students pursuing their first undergraduate degree, enrolled less than full-time but at least half time (6-11 credits).

Board of Higher Education Tuition Waiver (BHE Waiver): State funded program administered by the financial aid office.? Eligibility is determined by demonstrated financial need, priority is given to fulltime students. Awards are available to undergraduate students enrolled at least half time (6 credits) and legal residents of Massachusetts as defined by the state of Massachusetts.? The BHE tuition waiver applies to state funded-undergraduate degree courses only.? Continuing education courses are not covered by this program.

Board of Higher Education Grant (BHE Grant): State funded program administered by the financial aid office.? Eligibility is determined by demonstrated financial need, priority is given to full time students. Awards are available to undergraduate students enrolled at least half time (6 credits) and legal residents of Massachusetts as defined by the state of Massachusetts.?

University Awards: The university provides grants and scholarships from various sources to undergraduate students who demonstrate financial need. These scholarships are awarded as merit-based, need-based or a combination of both. Award amounts range from \$200 to \$5000, depending upon funding.?

Federal Work Study (FWS) Program: Federally funded work program administered by the financial aid office.? A need based program that provides students with part-time employment in various on-campus departments and off-campus agencies. Awards range

from \$1,500 to \$5,500.? FWS earnings are paid directly to the students and are to be used for educational related expenses.? Students have the option the complete a student withholding form to have 70% of their bi-weekly earnings go directly toward their University of Massachusetts Lowell bill.? This form may be downloaded from the financial aid website at by clicking on forms. Completed forms must be returned to the financial aid office.?

Campus Work Program (CWP): Institutionally funded work program administered by the financial aid office.? A need based program that provides undergraduate students with part-time employment in various on-campus departments and off-campus agencies. Awards range from \$1,500 to \$5,500.? CWP earnings are paid directly to the students and are to be used for educational related expenses.? Students have the option the complete a student withholding form to have 70% of their bi-weekly earnings go directly toward their University of Massachusetts Lowell bill.? This form may be downloaded from the financial aid website at by clicking on forms. Completed forms must be returned to the financial aid office.?

William D. Ford Federal Direct Subsidized Loan: A need-based federal loan available through the University. Eligibility for a subsidized loan is determined by the completing the FAFSA and students must be enrolled at least half time (6 credits) in a degree granting program.? First year students may borrow up to \$3,500; second year students may borrow up to \$4,500; students who have completed two years of undergraduate study may borrow up to \$5,500 for each year thereafter up to lifetime aggregate loan limit of \$23,000. First time borrowers at University of Massachusetts Lowell are required to complete and sign an On-Line Master Promissory Note and Entrance Counseling before funds are disbursed to the students University account. Repayment starts six months after graduation, withdrawal, or when the student s course load drops below half time (6 credits) status. The federal government pays the annual interest rate on the subsidized loans while the student is enrolled in school and during the six month grace period after graduation or withdrawal from school.? Students are required to complete an Exit Counseling at point of graduation, withdrawal from school, or enrollment status drops below half time (6 credits) status. DL Entrance and Exit Counseling may be done online at <https://www.dlssonline.com>, and DL Master Promissory Notes may be signed electronically at <https://dlenote.ed.gov>. This is a loan that must be repaid.?

*Please also refer to the Non-Need Based Aid Programs - Loans section of this catalog for information on the Federal Direct Unsubsidized Loan.

Federal Perkins Loan: A 5% fixed interest Federal loan administered by the University. Awards range from \$500 to \$4,000, depending upon funding. Repayment starts nine months following graduation, a student s withdrawal from school, or when a student drops to less than half-time (6 credits) enrollment. Repayment may be extended over a ten-year period. Principal and interest are deferred while a student is enrolled at least halftime in a degree program.? Students must sign a Master Promissory Note and Entrance counseling at the Financial Aid Office prior to the loans being applied to students University bill.? An Exit Interview must be complete with the Accounts Receivables Office at point of graduation, withdrawal or enrollment drops below half time (6 credits) enrollment.? This is a loan that must be repaid.

Rights & Responsibilities

- [A student has the right to privacy. All records and information submitted with an application for financial aid are confidential, subject to legal requirements concerning disclosure of such information.](#)
- [A student s award is determined in accordance with the laws, regulations, and appropriations of the U.S. Congress, Commonwealth of Massachusetts and the University of Massachusetts Lowell and is subject to adjustment or cancellation in the event of any changes.](#)
- [A student must notify the university if there are any changes to their address or telephone number.](#)
- [A student receiving financial aid must maintain satisfactory academic progress \(SAP\). SAP is evaluated at the end of each academic year. A student failing to meet the established guidelines will receive a Notice of Ineligibility. A student has a right to appeal that decision. To appeal, a student must send a written letter to the Financial Aid Office stating the reason for the appeal. To regain financial aid eligibility, a student must achieve acceptable status or have the appeal granted in writing by a financial aid counselor.](#)
- [A student must reapply every year for financial aid by using the Renewal FAFSA online at <http://www.FAFSA.ed.gov>](#)
- All new Direct Loan borrowers must complete an Entrance Counseling. On line Entrance Counseling is available by visiting our web site at and clicking on loan servicing. All students, who graduate, withdraw or drop below half-time status must complete an Exit Counseling Interview which is also available on our web site.

Return of Title IV Financial Aid Funds

Withdrawals:

Undergraduate students withdrawing from the University are required to discharge all financial obligations to the University, return all University property, and file a written notification of withdrawal with the Registrar s Office.

Graduate students, withdrawing from the University, must obtain the appropriate signatures on the withdrawal clearance form and submit it to the Graduate School to ensure that academic and financial obligations are cleared before leaving the University.

Policy Guidelines:

The University of Massachusetts Lowell is required by Federal Law to determine the earned and unearned Title IV aid a student has earned as of the date the student ceased attendance based on the amount of time the student spent in attendance. The calculation of Title IV funds earned by the student has no relationship to the student s incurred institutional charges. The amount of aid earned is determined on a pro-rata basis. Once the student has completed more than 60 percent of the payment period or period of enrollment,

they earn all of their assistance. If the amount disbursed to the student is greater than the amount the student earned, unearned funds must be returned. The University and the student share in the return of the funds. The University's share is the lesser amount of the institutional charges multiplied by the unearned percentage of the funds or the entire amount of the excess funds. Any loan funds that the student must return, the student (or the parent for a PLUS Loan) repay in accordance with the terms of the promissory note. If the amount disbursed to the student is less than the amount the student earned and for which the student is otherwise eligible, he or she is eligible to receive a post-withdrawal disbursement of the earned aid that was not received. Post-withdrawal disbursements will be credited first toward unpaid institutional charges. Any portion of the post-withdrawal disbursement that exceeds unpaid institutional charges will be offered to the student who must accept this disbursement within 14 days of the offer. If a response is not received or if the offer is declined, these excess funds will be returned to the appropriate Title IV program.

Admissions Policies

The information within this online catalog describes in detail university requirements and processes concerning the admission of high school graduates, non-traditional students, and transfer students; the admission of international students and candidates for second degrees; the admission of non-matriculating students; and the readmission of previously enrolled University students. It also provides the basic information concerning degree programs, applicant inquiries, application deadlines, Advanced Placement, health certification requirements, and joint admission.

For further information, visit the website.

Accommodations for Students with Disabilities

The university and its programs and activities are accessible to academically qualified students who have physical, learning, or psychiatric disabilities as required under the Americans With Disabilities Act (ADA). Although some architectural barriers still remain, physically disabled persons can traverse the campus with a minimum of difficulty. University libraries, the student unions, several residence halls, and more recently constructed classroom buildings are accessible to students who use wheelchairs or have other mobility impairments. Early registration, preferential scheduling, housing assistance, readers, note-takers, interpreters, alternative testing procedures, reduced course load, and special parking arrangements are some of the accommodations available to students with disabilities. Documentation from an appropriate professional is required for all accommodations. For more information visit the website.

Since admission to the university is based entirely on the academic qualifications of the applicant, admission procedures remain the same for all applicants, regardless of disability.

Applicants for Additional Bachelor's Degree

A student who has earned a bachelor's degree at the University of Massachusetts Lowell or at another accredited bachelor's institution may be admitted to the university to pursue an additional bachelor's degree subject to the following requirements:

1. the major field of the previous degree must be clearly distinct from that of the additional degree (as determined by the department awarding the second degree);
2. the work for the additional degree must consist of not less than two semesters (or the equivalent) of full-time study;
3. the final 30 credits presented for the additional degree must be in addition to and independent of any previously awarded bachelor's; and
4. a minimum of 15 credits must be taken at the University in the major field which is presented for the additional degree.

Candidates for the additional bachelor's degree must earn a minimum of 30 credits and must comply with any special college regulations concerning completion at the university of major field and professional program requirements (including collateral and prerequisite course requirements for the major/professional program). Second-degree candidates may be eligible for major field honors but are not eligible for university honors unless they have completed 60 credits at the university for the additional bachelor's degree.

Application for admission to the university as a candidate for an additional bachelor's degree is made through the Office of Undergraduate Admissions. Prior to admission to the university as candidates for additional bachelor's degrees, applicants must be approved by the college in which they plan to matriculate and the department in which they intend to major. Retention standards for candidates for additional bachelor's degrees are based upon the grade point averages for achieving satisfactory standing which are specified for the several levels of course credits completed. Grade point averages are computed solely on the basis of qualitatively graded courses which have been completed at the university for the additional bachelor's degree. The number of course credits completed include those which have been applied from previous bachelor's programs.

Types of Aid

The university participates in various federal, state, institutional and private financial aid programs. There are three major types of financial aid.?

1. Grants and Waivers - gift aid that does not need to be repaid, unless an overpayment has resulted due to the student withdrawing from school before the end of the enrollment period for which the grant was awarded. The school will notify the student whether any funds may need to be returned.? Students should meet with their financial aid counselor in person if they plan to withdraw from school.?
2. Work Study provides income for part time employment and does not have to be repaid.?
3. Loans money lent to a student that must be repaid with interest. The following is a description of financial aid programs. Please

note that the term undergraduate in following section refers to students who are pursuing their first undergraduate degree.

New England Regional Student Program

Students who meet the eligibility requirements for residents of their state and admission requirements of a university program approved as a regional curriculum will receive preference in admission among out-of-state applicants and will be charged the in-state tuition plus 50% upon admission. It is assumed that students accepted into a program of study offered under the New England Regional Student Program will remain in the same field of study. If a student subsequently transfers into a program which is not included in the regional student program, out-of-state tuition will be applicable as of the date of transfer. The same holds true for the inverse. The date of transfer into a regional student program is the effective date for the reduced tuition rate.

The following is a listing of programs of the University of Massachusetts Lowell which are presently offered under the New England Regional Student Program.

UMass Lowell Programs*	Eligible States
American Studies	RI, VT
Chemical Engineering	VT
Community Health Education	NH, RI, VT
Computer Engineering	CT, VT
Criminology & Justice Studies	RI
Meteorology	ME, NH, RI, VT
Music Business	CT, ME, NH, RI, VT
Nuclear Engineering	CT, ME, NH, RI, VT
Plastics Engineering	CT, ME, NH, RI, VT
Sound Recording Technology	CT, ME, NH, RI, VT
Radiological Health Physics	CT, ME, NH, RI, VT

*This list of approved programs differs from that which has been approved for state colleges.

UMass Lowell also participates in the Proximity Allowance of the New England Regional Program. This program allows New Hampshire residents from selected towns within a 20 mile radius of UMass Lowell to be eligible for a tuition discount for most majors. Please visit [Undergraduate Admissions](#) website? for details.

Payment, Refund and Waiver Policies

Policies concerning university fees are determined by the University of Massachusetts Board of Trustees. Policies concerning room and meal plans are established by the Board of Trustees in conjunction with the UMass Building Authority and food vendor respectively.

Tuition and tuition waiver policies are established either by the General Court, the Massachusetts Board of Higher Education or the Board of Trustees of the University of Massachusetts as applicable.

View UMass Lowell's .

Policies below:

- [Payment of Bills](#)
- [International Student Deposit](#)
- [Bookstore Financial Aid Voucher Program](#)
- [Refund Policy](#)
- [Refund on Room Reservation Deposit](#)
- [Refund on Room Fees](#)

Payment of Bills

Students will be permitted to attend classes and to utilize University facilities only after they have cleared all their financial obligations to the University. Financial obligations in addition to tuition and fees include indebtedness for library fines, parking fines, rental payments, and repayment of emergency loans. All bills are payable on or before the due date indicated on student bills. Checks, money orders and major credit cards (Mastercard and VISA) are accepted. All payment of fees and tuition should be made payable directly to the University of Massachusetts Lowell. A student in debt to the University at the end of any semester or summer session is not permitted to register again at the University until his or her indebtedness has been discharged. Students are advised that the University utilizes the services of collection agencies authorized under the Commonwealth's Master Service Agreement and where deemed warranted may include litigation. Students are held personally liable for associated collection costs in the event that their account is sent to a collection agency. In addition, official student transcripts and diplomas will not be released until all indebtedness has been discharged.

International Student Deposit

For students requiring a Form I-20, Certificate of Eligibility, a \$4,000 prepayment of University tuition and fees must be received and credited to their student account before the form can be issued.

Bookstore Financial Aid Voucher Program

If anticipated financial aid exceeds a student's financial obligation to the University and the student has been otherwise financially cleared, the Accounts Receivable Office can authorize a Bookstore Voucher to be used at the University of Massachusetts Lowell Bookstore for the purchase of text books and school supplies. At the end of the drop/add course enrollment period, bookstore purchases made through this program are charged directly to the student's account and will be repaid using that student's financial aid award(s). Should the actual financial aid award be reduced for any reason, the student becomes personally responsible for charges to the bookstore. If complete payment is not made, as with all charges, University services may be withheld, and the financial obligation will be sent to a collection agency. In such case, the student assumes responsibility for all associated collection costs.

Refund Policy

If a student officially withdraws on or before the tenth day of class, s/he will be entitled to a full refund.

- Student health insurance (because the policy is held with an independent insurance company and remains in effect regardless of enrollment status).
- Residence hall deposits (are forfeited when a student remains enrolled at the University but elects to leave the residence hall during the term).
- Book vouchers (because the bookstore is an independent operator and students generally have the option of returning the materials purchased for a refund).

Note: Refunds will first be returned to applicable student financial assistance programs, consistent with the refund distribution prescribed by law and regulation, before any refund is disbursed to a student.

Please contact the Accounts Receivable Office for further details. Please note that the refund policy is also subject to change without notice.

Refund on Room Reservation Deposit

The \$200 room reservation deposit reserves a space in the residence halls until occupancy and is applied to the spring semester room rental. This deposit is generally non-refundable except in the case of an academic dismissal or graduation from the University (see section below, Refund on Room Fees).

Refund on Room Fees

All cancellations of room contracts must be submitted, in writing, to the Office of Residence Life. In addition to forfeiting their room reservation deposit, students canceling their housing contract for reasons other than academic dismissal or graduation will be responsible for the room fees according to the following guidelines:

Residents required to leave the residence halls and/or the University due to judicial sanctions will not be granted a refund of their room fees.

The Office of Residence Life has a Housing Contract Appeals Board to hear appeals from students who request exemption from the above refund schedule. This Board consists of the Director of Residence Life, a professional Resident Director, a member of the University Life staff and the president of the Residence Hall Association. Students may appeal their exemption from charges due to military obligations, change in personal situation, family finances, financial aid, illness, or other extenuating circumstances as may be deemed appropriate by the Appeals Board. All appeals must be documented in writing for review by the Appeals Board. The finding of this Board can be appealed to the Dean of Students whose decision is final.

Rules Governing Massachusetts Residency for Tuition Purposes

These rules and regulations apply to the classification of UMass Lowell students as Massachusetts or non-Massachusetts resident students for tuition and fee purposes. Residency regulations are based primarily on the Residency Status For Tuition Classification Purposes document from the Massachusetts Board of Higher Education, effective July 1, 2007. The Massachusetts Board of Higher Education, Board of Trustees, and Office of the General Counsel for the University of Massachusetts may revise or interpret this policy at any time. Also, UMass Lowell supplements these regulations with additional requirements or clarifications specific to our institution. The UMass Lowell website is the primary source for information concerning residency regulations. In the event of a revision, the revised policy will supersede the following.

- [1.0 Definitions](#)
- [2.0 Classification](#)
- [3.0 Determination of Residency](#)
- [4.0 Appeals and Reclassification](#)
- [5.0 Penalties](#)
- [6.0 Miscellaneous](#)
- [7.0 Deadlines](#)

1.0 Definitions

1.1 Board of Trustees shall mean, the Board of Trustees of an institution.

1.2 Continuous attendance shall mean, enrollment at an institution for the normal academic year in each calendar year, or the appropriate portion or portions of such academic year as prescribed by the Board of Trustees or under its authority.

1.3 Eligible person shall mean: a U.S. citizen, lawful immigrant, permanent resident, or holder of another legal immigration status, who has satisfied the durational residency requirement, and can demonstrate his/her intent to remain in Massachusetts.

1.4 Emancipated person shall mean, a person who has attained the age of 18 years and is financially independent of his or her parents, or, if under 18 years of age, (a) whose parents have entirely surrendered the right to the care, custody, and earnings of such person and who no longer are under any legal obligation to support or maintain such person; or (b) a person who is legally married; or (c) a person who has no parent. If none of the aforesaid definitions applies, said person shall be deemed an unemancipated person.

1.5 Institution shall mean the public college or university at which any person is or seeks to be enrolled as a student.

1.6 Proof of Emancipation shall be demonstrated through submission of evidence including, but not limited to:

- (a) Birth certificate or any other legal document that shows place and date of birth;
- (b) Legal guardianship papers court appointment and termination must be submitted;
- (c) Statement of the person, his or her parent(s), guardian(s), or others certifying no financial support;
- (d) Certified copies of federal and state income tax returns filed by the person and his or her parent(s);
- (e) Copies of applications for federal financial aid; or
- (f) Where none of the foregoing can be provided, an affidavit of the emancipated person in explanation thereof and stating fully the grounds supporting the claim of emancipation.

1.7 Parent shall mean,

- a) the person's father and mother, jointly;
- b) if the person's father is deceased, the person's mother; if the person's mother is deceased, the person's father;
- c) if a legal guardian has been appointed by a court having jurisdiction, the legal guardian;
- d) if neither the father nor mother is living and no legal guardian has been appointed, the person who then stands in loco parentis to the person;
- e) if the father and mother are divorced, separated or unmarried, the parent who has been awarded legal custody of the person; or, if legal custody has not been awarded, the parent with whom the person lives.

With respect to any adopted student, the word adoptive should be inserted before the words father and mother wherever used.

1.8 Reside, residency, or resident shall mean domicile, i.e., a person's true fixed and permanent home or place of habitation, where he or she intends to remain permanently.

2.0 Classification

2.1 For the purpose of assessing tuition and fees, each student shall be classified as a Massachusetts resident or a Non-Massachusetts resident. At the University and the state colleges, an eligible person shall be classified as a Massachusetts resident if he or she (or the parent of an unemancipated student) shall have resided in the Commonwealth of Massachusetts for purposes other than attending an educational institution (including a private educational institution) for twelve months immediately preceding the student's entry or reentry as a student. At the community colleges, a person shall be classified as a Massachusetts resident if he or she (or the parent of an unemancipated student) shall have resided in the Commonwealth of Massachusetts for purposes other than attending an educational institution (including a private educational institution) for six months immediately preceding the student's entry or reentry as a student.

2.2 Physical presence for this entire twelve-month or six-month period need not be required as long as the conduct of an individual, taken in total, manifests an intention to make Massachusetts his or her permanent dwelling place. However, residency is not acquired by mere physical presence in Massachusetts while the person is enrolled in an institution of higher education.

3.0 Determination of Residency

3.1 Proof of Residency

- a) Each case will be decided on the basis of all facts submitted with qualitative rather than quantitative emphasis. A number of factors are required for residency to determine the intention of the person to maintain permanent residence in Massachusetts. No single indicium is decisive. The burden of proof rests on the student seeking classification as a Massachusetts resident.
- b) The following shall be indicia of residence:

1. For unemancipated persons, the residency of parents, having custody, within Massachusetts;
2. Certified copies of federal and state income tax returns;
3. Permanent employment in a position not normally filled by a student;
4. Reliance on Massachusetts sources for financial support;
5. Possession of a Massachusetts high school diploma;
6. Continuous physical presence in Massachusetts during periods when not an enrolled student;
7. Military home of record; and
8. All other material of whatever kind or source which may have a bearing on determining residency.

3.2 Eligibility

- a) The following individuals shall be eligible for in-state tuition:

1. Any person who is registered at an institution as a Massachusetts resident shall be eligible for continued classification as a

Massachusetts resident for tuition purposes (until attainment of the degree for which he or she is enrolled) during continuous attendance at the institution.

2. The spouse of any person who is classified or is eligible for classification as a Massachusetts resident is likewise eligible for classification as a Massachusetts resident. This provision will not apply in the case of a spouse in the United States on a non-immigrant visa.
3. A person who is a lawful immigrant or permanent resident of the United States (or is eligible to apply and has applied for such status) is eligible to be considered for Massachusetts residency for tuition purposes provided that he/she meets the same requirements for establishing residency in Massachusetts as are required of a United States citizen. Non-citizens who are in (or who are eligible to apply and who have applied for) refugee/asylum status are likewise eligible to be considered for Massachusetts residency for tuition purposes provided that they meet the same requirements for establishing residency in Massachusetts as are required of a United States citizen. All non-citizens must provide appropriate United States Citizenship and Immigration Services documentation to verify their status.
4. Those students whose higher education pursuits are funded by the Department of Institutional Assistance, the Massachusetts Rehabilitation Commission, or any of the other Commonwealth of Massachusetts public assistance programs.
5. A member of the Armed Forces of the United States who is stationed in Massachusetts on active duty pursuant to military orders, his or her spouse and dependent children. A person does not gain or lose in state status solely by reason of his or her presence in any state or country while a member of the Armed Forces of the United States.
6. Full time faculty, professional staff, and classified staff employees of the public higher education system and their spouses and dependent students.

b) A person having his or her residency elsewhere than in Massachusetts shall not be eligible for classification as a Massachusetts resident for tuition purposes, except as herein provided.

4.0 Appeals and Reclassification

4.1 Reclassification: A student may at any time request the institution to reclassify him or her as a Massachusetts resident if the factual basis for his or her classification as a nonresident has changed. To do so, the student shall submit a Residency Reclassification Form to the Residency Reclassification Officer for its review and decision as delineated on the UMass Lowell website.

4.2 Appeals: A student or applicant may appeal the institution's final decision to deny his or her classification (or reclassification) as a non-resident by filing an appeal through the appeal process established by the institution. The decision on appeal is final and may not be appealed further. Appeal letters should be submitted to the Residency Reclassification Appeals Committee as delineated on the UMass Lowell website.

4.3 Tuition Deadlines: All deadlines for the payment of tuitions, fees, and other financial obligations to the institution remain in force during the pendency of any request for Reclassification or any appeal.

4.4 Retroactive Effect: Any change in a student's classification as the result of a request for reclassification or an appeal will be retroactive only to the beginning of the semester during which the institution makes the final decision to reclassify the student.

5.0 Penalties

5.0 Misrepresentation in or omission from any evidence submitted with respect to any fact which, if correctly or completely stated, would be grounds to deny classification as a Massachusetts resident, shall be cause for exclusion or expulsion from or other disciplinary action by the institution.

6.0 Miscellaneous

6.1 Each institution may adopt supplementary rules governing any procedures, deadlines, and related matters appropriate for the implementation of this policy.

6.2 The provisions of this policy shall apply to the classification of a student as the resident of any New England state for purposes of determining his or her eligibility for tuition benefits through the New England Board of Higher Education.

7.0 Deadlines

Written appeals of initial classifications (i.e., residency reclassification requests) must be submitted by the deadlines delineated on the UMass Lowell website. Students are responsible for the payment of tuitions, fees, and other financial obligations to the institution while waiting for a decision on a residency reclassification request.

University Expenses

The following is intended to provide information related to the cost of attending UMass Lowell (including state, federal, and University policies governing fees, residency and non-residency tuition rates, payment schedules, tuition waivers, the New England Regional Program, and financial requirements for international students) and our student financial aid programs.

Veteran's Benefits

The Veterans Administration has approved the University of Massachusetts Lowell for undergraduate study. For details regarding veteran tuition benefits, refer to the .

Non-Need Based Loans

William D. Ford Federal Direct Unsubsidized Loan: A non-need based federal loan available through the University. Eligibility for an unsubsidized loan is determined by the completing the FAFSA and students must be enrolled at least half time (6 credits) in a degree granting program. An unsubsidized loan is not awarded on the basis of need. A student will be charged interest from the time the loan is disbursed until it is paid in full. If a student allows the interest to accumulate, it will be capitalized that is, the interest will be added to the principal amount of the loan and additional interest will be based upon the higher amount.

First time borrowers at University of Massachusetts Lowell are required to complete and sign an On-Line Master Promissory Note and Entrance Counseling before funds are disbursed to the students University account. Repayment of principal starts six months after graduation, withdrawal, or when the student s course load drops below half time (6 credits) status. Students are required to complete an Exit Counseling at point of graduation, withdrawal from school, or enrollment status drops below half time (6 credits) status. DL Entrance and Exit Counseling may be done online at <https://www.dlsonline.com>, and DL Master Promissory Notes may be signed electronically at <https://dlnote.ed.gov>. This is loan that must be repaid.?

Borrowers may receive both the subsidized* and unsubsidized loans for the same loan period, although the combination of both cannot exceed the following loan limits:

Annual Maximum Federal Direct Loan Limits for 2008-2009

	Dependent	Independent
Freshman	\$3,500	\$7,500
Sophomore	\$4,500	\$8,500
Junior	\$5,500	\$10,500
Senior	\$5,500	\$10,500
Graduate	\$20,500	\$20,500

- Aggregate dependent undergraduate loans cannot exceed \$23,000.
- Aggregate independent undergraduate loans cannot exceed \$46,000 (\$23,000 may be in subsidized loans).
- Aggregate graduate loans cannot exceed \$140,500 (only \$65,500 of this amount may be in subsidized loans). The graduate debt limit includes any student loans received for undergraduate study.
- A fee of 2% will be deducted from each disbursement of your loan.

Dependent students whose parent/stepparent has been denied a Federal Direct Parent Plus Loan may apply for an additional Unsubsidized Federal Direct Student Loan of up to \$4,000 for freshmen and sophomores and \$5,000 for juniors and seniors. The interest rate on the Subsidized and Unsubsidized Direct Student Loans is fixed. All prior federal student loans may be consolidated under one Federal Direct Loan when a student enters repayment. Several flexible repayment options are available. For more information regarding loan repayment or consolidation, contact the Direct Loan Servicing Center at 1 (800) 848-0979.

*Please also refer to the Need-Based Aid Programs - Loans section of this catalog for information on the Federal Direct Subsidized Loan.

Federal Direct PLUS Loan: A non-need based federal loan offers up to the cost of attendance minus financial aid per academic year to qualified graduate students and parents/stepparents of undergraduate dependent students. Interest rate is fixed and repayment begins 45-60 days after the second disbursement. Refer to the [Direct Loan](#) website for current interest rates. A FAFSA is not required to apply for the PLUS loan; however, students are encouraged to file a FAFSA so that they can receive the maximum aid available. Parents may download an application online from the website by clicking on forms. Applications should be returned to the financial aid for processing. This is a loan that needs to be repaid by the parent/stepparent.

Other Services Provided

The Job Locator Program: An employment service provided by the Financial Aid Office to assist students in finding off campus employment. Various companies in the greater Lowell area post open positions in the Financial Aid Office, which are updated on a weekly basis, these positions are also emailed to students on a list serve on a weekly basis.

Disbursement of Financial Aid

Disbursement of financial aid, in accordance with the University s policy, is directly made to the student s account, except in the case of on-campus employment. Financial aid is disbursed after the add/drop period of each semester.

University Scholarships

Charles J. Hoff Scholarship: The largest campus-wide scholarship opportunity is the Hoff Scholarship. Awards are in the amount of \$4,000, which is applied directly to a student's financial account. This amount (\$4,000) pays for almost half of the \$8,500 annual tuition and fees and may be continued until graduation on a semester basis, conditional upon satisfactory performance and financial aid eligibility. To be considered, students must be enrolled full time as an undergraduate student in the Francis College of Engineering, Manning School of Business, College of Health Sciences, College of Sciences or College of Fine Arts, Humanities and Social Sciences. Students must also be classified as a sophomore, junior or senior, have a cumulative GPA of 3.0, have no more than 30 transfer credits and demonstrate financial need by apply for the FAFSA. The maximum length of the award is six semesters. There is no pre-determined number of new recipients selected for this scholarship each year, but for the 2008-2009 academic year, there will be about 30 awards. For more information and application, please visit website.

Chancellor's Scholarship: The Chancellor's Scholarships are available to new freshmen in all undergraduate colleges who are in the top 25 percent of their graduating high school class, have a combined SAT score of 1200 or above and have demonstrated need. These scholarships provide up to \$3,000 a year towards tuition and fees and \$2,000 towards on-campus room and board. This scholarship is renewable for a total of four years, if the student maintains a 3.0 cumulative grade point average and continues to demonstrate financial need.

Commonwealth Scholars Program: The Commonwealth Scholarships are four-year scholarships that cover full academic year tuition and fees, and room and board for recipients who live on campus. An allowance of up to \$2,000 will be awarded to cover commuting and living expenses for recipients who live off campus. These scholarships are awarded to a limited number of high school seniors, who have a minimum, cumulative, recalculated high school grade point average (GPA) of 3.75, combined SAT scores of 1400 or above. Commonwealth Scholarships are renewable annually for a maximum of four years, provided that the student maintains full time status and either a cumulative GPA of 3.25 or better.

University Scholars Program: The University Scholars Program is a scholarship available to the two top ranking seniors who are enrolled at a high school in Massachusetts accredited by the New England Association of Schools and Colleges. To be eligible, students will be required to achieve a minimum combined SAT score of 1200 (ACT of 27), be nominated by the high school principal, be a Massachusetts resident (as determined by university policy on residency status), apply and meet all admissions criteria established by the campus, and be admitted to that campus for the semester following high school graduation. University scholars will receive a scholarship of up to \$10,000 per year renewable annually for four years provided that the student maintains a 3.0 overall GPA while taking at least 12 credits per semester. This scholarship will be discontinued beginning with the 2009/2010 academic year, the last class to be awarded this scholarship is the 2008/09 class.

Dean's Scholarship Program: The Dean's Scholarship Program supports 62 renewable \$4,000/year scholarships. Entering freshmen considered for a Dean's Scholarship must have a high school GPA of 3.25 (out of a possible 4.0) and must have a combined SAT score of at least 1100. Recipients are selected, during the admissions process, by each dean of UMass Lowell's undergraduate colleges on the basis of academic achievements and extra curricular activities. This scholarship is renewable for a total of four years, if the student maintains a cumulative GPA of 3.0 beginning at the end of freshman year.

University Community College Scholars Program: The University Community College Scholars Program presents top-ranked community college students with scholarships of up to \$10,000. To be eligible for this award, a community college student must be nominated by his or her community college president, be a resident of Massachusetts, be the top academically ranked student of his or her graduating class, and have earned a designated transfer associate degree at a Massachusetts community college achieving at that college at the time of nomination an overall grade point average of 3.75 or above, and have filed an application to the University of Massachusetts Lowell, meet all of the admission criteria and be admitted. Eligibility for the program is determined without regard to proven financial need. The University Community College Scholarships are granted for a maximum of four (4) semesters to recipients who maintain at least a 3.25 overall GPA while taking 12 or more credits per semester.

UMass Lowell Community College Transfer Scholarship: Thirty scholarships are available each year for fall and spring enrollment at UMASS Lowell. Each award is \$2,500 per year for full-time students (the amount is pro-rated for students who enroll part-time) with a maximum value of \$5,000 per student. To be eligible, applicants will be required to achieve a minimum cumulative grade point average (GPA) of 3.7 at the time of application, complete at least forty-five (45) of the total number of credits for the Associates degree at a Massachusetts Community College, complete the transfer admissions process to the University, complete graduation requirements at one of the Massachusetts Community Colleges prior to enrollment at UMass Lowell, plan to matriculate as a day school student at UMass Lowell, and be a U.S. citizen, lawful immigrant, permanent resident, or holder of another legal immigration status.

Continuing Studies Dean's Scholarship: The Continuing Studies Dean's Scholarship awards are for \$1,000 and may be continued on a semester basis, conditional upon satisfactory academic performance. The maximum length of the award is 4 semesters. See [Division of Online and Continuing Education](#) website for details.

Millie McGuire Technical Writing Scholarship Fund: The Millie McGuire Scholarship is awarded in May each year to a student enrolled in the Continuing Studies Technical Writing Certificate Program at UMass Lowell. The scholarship is managed by the UMass Lowell Director of Giving. The recipient is selected by the NNE Scholarship committee in conjunction with UMass Lowell.

Veterans Online and Off-Campus Scholarships: Scholarships will be awarded to Veterans who are enrolled in a Continuing Studies degree or certificate program for \$300 each. These scholarships can be used one time only and for one course only. Applications will be evaluated by the CSCDE Scholarship Committee and will be judged by merit and thoughtfulness in written response. Download the application form from our [website](#).

Leo F. King Scholarship: The friends of the Dean Leo F. King Scholarship Committee are pleased to announce the availability of an annual scholarship award for adult learners returning to school through Continuing Education. Contact the Faculty and Student Support Center at (978) 934-2474 for details.

ASL Adult Education Foundation Scholarships: Alpha Sigma Lambda Adult Education Foundation Scholarships are available for Continuing Studies, Corporate and Distance Education students who are matriculated in associate's or bachelor's degree programs and who demonstrate academic strength and leadership. Submissions are due by early April.

Additional University Scholarships: More than 150 University of Massachusetts Lowell scholarships are available to eligible students each year. Scholarships are awarded by the academic college or department, as stated in the fund criteria. To learn more about each fund, review the [UMass System Scholarship Database](#) or go to the list of University of Massachusetts Lowell endowed scholarship funds as of January 2008. For more information about the selection process, contact the department chair. Students may also fill out the [Scholarship Interest Form](#) to indicate interest in specific scholarships and/or to receive more information.

Unless otherwise stated, scholarships are awarded every spring for the following academic year. For example, scholarships awarded during the spring of 2008 will take effect during the 2008-2009 academic year, and will appear on student accounts at that time. The endowment is divided equally between the academic year's two semesters. Awards are applied directly to student accounts in the following order of priority; (1) to pay any balance due to the University, (2) to reduce student loans, (3) as a refund check, if all other obligations have been met.

Categorical Tuition Waivers

To be eligible for a Categorical Tuition Waiver, a student must be permanent legal resident of Massachusetts for at least one year prior to the opening of the academic year, be a U.S. Citizen or eligible non-citizen, have registered for Selective Service, not be in default of any federal or state loan, or owe a refund on any previously received financial aid, and be a member of an eligible category as defined below:

- **Veteran:** As provided in M.G.L. Chapter 4, Section 7(43) including: Spanish War, World War I, World War II, Korean, Vietnam, Lebanese peace keeping force, Grenada rescue mission, the Panamanian intervention force, or the Persian Gulf. For purposes of tuition waivers, the term "veteran" shall also include any individual who served in the army, navy, marine corps, coast guard or air force of the United States for not less than ninety days at least one of which was served in the theatre of operation for the Somalian mission known as "Operation Restore Hope" and whose last discharge or release was under honorable conditions.
- **Native American:** As certified by the Bureau of Indian Affairs.
- **Senior Citizen:** Persons over the age of 60.
- **Armed Forces:** An active member of the Armed Forces (Army, Navy, Marine, Air Force or Coast Guard) stationed and residing in Massachusetts.
- **Clients of the Massachusetts Rehabilitation Commission or Commission for the Blind:** As certified by the respective commission.

Students must present documentation of categorical waiver eligibility to the Accounts Receivables office, enroll in at least three undergraduate credits per semester in state supported undergraduate degree or certificate program, and maintain satisfactory academic progress in accordance with federal and institutional standards.

Non-Need Based Aid

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Advanced Placement Policies for Baccalaureate Applicants

Students entering the university as freshmen or as transfer students may elect to challenge required courses through established procedures cited below. University departments reserve the right to refuse the granting of credit for those examinations which are presented by a student for his or her major(s). Equivalency credit is granted for laboratory components of science courses only through examinations of university departments. Accordingly, science credits which are granted through the College Level Examination Program and Advanced Placement Examinations of the College Entrance Examination Board do not waive any specified laboratory requirement, including those of the university core curriculum.

- [College Level Examination Program \(CLEP\)](#)
- [International Baccalaureate \(IB\) Program](#)
- [Advanced Placement Examinations of the College Entrance Examination Board](#)
- [Foreign Language Achievement Tests of the College Entrance Examination Board](#)
- [Course Credit Limits Through Advanced Placement with Credit](#)

College Level Examination Program (CLEP)

Entering freshmen and transfer students may be granted university credit for subject examinations of the College Level Examination Program when they have achieved scores which are on or above the 'C' grade level. Once matriculated, a student must obtain permission from his/her department chair or program coordinator and submit an academic petition to have CLEP credits awarded. A complete listing of subject examinations of CLEP for which the University grants credits is noted below:

Composition and Literature	Score	Equivalent	Credits
American Literature	50	42.281	3
Analyzing and Interpreting Literature	52	42.199 & 42.299	6
College Composition	53	42.101 & 42.102	6
College Composition Modular	50	42.101	3
English Literature	50	42.282	3
Humanities	50	58.105 & 42.202	6
Foreign Languages	Score	Equivalent	Credits
French Language	53	50.101	3

French Language	58	50.101, 50.102	6
French Language	68	50.101, 50.102, 50.211	9
French Language	72	50.101, 50.102, 50.211, 50.212	12
German Language	53	51.101	3
German Language	58	51.101, 51.102	6
German Language	68	51.101, 51.102, 51.211	9
German Language	72	51.101, 51.102, 51.211, 51.212	12
Spanish Language	53	54.101	3
Spanish Language	58	54.101, 54.102	6
Spanish Language	68	54.101, 54.102, 54.211	9
Spanish Language	72	54.101, 54.102, 54.211, 54.212	12

Social Sciences and History	Score	Equivalent	Credits
American Government	50	46.101	3
History of US I: Early Colonization's to 1877	50	43.111	3
History of US II: 1865 to the Present	50	43.112	3
Human Growth and Development	50	47.260	3
Macroeconomics, Principles of	54	49.202	3
Microeconomics, Principles of	56	49.201	3
Psychology, Introductory	50	47.101	3
Introductory Sociology	51	48.101	3
Western Civilization I: Ancient Near East to 1648	53	43.105	3
Western Civilization II: 1648 to the Present	53	43.106	3

Sciences and Mathematics	Score	Equivalent	Credits
Biology	50	81.111 & 81.112	6
Calculus	50	92.131	3
College Algebra	50	92.120	3
Info Systems and Comp Applications	50	90.160	3
Mathematics, College	50	92.151	3
Natural Sciences	50	83.101 & 83.102	6

Business	Score	Equivalent	Credits
Financial Accounting	53	60.201 & 60.202	6
Business Law, Introductory	50	41.262	3
Marketing, Principles of	53	62.201	3

International Baccalaureate (IB) Program

Higher Level (HL) Exam Only	Transfer Credit Awarded with Scores of 4-7 (unless otherwise noted)
Accounting/Finance	3 credits: 60.199
Chemistry	6 credits: 84.121 & 84.122 (scores of 5-7 only)
Economics	6 credits: 49.201 & 49.202 (scores of 5-7 only)
English	6 credits: 42.101 & 42.199 (scores of 5-7 only)
History	6 credits: 43.299 & 43.399 (scores of 5-7 only)
Language B	6 credits: Intermediate I & II (# depends on language); ex. French 50.211/50.212
Mathematics	7 credits: 92.131 & 92.283
Psychology	6 credits: 47.101 & 47.269
Sociology	3 credits: 48.199 (score of 4); 6 credits: 48.199 & 48.299 (score of 5-7 only)

Advanced Placement Examinations of the College Entrance Examination Board

Entering freshmen who have demonstrated college level proficiency through Advanced Placement examinations of the College Entrance Examination Board may be granted university credit for scores of 5, 4, and 3. Credit will not be given for scores of 2 or 1.

The following is a listing of Advanced Placement Examinations for which the university grants course credit:

AP Test Name	Score	Equivalent	Credits
Art History	3, 4 or 5	58.101	3
		81.111	
Biology	3, 4 or 5	81.112	6

Biology	3, 4 or 5	81.113 81.114	8
Calculus AB	3, 4 or 5	92.131	4
Calculus AB Subscore	3, 4 or 5	92.131	4
Calculus BC	3, 4 or 5	92.131 & 92.132	8
Chemistry	4 or 5	84.121 84.122 84.123 84.124	8
Chinese Language	3 or 4 5	WLCH.1050, WLCH.1060 WLCH.1050, WLCH.1060, WLCH.2050, WLCH.2060	6 12
Classics-Latin Lyric	3, 4 or 5	56.303	3
Classics-Virgil	3, 4 or 5	56.303	3
Comparative Government & Politics	3, 4 or 5	46.112	3
Computer Science A	4 or 5	91.101	4
Computer Science AB	3 4 or 5	91.101 91.101 & 91.102	4 8
English Language & Composition	3 or 4 5	42.101 or 42.199 42.101 & 42.102	3 6
English Literature & Composition	3 or 4 5	42.101 or 42.199 42.101 & 42.102	3 6
Environmental Science	3, 4 or 5	87.199	3
European History	3, 4 or 5	43.105 & 43.106	6
French Language	3 or 4 5	50.101, 50.102 50.101, 102, 211, 212	6 12
French Literature	3, 4 or 5	50.261 & 50.262	6
German Language	3 or 4 5	51.101 & 51.102 51.101, 102, 211, 212	6 12
Macroeconomics	4 or 5	49.202	3
Microeconomics	4 or 5	49.201	3
Music	3, 4 or 5	71.101	3
Physics 1	3, 4 or 5	95.103 & 96.103	4
Physics 2	3, 4 or 5	95.104 & 96.104	4
Physics C-Mechanics	3, 4 or 5	95.141 & 96.141	4
Psychology	3, 4 or 5	47.101	3
Spanish Language	3 or 4 5	54.101 & 54.102 54.101, 102, 211, 212	6 12
Spanish Literature	3, 4 or 5	54.301 & 54.302	6
Statistics	3, 4 or 5	92.283	3
US Government & Politics	3, 4 or 5	46.101	3
United States History	3, 4 or 5	43.111 & 43.112	6
World History	4 or 5	43.107 & 43.108	6

Foreign Language Achievement Tests of the College Entrance Examination Board

University credit is granted on the recommendation of the Department of Languages to entering freshmen who have demonstrated satisfactory language competency through the Language Achievement tests of the College Entrance Examination Board. University credit on the intermediate course level will be given to students achieving scores of 550 or better. Such credit will satisfy any language proficiency requirement specified for students by their major departments.

Course Credit Limits Through Advanced Placement with Credit

The maximum number of credits that may be granted to any student through advanced placement procedures, including departmental equivalency examinations, is 30 semester credits. Under no circumstances will duplicate examination credit be granted to students who present formal course work for transfer. Nor will examination credit be granted to transferring students for the purposes of reducing either the major field residency requirement of 15 credits or the general residency requirement of 30 credits in university courses.

Change of Baccalaureate Program Declaration After Application

Individuals who are admitted to specific programs and who wish to change their major may do so by notifying the Office of Undergraduate Admissions. Changes will be approved only if space in the desired program is available and the applicant has satisfied all admission requirements for the new college or program.

The Commonwealth Transfer Compact through Fall 2001

For Students Transferring from Massachusetts Community Colleges to Public Colleges and Universities Offering the Baccalaureate Degree

- [Section I: Requirement for Transfer Compact Status](#)
- [Section II: Credits to be Transferred](#)
- [Section III: Credits Beyond the Associate Degree](#)
- [Section IV: Admission to Competitive Majors or Programs](#)

The University of Massachusetts Lowell has affirmed its intention to maintain flexibility in the transfer of qualified students from community colleges of the Commonwealth of Massachusetts. For the implementation of this objective, the University of Massachusetts Lowell has subscribed to the Commonwealth Transfer Compact and applies to students seeking admission under this compact the same policies as are applied to University of Massachusetts Lowell students who petition for intercollegiate transfer within the University.

All courses that have been accepted by the University from signatory community colleges of the Commonwealth Transfer Compact are listed on the student's transcript, and those courses which are not applicable to specific curriculum requirements are credited, whenever possible, as unrestricted elective courses. Since some curricula of the University do not provide for such unrestricted elective courses, or the number of transferred courses may exceed the number of unrestricted elective courses which are permitted within the specifications for minimum degree requirements, transferred courses which are not applicable to the specific requirements of a curriculum are not counted in the determination of the number of course credits completed until the semester of graduation. This procedure prevents the early imposition of a grade point requirement for retention which is in excess of that specified for the number of credits completed and applicable to the student's particular curriculum.

The revised Commonwealth Transfer Compact provides a process to facilitate the transfer of collegiate credits and to ensure the appropriate recognition of academic progress earned by students at a community college who wish to continue their education at a public college or university.

The Commonwealth Transfer Compact effective Spring 2013

For Students Transferring from Massachusetts Community Colleges to Public Colleges and Universities Offering the Baccalaureate Degree

Please note: As of Spring 2013 the Mass Transfer program will be replacing Joint Admissions and The Commonwealth Transfer compact. At this time, students who have applied before Spring 2013 will be allowed all benefits from these programs as outlined below.

Please refer to the MASS transfer program as outlined from the [Massachusetts Board of Higher education](#) website.

Section I: Requirement for Transfer Compact Status

A student shall be eligible for Transfer Compact status if he or she has met the following requirements:

- completed an associate's degree with a minimum of 60 credit hours exclusive of developmental course work;
- achieved a cumulative grade-point average of not less than 2.000 (in a 4.000 system) at the community college awarding the degree; and
- completed the following minimum general education core, exclusive of developmental course work

English Composition/Writing	6 credits
Behavioral and Social Science	9 credits
Humanities and Fine Arts	9 credits
Natural or Physical Science	8 credits
Mathematics	3 credits

The sending institution is responsible for identifying the transcript of each student who is a candidate for transfer under this compact.?

Section II: Credits to be Transferred

The 35 credits in general education specified in Section I will be applied toward the fulfillment of the receiving institution's general education requirements. A minimum of 25 additional credits will be accepted as transfer credits by the receiving institution. These credits may be transferred as:

- free electives,
- toward the receiving institution's additional general education requirements,
- toward the student's major, or
- any combination, as the receiving institution deems appropriate.

Only college-level course credits consistent with the standards set forth in the Undergraduate Catalog are included under this Compact. Credits awarded by the sending institution through CLEP and challenge examinations may be included when the community college certifies that a student qualifies under this Compact. Student must forward official CLEP scores.

Section III: Credits Beyond the Associate Degree

To complete the baccalaureate degree, a student who transfers under this compact may be required to take no more than 68 additional credits unless:

- a. the student changes his or her program upon entering the receiving institution; or
- b. the combination of additional general education requirements, if any, and the requirements of the student's major at the receiving institution total more than 68 credits.

Under these circumstances, transfer students will be subject to the same requirements as native students. (The term native student refers to students who began their undergraduate education at the baccalaureate institution.)

Section IV: Admission to Competitive Majors or Programs

If, because of space or fiscal limitations, the receiving institution does not admit all qualified applicants to a given major or program, the receiving institution will use the same criteria for applicants who are transfer students under this Compact as it does for its native students.

Day Programs for Students Matriculating for Online & Continuing Education

Students who have established matriculation for University of Massachusetts Lowell continuing education degrees at either the associate or baccalaureate levels may be permitted to pursue specifically authorized day courses. Such students must secure the written approval of their program coordinators for all projected courses prior to receiving permission from the course instructor. Full notation of approved courses (including those failed) is made upon the permanent record of Online & Continuing Education students.

Dual Enrollment Program for High School Students

The Massachusetts Dual Enrollment Program was established by the Education Reform Act of 1993. The program provides qualified high school juniors and seniors the opportunity to take courses at public colleges and universities and thus earn both high school and college credit. Participants in this program are required to have a high school GPA of 3.0 or better and be recommended by their high school principal or guidance counselor. Dual Enrollment students must file an application with the Office of Undergraduate Admissions and submit high school transcripts, along with a parental signature and a guidance counselor signature allowing them to take classes on campus. Dual enrollment students are limited to enrolling in 100 and 200 level courses. The university reserves the right to decline admittance to students on the basis of academic ability. Students are financially responsible for all Dual Enrollment Courses.

Equal Opportunity and Outreach

Equal and Fair Treatment

Under federal and state laws, all students are protected from discrimination based on race, color, religion, national origin, disability, gender, (including sexual harassment), age, sexual orientation, marital or veteran status. If you feel that you have been discriminated against based upon any one of these areas, you must contact (EEO), Wannalancit Business Center, 600 Suffolk Street, Suite 301. These protections also include retaliation for filing complaints of discrimination. Concerns regarding course offerings, instructor and student attitudes should also be directed to EEO staff.

Students are responsible for adhering to the policies of the University regarding equal and fair treatment.

General Policies

Admission to all Baccalaureate day programs is made through the Office of Undergraduate Admissions according to established undergraduate policies. Admission to programs of continuing education or to summer school, which is made through the Division of Continuing Studies & Corporate Education, does not constitute admission to baccalaureate day programs and implies no commitment, per se, for subsequent application of continuing education or summer school courses to baccalaureate day programs. It is the policy of the University of Massachusetts Lowell that students seeking admission to either regular or continuing education programs will be evaluated on their merits and (as prescribed in applicable federal and state laws) without respect to their race, color, creed, national origin, age, gender, handicap, sexual orientation, veteran status or marital status.

The admission policies of the University of Massachusetts Lowell, which are in keeping with its mission and the guidelines of the Massachusetts Department of Higher Education, specify procedures for admitting three types of applicants for undergraduate degrees:

1. high school seniors and individuals who have graduated from high schools within the past three years;
2. non-traditional students (students who have graduated from high school more than three years at time of application to the University of Massachusetts Lowell); and
3. transfer students.

Accordingly, these policies not only protect the intellectual integrity and strength of the university by requiring standards of preparation and objective evidence of the student's potential for success, but also provide access for a diverse student population, including traditional and non-traditional students and students with special needs and talents. Individuals who are admitted by the Office of Undergraduate Admissions must be accepted under one of the following categories:

1. as undeclared students (entering as freshmen or transfer students with less than 45 semester credits) who wish to establish initial matriculation in an undeclared status offered by one of the colleges of the University of Massachusetts Lowell;

2. as declared students (entering as freshmen or transfer students) who wish to establish initial matriculation for a UMass Lowell degree and who have a commitment to an academic major or professional program which is offered by one of the colleges of the university;
3. as declared students with advanced standing who wish to pursue a second baccalaureate degree at Lowell after having completed an initial baccalaureate degree at the university or another accredited institution; or as non-matriculating students admitted on a semester-by-semester basis.

To be admitted for undergraduate study, applicants must present records of academic performance that indicate a reasonable probability of success in their chosen programs or colleges. For regular freshman admission to an undergraduate college or degree program, probability of success is measured by an individual's high school record, class and standardized test results and/or by his or her academic record at the University of Massachusetts Lowell for prescribed provisional courses of study. For regular transfer admission to an undergraduate college or degree program, probability of success is measured by an individual's previous academic record at some other accredited institution of higher education. Within the space available in particular programs, admission is offered first to those whose performance record indicates the highest probability of success in the chosen college and/or program. Specific academic standards and requirements are described below under headings for admission categories.

The university welcomes correspondence from prospective students who may need assistance in adapting their high school programs to satisfy specific program requirements. Such correspondence should be addressed to the Office of Undergraduate Admissions, University of Massachusetts Lowell, 883 Broadway Street, Suite 110, Lowell, Massachusetts 01854-5104.

Students may apply online through the [Common Application](#) or . Students may also download and mail an .

Applicant Decisions Concerning Program Selection?

Entering freshmen who prefer to test their abilities and interests or who wish to explore several areas of study before identifying themselves with one of the baccalaureate day programs can request admission as undeclared students. Students transferring 60 or more credits may not request status as undeclared students and must enter the University with a commitment to an academic major or professional program. Undeclared students are advised that openings in a desired professional program may be inadequate to accommodate all qualified undeclared student applicants at the time when program declarations must be made (upon completion of 45 credits). When resources of a college or program render it necessary to establish admission quotas, different admission criteria, above and beyond specified admission requirements, will be applied in the selection of applicants as matriculating students.

The University of Massachusetts Lowell has an Early Action Deadline of Nov. 15 for freshmen applicants for the fall semester. The regular decision deadline for freshmen applicants for the fall semester is Feb. 15. The deadline for transfer applicants for the fall semester is Aug. 15

Baccalaureate degree programs are offered by the Colleges of Fine Arts and Humanities, College of Sciences, Francis College of Engineering, the Manning School of Business and the College of Health Sciences. Continuing education degree programs, including certificate, associates, and baccalaureate degree programs are offered in the evening and online. Applicants who wish to apply for continuing education programs should address their inquiries to Continuing Studies & Corporate Education, 883 Broadway St., Suite 110, Lowell, MA. 01854.

Health Certification Requirements

All students, as part of the condition of admission, are required to have on file a Health Examination Report and physical exam form, evidence of a recent Mantoux TB test, and proof of completed up-to-date immunizations as mandated by law.

The Massachusetts College Immunization Law requires all full-time students, and all full or part time students in the health sciences, regardless of age, to provide a medical certificate of immunization against measles, mumps, rubella, tetanus and diphtheria. The month and year must be given.

The measles vaccine must have been administered after 1968 and after the age of one, and there must have been two doses at least one month apart.

In the absence of proof of the measles, mumps, or rubella vaccine, a positive titer is sufficient. History of a disease is not acceptable.

The Tetanus-Diphtheria injection must be within the past ten years.

All freshmen entering college after September 2001, as well as any student in the health sciences, regardless of class must have completed the hepatitis B vaccine series.

As of August 2007, the Massachusetts Department of Public Health has mandated that all new college students, who live in campus housing receive one of the Meningococcal vaccines or sign the Department of Public Health's waiver form.

Effective September 1, 2011, the Massachusetts Department of Public Health has added new immunization requirements for all newly enrolled students as well as all students enrolled in the College of Health Sciences. These immunizations include Tdap and Varicella.

Joint Admissions

Joint Admissions is a state-wide program which guarantees qualified students admission to the University of Massachusetts Lowell upon completion of an Associate Degree in an approved Joint Admissions program. A minimum cumulative grade point average of 2.5 is required. Students may enroll in the Joint Admissions program at any time prior to graduation from their community college by signing

the Joint Admissions agreement (available in the transfer office of their community college).

- When ready to transfer, students are required to submit the Intent to Enroll Form as application to the university. There is no application fee.
- Students must provide the University with their final transcript showing graduation date and their cumulative grade point average.

Application Procedures and Requirements for Non-Graduates of High Schools

Individuals who have not graduated from high school may be admitted to the university upon satisfactory completion of the General Educational Development (GED) tests and receipt of a certificate of high school equivalency. Such students are required to take either the Scholastic Aptitude Tests of the College Entrance Examination Board (SAT) or ACT exam prior to their application and to present scores that are acceptable to the university. Admission procedures for students possessing certificates of high school equivalency are the same as those that are prescribed for graduating seniors and high school graduates.

Application Procedure for Non-Matriculating Students

Admission as a non-matriculating student is granted only under provisions which govern the non-degree programs cited below. Applicants for admission as non-matriculating students are required to file admission applications and to submit such credentials as are specified for their proposed non-degree programs. A non-matriculated student may be readmitted subject to the following conditions:

- the student has satisfactorily completed his or her previously attempted courses,
- the original condition under which the student initiated non-matriculating studies permits continued enrollment, and
- commitments of the University to matriculating students permit enrollment of non-matriculating students.

Non-Matriculating Programs for Students Holding Baccalaureate Degrees

An individual who holds a baccalaureate degree and who wishes to pursue a limited non-degree program (up to a maximum of 15 credits) may be admitted full- or part-time to the University as a non-matriculating student. Such admission requires the approval of each of the departments in which courses are contemplated. University of Massachusetts Lowell graduates should indicate their date of graduation on their application forms. Other applicants must request the registrars of the institutions by which their degrees were conferred to mail transcripts of their baccalaureate records directly to the Office of Undergraduate Admissions and are warned that permission to enroll in courses will be denied if transcripts have not been received prior to course registration. A student who holds a baccalaureate degree and who wishes to pursue a second baccalaureate should investigate the appropriateness of both degree and non-degree programs of the Graduate School before applying for such status.

Admission Policies for Non-Traditional Students

Students applying for admission more than three years after high school graduation, or who have completed the GED and would have graduated from high school three or more years prior to applying to college, must show their ability to succeed in college based upon their high school record and other application materials.

Students who drop out of high school, earn a GED, and apply to college within three years of when they would have graduated with their high school class are subject to the same admission standards as students applying within three years of graduation from high school.

English as a Second Language (ESL) Applicants

If you have submitted an application to an undergraduate program at UMass Lowell and need to demonstrate English Language Proficiency to complete your application process, you will be contacted by an Admissions counselor who will let you know if the University sponsored diagnostic test is an option for you. If it is an option but you cannot make it to campus you can take the Test of English as a Foreign Language. Students must have a minimum score of 79-80 on the internet based test.

Fresh Start Program

Students who have been absent from the University for two years or longer may be readmitted under the terms of the Fresh Start program. Under this program, a returning student will be treated as if he or she were a transfer student. Courses completed during earlier periods of enrollment with grades of C or above will be accepted toward graduation but will not be included in the cumulative average. Courses completed during earlier periods of enrollment with grades below C will not be counted toward graduation or included in the cumulative average.

A maximum of 75 earlier University of Massachusetts Lowell transfer credits will be accepted toward graduation, and after readmission under Fresh Start the student must earn a minimum of 45 credits in residence at UMass Lowell in a matriculated program of study.

Courses taken in the academic major during earlier periods of enrollment must be approved by the major department before those courses can be counted toward the requirements of the major. (This provision is especially important in majors that undergo regular curriculum revision.)

Readmission Procedures for Previously Enrolled Students of the University of Massachusetts Lowell

The University does not grant leaves of absence to students who wish to interrupt their baccalaureate studies. For more information

about withdrawal options, please contact the Office of the Registrar. Accordingly, students who have withdrawn from the University and who seek readmission must file an application for readmission with the Registrar's Office. Your options for readmission, including qualified, unqualified, and probationary readmission are explained below. When resources of a college or program render it necessary to limit enrollments, the Registrar's Office will establish a waiting list of applicants for transfer and reinstatement. Different admission and/or enrollment criteria, above and beyond minimum program requirements, may be applied to these individuals to ensure the admission and readmission of the most qualified applicants for the limited openings.

Upper division students in the College of Health Sciences who have withdrawn must make individual arrangements with appropriate chairpersons to reserve their spaces in courses for the semester of the anticipated return to the University. Unless such special arrangements have been made, reinstatement by the Office of the Registrar cannot ensure full resumption of a student's course of study. Please note that other departments may also have additional requirements for reinstatement.

In the event that readmission applicants wish to change their programs and/or to seek readmission to the University in a college other than that which they previously attended, their reinstatement must be approved by the chairperson of the program to which they seek admission and the appropriate college dean or his/her designee. If program enrollments permit, approval for such readmission will be granted to students who satisfy all program admission requirements. Individuals who seek re-admission to the University in a college other than that which they previously attended will be subject to re-evaluation procedures that are specified for enrolled students who seek an intercollegiate transfer (cf. policies governing intercollegiate transfers which appear elsewhere in this publication under the heading Academic Policies: Change of Major with Intercollegiate Transfer). Individuals who apply for intercollegiate transfers must submit their applications no later than November 1 for Spring semester reinstatement and April 1 for Fall semester reinstatement.

Unqualified Reinstatement

Individuals who were students in satisfactory academic standing prior to their withdrawal and who have not been absent from the University for more than one semester are automatically reinstated to the programs in which they were previously enrolled and are subject to curriculum requirements that are in effect for the classes to which they previously belonged. Application for readmission must be filed with the Office of the Registrar.

Qualified Reinstatement

Students who have been absent from the University for two or more continuous semesters are subject to the rules and regulations of the University which are in effect at the time of their readmission rather than at the time of their original admission. If program enrollments permit, individuals who were students in satisfactory academic standing prior to their withdrawal ordinarily are reinstated to the programs in which they were previously enrolled. However, during an individual's absence some programs may have established higher entrance and retention requirements and he or she may be denied reinstatement for failure to satisfy these requirements.

Individuals are not automatically reinstated to the programs in which they were previously enrolled when they have been absent from the University for periods exceeding ten years. Course work that has been completed prior to ten years of the date of readmission is generally recognized only through those examination procedures described in the policy statements for course equivalency. Such course work may also be evaluated on an individual basis by the academic standards committee of the college in which an applicant desires to re-establish his or her matriculation. Students who wish to have such course work evaluated by the committee must present their cases in writing to the committee.

Individuals who have been suspended from the University for unsatisfactory academic standing may apply for readmission only within policies that govern probationary readmission.

Probationary Readmission

A student who has been suspended from the University is entitled to apply for readmission as a full-time probationary student but may not initiate his or her probationary studies before an absence from the University for one semester. Application for readmission to all programs is made through the Office of the Registrar and must be received by April 1 for a readmission decision during the Spring semester and by November 1 for a readmission decision during the Fall semester.

Petitions that have been received by the filing deadline of November 1 will be reviewed by the appropriate academic standards committee during the Fall semester, and readmitted students will be permitted to initiate their probationary studies at the beginning of the Spring semester. Similarly, petitions which have been received by the filing deadline of April 1 will be reviewed by the appropriate academic standards committee during the spring semester, and readmitted students will be permitted to initiate their probationary studies at the beginning of the Fall semester. Probationary studies may be authorized during the Fall and Spring semesters in day classes only.

Upon the receipt of an application, the Office of the Registrar will forward all readmission papers to the academic standards committee of the college to which the student applies. Except as prohibited by the academic policies of professional colleges, suspended students may petition for readmission to the University with probationary status as follows: 1) all suspended students may petition for readmission to the college in which they were previously enrolled and may request re-enrollment in the former major or readmission with a change of major; 2) freshmen students and sophomore students who have not attempted more than 45 credits or have not completed more than three full-time semesters also may petition for simultaneous intercollegiate transfer and probationary admission to a new program. Students who have attempted 45 credits or three full-time semesters are not eligible for intercollegiate transfer at the time of probationary readmission.

Students who are readmitted to colleges from which they were previously suspended must achieve satisfactory academic standing for all course hours completed by the end of their probationary semester. Students who are permitted to make an intercollegiate transfer will be required to attain a probation average of 2.000 in order to achieve satisfactory academic standing.

After securing recommendations from appropriate departments and studying the previous academic record of the student, the academic standards committee will lay down the requirements which the student must satisfy as a condition for his or her probation (specific courses to be taken, conference schedules with faculty advisors, and any other special or general academic condition which may be construed as necessary for the student's successful completion of his or her probationary studies). In determining such requirements for probation, the academic standards committees shall prescribe a sufficient number of courses for a student who has been readmitted to the college from which he or she has been suspended, which shall make the achievement of satisfactory academic standing reasonably possible during a full-time semester of probation.

A student who has been dismissed from the university needs to review the Academic Standing policy for .

Admissions Policies for Traditional Students

Graduating High School Seniors and High School Graduates

Graduating high school seniors and high school graduates who wish to be admitted to the university as matriculating students must complete the following steps:

1. file an official application form with the University of Massachusetts Lowell prior to July 1;
2. request high school principals or guidance directors to forward to the Office of Undergraduate Admissions transcripts of secondary school grades, including grade reports for at least the first quarter of the senior year;
3. arrange to take either the? College Entrance Examination Board Scholastic Aptitude Test (SAT) or ACT exam.

Detailed information concerning the College Entrance Examination Board tests and the dates throughout the year on which they are administered may be secured from the Office of Undergraduate Admissions of the University of Massachusetts Lowell, guidance counselors, or the Educational Testing Service, Princeton, New Jersey 08540. Special information is provided in the following sections concerning required aptitude examinations for applicants to music programs and for satisfaction of department language requirements through the Foreign Language Achievement Tests of the College Entrance Examination Board.

The responsibility for having all credentials forwarded to the University of Massachusetts Lowell rests solely with the applicant.

Admission Requirements for Graduating High School Seniors and High School Graduates

The general expectation is that applicants will present course work, which has been taken within college preparatory curricula. However, the Office of Undergraduate Admissions will evaluate the academic units of vocational technical school (Chapter 74) graduates to determine their relevance for University curricula. The ultimate judgment concerning such equivalency rests solely with the University of Massachusetts Lowell. The following pages specify prescribed high school unit requirements and other qualitative requirements for the admission of freshmen students. Applicants must satisfactorily complete prescribed units prior to enrollment. Table 1 specifies the high school unit distribution which is required for general University admission consideration.

Prescribed High School Unit Requirements

Table 1: General University Admission

Subject Required	Units
English	4 courses
Mathematics	3 courses (Algebra I & II and Geometry or Trigonometry, or comparable coursework)
Sciences	3 courses (including 2 courses with laboratory work)
Social Sciences	2 courses (including 1 course in U.S. History)
Foreign Languages	2 courses (in a single language)
Electives	2 courses (from the above subjects or from the Arts and Humanities or Computer Sciences)

Minimum Prescribed Units? 16

Qualitative Requirements for the Admission of Freshman Students

All freshman applicants are evaluated using standards determined by both the Massachusetts Department of Higher Education and the University.? Emphasis is placed upon the rigor of the high school course selection as well as scores on standardized tests (if applicable); letters of recommendation, essays and extracurricular activities are also considered during the evaluation of applications.

Entering freshmen in Fall 2011 had an average GPA 3.25 and an average combined Critical Reading and Math SAT score of 1113.

*SAT Requirements

*Criminal Justice & Sound Recording: 1000 SAT or equivalent ACT score

Music Aptitude and Proficiency Examinations, College of Arts & Sciences Music Programs

Students who wish to apply for music programs are required to demonstrate vocal or instrumental ability in a performance audition with a member of the faculty of the College of Fine Arts and Humanities. The student is also required to achieve satisfactory scores on both a written test of music fundamentals and a brief examination in aural comprehension. Performance auditions and theory testing are scheduled throughout the spring semester. Applicants will be invited to take these special music tests at the University when all credentials have been evaluated by the Office of Undergraduate Admissions and the applicant has been admitted to the University.

Admissions Policies for Transfer Students

- [Application Procedures and Requirements](#)
- [Required Credentials for Transfer Applicants](#)
- [Evaluation of Transfer Credentials](#)
- [University Restrictions Concerning Transfer Credit Recognition](#)
- [College and Program Restrictions Concerning Transfer Credit](#)
- [Initial Review of Transfer Students for Compliance with University Retention Standards](#)

Application Procedures and Requirements

In general, the University of Massachusetts Lowell will accept on an hour-for-hour basis semester credits with grades of C- (1.70 on a 4.00 scale) or better as shown on official transcripts of record which are received directly from other regionally accredited collegiate institutions and which are applied to an initial baccalaureate degree. No credit will be recognized for the grade of P unless the catalog of the transferring institution specifically states that P is equivalent to a final course grade of C-. Quarter credits are recognized on a prorated basis of three quarter credits to two semester credits. (Students who are interested in transferring credits for an additional baccalaureate degree should consult the appropriate section below concerning such admission.) Preference for admission to the University is based upon the record of each individual transfer applicant at the end of the semester preceding admission. All credits to be transferred must be identified at the time of application for transfer. The University reserves the right to deny credit for course work taken by the student prior to admission if it is identified and presented after transfer.

In general, the University of Massachusetts Lowell will accept departmental test credits with grades of C- or better as shown on official transcripts of record which are received directly from other accredited institutions. No credit will be recognized for the grade of P or S unless the catalog of the transferring institution specifically states that P or S is equivalent to a final minimum course grade of C-

Students who transfer from four-year institutions must complete a minimum of 30 semester credits at the University of Massachusetts Lowell to be eligible for a Lowell baccalaureate degree. The University will not reduce the minimum residency requirement of 60 semester credits for students who present 60 or more semester credits from a two-year college. The records of applicants 1) who have completed associate degree programs or who have established matriculation at other accredited institutions of higher education and 2) who are eligible to return to such institutions for the semester in which they seek admission to the University are routinely processed by the Office of Undergraduate Admissions for regular transfer admission.

Required Credentials for Transfer Applicants

It is the responsibility of students seeking transfer to arrange for all official transcripts and notations on courses in progress to be forwarded to the Office of Undergraduate Admissions directly from the previous institution(s).

Additionally, final transcripts of all completed courses must be forwarded to the Office of Undergraduate Admissions following the completion of previously designated courses in progress. Transfer students whose records are incomplete on the first day of semester classes may be prohibited from attending courses and may be required to withdraw from the university.

An applicant who has attended one or more institutions must request each registrar to mail directly to the Office of Undergraduate Admissions a transcript of his or her record, even if credits were not earned or credits are not presented for transfer.

Transfer students must meet one of the following criteria:

1. 12 or more transferable college credits and a minimum of 2.5 college GPA;
2. Up to 23 transferable college credits, a minimum 2.0 college GPA, and a high school transcript that meets the admission standards for freshmen applicants; or
3. 24 or more transferable credits and a minimum 2.0 college GPA.

Transfer students who have fewer than 12 transferable college credits must meet the admission standards for freshmen applicants.

Evaluation of Transfer Credentials

A preliminary evaluation of course credits to be transferred to the University is made by the Office of Undergraduate Admissions at the time of application. Students seeking transfer should be aware that this evaluation by the Office of Undergraduate Admissions is preliminary in nature and that acceptance of transfer credit and assignment of a year of graduation or other status is subject to final review by the student's major department when the student is formally accepted for matriculation by one of the colleges of the University. Credit which is acceptable according to general University standards is not necessarily acceptable for specific programs. This is especially true when program transfer quotas have been imposed. The Office of Undergraduate Admissions will advise applicants when their admission to the University does not guarantee acceptance into their preferred professional programs. The applicability of grades received in transferred courses for the determination of the grade-point average of the student's major at the University of Massachusetts Lowell is determined by policies of each of the colleges.

Massachusetts public community colleges may award other associate degrees and certificates with a primary objective other than student transfer to a four-year institution. Course credits from such programs presented for transfer will be evaluated by the four-year institution for applicability to general education requirements, to unrestricted elective courses, and to requirements in the student's major field.

To view the list of courses approved by departments for transfer into the University of Massachusetts Lowell, visit the [Office of the Registrar](#) website.

University Restrictions Concerning Transfer Credit Recognition

Courses completed at non-public institutions which are not accredited by the major regional accrediting associations will not be credited to degree programs of the University. Nor will credit be granted for courses which are unacceptable to the transfer institution for its own associate or baccalaureate programs or which are completed within post-secondary school diploma programs. Non-credit CEU courses, adult-enrichment or refresher courses, and secondary school correspondence and home study courses also are not recognized for transfer credit. The University reserves the right to refuse recognition for courses which were taken more than ten years prior to the date when a student applies for transfer when, in the opinion of department chairpersons and program directors, the knowledge attained in such courses is deemed to be out of date and/or in need of verification. Competencies which a student has achieved through such courses, or by any other means, may be recognized for credit if verified by the College Level Examination Program (CLEP) or departmental examinations.

College and Program Restrictions Concerning Transfer Credit

Many colleges and programs impose additional restrictions on the acceptability of transfer credit. The College of Health Sciences and the Manning School of Business have special regulations governing the acceptance of transfer credits for professional courses. Transfer applicants to these colleges should consult the dean of the college or the appropriate department chairperson concerning transfer credit for these courses.

As a general rule, courses of a professional nature from any curriculum are not accepted in transfer when a student seeks admission to a different curriculum or program at the University of Massachusetts Lowell. Transfer applicants should consult the appropriate dean or departments for current regulations.

Initial Review of Transfer Students for Compliance with University Retention Standards

For the purpose of determining academic standing, student records are reviewed each semester. Transfer students are initially evaluated for retention purposes at the end of the semester in which they have attempted their first 18 credits at the University.

Tuition Assistance Program

MASSACHUSETTS ADVANTAGE PLUS PROGRAM (MAPP)

The University of Massachusetts Lowell proudly offers Massachusetts community college students who have earned an associate degree in an approved program with a 3.0 or better grade point average a full in-state tuition discount when they transfer to the University of Massachusetts Lowell.

Award: In-State day school tuition, currently \$1,454 for full time students/pro-rated for part time students.?

- In-state, Out of State, International, Proximity, or New England Regional residencies
- Minimum GPA of 3.0
- Associates Degree from MA State community college
- Mass Transfer eligible major
- Enroll at the University of Massachusetts Lowell within one year of graduating from MA community college
- Does not cover online or continuing education courses

Renewal criteria: 3.0 GPA; maximum four semesters.

Programs for University Employees

University employees who are high school graduates or who possess certificates of high school equivalency may apply for admission as non-matriculating students. Admission is extended to employees as non-matriculating students on a semester-by-semester basis and solely for courses designated at the time of application. Employees who wish to matriculate for a baccalaureate degree should apply for admission. Participation in this program is subject to employee obligations and special policies of the Board of Trustees.

Programs for Students Matriculated at other Colleges and Universities

Visiting Students

Students who are matriculated for degrees at associate or baccalaureate institutions may be admitted to the university to pursue specifically authorized courses. Such students are admitted to the university on a semester-by-semester basis and must secure prior approval for university courses from appropriate authorities at institutions where their degrees will be granted. Permission to enroll in courses of the university will not be granted to students without a letter from an appropriate officer of the institution in which they are matriculating which certifies that they are candidates for a degree and are in good academic standing. Courses of a professional nature may not be elected by non-matriculating students of the university unless specifically authorized by the appropriate college dean.

General Policies

Registration for Art Courses

The Art & Design department reserves the right to pre-register its major students in order to assure completion of their degree

requirements. In the event of over-subscription of art courses by art majors, the department will grant first preference to seniors and second preference to juniors. During the two week designated advising period each semester, advisors are available for career advising and assisting in course selection.

Attendance and Personal Conduct

Studio art courses consist of lectures, demonstrations and critiques. Because of the complex nature of these courses, students are expected to attend all scheduled classes and be on time. Excessive absences may cause failure of the course or a lower grade. The study of art provides an environment for creativity and artistic freedom. However, students enrolled in the BFA program will be expected to conduct themselves in a professional and academic manner.

Art Studios and Computer Labs Policy

For insurance coverage and safety reasons, the art studios and computer labs are to be used solely by students enrolled in classes in the Art & Design department. Studio and lab monitors will check students IDs after hours.

Policy Concerning Student Work

The Art & Design department reserves the right to keep student work for a period of time not to exceed one year for inclusion in exhibitions. The department reserves the right either to photograph student work or, in the case of photography, printmaking, computer art and digital media where many copies can be made, to keep actual examples of work. Unless otherwise specified, artwork and term papers left pass the deadline set by the Studio Manager following the semester in which they were completed, will be discarded.

Senior Studio students are required to submit visual documentation of their course work; this documentation becomes part of their department records. Students who do not meet this requirement will receive an incomplete grade.

Academic Integrity

Students should be aware of the issues of creative honesty and of the prohibition against unwarranted use of the work of others, of the dishonesty of misrepresenting the source of work and ideas, and the penalties established by the university for cheating and plagiarism. The department expects that work passed in by the student will be the product of the student's own effort. Particulars of the university policy on academic dishonesty can be found in the section of the university catalog.

Equipment Care and Replacement Repair

The Art & Design department provides equipment for student use. Students are responsible for replacement costs of any items that they lose or damage in the course of their studies. In most cases, students are responsible for materials and expandable supplies required by their studio courses.

Portfolio Admission Requirements

Undergraduate application to the Art and Design Department at the University of Massachusetts Lowell is a two-part process. Incoming applicants need to:

1. submit an application to
2. submit a portfolio directly to the Art and Design Department via [Slideroom.com](https://www.slideroom.com)

Academic records are reviewed by the Admissions Office. This is followed by the Art and Design Department's review of portfolios.

Applicants who do not have a portfolio

The Art and Design department's goal is to train any student accepted at UMass Lowell. If you are interested in becoming an Art major but do not have a portfolio or if your portfolio is not accepted by the review committee, you can take Drawing I and Art Concepts I. These courses will prepare you for the portfolio application. Should you decide that your strength is in a different field, these courses will count toward general education (Arts and Humanities) for non-art majors.

For more information visit the [Art and Design](#) website.

Academic Progression Policy

As part of the College of Health Sciences, the Clinical Laboratory Sciences (Clinical Science and Medical Laboratory Science Options) and Nutritional Science Programs have the following academic policies for students to successfully progress in and complete the baccalaureate program.

Students who are freshman in the curriculum will receive a warning letter the first time they fail to meet these academic requirements. Sophomore year students and higher who fail to meet the criteria for the first time and freshman who fail to meet the criteria for the second time will receive a letter dismissing them from the program with the right to appeal. The student appeal will be considered by a Department Professional Review Committee. Granting an appeal request is not automatic and the decision will be based on the likelihood of future success of the student in the major. A student with a successful appeal will be reinstated into the program on probation with conditions to be met by a certain deadline.

Department Academic Policies

1. Overall cumulative GPA must be a 2.5 or greater
2. Semester GPA must be a 2.5 or greater
3. No grade lower than C in courses listed as Designated Professional Courses*
4. No withdrawal from a Designated Professional Course.*
5. Medical Laboratory Science option only
 - Basic science GPA must be a 2.5 or greater
 - Anatomy and Physiology I & II Lecture and Lab
 - Physiological Chemistry I & II Lecture and Lab
 - Basic Clinical Microbiology Lecture and Lab
 - Organic Chemistry Lecture and Lab
 - Clinical Laboratory Theory Lecture and Lab
6. Clinical Science option
 - Must have a grade of at least a C in a course to be used to meet the Science Specialization requirement

*List of Designated Professional Courses will be supplied by the department.

Technical Standards

Clinical Laboratory and Nutritional Sciences Admission, Continuation and Graduation

The goal of the University of Massachusetts Lowell, Department of Clinical Laboratory & Nutritional Sciences is to prepare entry level practitioners in Clinical Laboratory and Nutritional Sciences. This preparation specifically requires the accumulation of scientific knowledge and essential skills necessary to accurately and safely work in a variety of clinical, industrial, research and academic settings.

The faculty of the Department of Clinical Laboratory and Nutritional Sciences has the responsibility to accept and graduate students who are well educated and possess the qualities of critical thinking, sound judgment, emotional stability, maturity, mental stamina, and empathy. In order to fulfill this responsibility, the faculty of the department maintains that certain minimal essential functions must be met in a timely manner by every applicant, with or without reasonable accommodations or academic adjustments consistent with the Americans with Disabilities Act. Students who feel they may not be able to meet one or more of the Essential Functions described below should contact their faculty adviser or Program Director for clarification.

Communication skills

- Communicate effectively in written and spoken English
- Comprehend and respond to both formal and colloquial English person to person, by telephone, and in writing
- Appropriately assess nonverbal and verbal communication
- Maintain body language that portrays alertness, confidence, interest and a professional demeanor
- Relate to students, instructors, patients, and members of the healthcare team, demonstrating calmness and reasoned judgment

Large and small motor skills

- Move freely from one location to another in physical settings such as clinical laboratories, patient care areas, schools, corridors, and elevators
- Use computers in data entry, administration, and education with facility
- Perform delicate manipulations of specimens, instruments, and tools with facility and accuracy
- Grasp and release small objects (e.g. test tubes, pipette tips, microscope slides and coverslips); twist and turn dials/knobs (e.g. on microscopes, balances, centrifuges, spectrophotometers)
- Manipulate other laboratory materials (e.g. reagents and automated pipettes)

Professional and application skills

- Follow written and verbal directions
- Apply mathematical skills necessary in job related problems
- Work independently and with others under time constraints
- Prioritize requests and work concurrently on at least two different tasks and react to changing roles quickly
- Maintain alertness and concentration during a normal work period
- Apply knowledge, skills, and values learned from course work and life experiences to new situations
- Exercise good judgment, function effectively and display flexibility under stress, (eg. frequent interruptions, noise levels and unexpected situations)
- Recall, interpret, analyze, synthesize, evaluate and then apply the information obtained from reading, lecture, and discussion materials
- Show respect for self and others
- Project an image of professionalism including appearance, dress, and confidence
- Function effectively using all necessary skills under normal working conditions
- Recognize emergency situations and take appropriate actions
- Work safely with potential chemical, radiological, and biological hazards using the standards established in the department chemical hygiene plan, safety manual, and the blood-borne pathogen policy
- Problem solve and comprehend spatial relationships of structures
- Follow all institutional, local, state and federal regulations related to the medical laboratory
- Students must have the ability to complete reading assignments and search and evaluate the literature
- Maintain student and patient confidentiality

Other physical requirements

- Identify and distinguish objects macroscopically and microscopically, including color and clarity
- Read charts, graphs, and instrument scales/readout devices accurately
- Lift and move objects of at least 20 pounds
- Distinguish objects by touch and temperature

Essential Functions adapted from: Body of Knowledge, American Society of Clinical Laboratory Sciences, 1998.

No applicant with a disability is required to disclose that disability as part of the application process. If reasonable accommodations and/or academic adjustments are required based on a documented disability it is the student's responsibility to contact .

Phone: 978-934-4574

Email: Disability@uml.edu

Admission Requirements

Freshman Entry EP Program

1. A high school diploma
2. High school grades of B (3.0) or better
3. Completion of high school program that is specifically college prep courses which includes English, mathematics, biology, chemistry and physics. It is strongly recommended that incoming freshman take math through pre-calculus or calculus.
4. ?Combined SAT scores totaling at least 1,000 (mathematics and verbal)
5. Evidence of good health through a physical exam that demonstrates the ability of the student to actively participate in all phases of laboratory work.

Freshman Entry DPT/EP program

Students who meet the following qualifications are invited into the DPT/EP program during the admissions process.? Students completing the BS in EP program (4 Years) with an overall and science GPA minimum of 3.4 will continue into the professional (graduate) phase of the DPT program.

1. A high school diploma.
2. High school grades of B+ (3.25) or better.
3. Completion of high school program that is specifically college prep courses which includes English, mathematics, biology, chemistry and physics. It is strongly recommended that incoming freshman take math through pre-calculus or calculus and complete high school physics.
4. Combined SAT scores totaling at least 1,200 (mathematics and verbal).
5. Evidence of good health through a physical exam that demonstrates the ability of the student to actively participate in all phases of laboratory work.

Transfer Admission Requirements

Students may apply to transfer into Exercise Physiology (EP) through two routes; either as external transfers from other schools or as internal transfers from other majors within UMass Lowell.? Admissions are competitive and on a space available basis; overall and science GPAs of 2.7 are required for acceptance, as well as successful completion of one year long science sequence (Anatomy and Physiology I and II, Physiological Chemistry or General Chemistry I and II, and General Physics I and II). It is strongly recommended that transfer students complete college level pre-calculus or calculus prior to transfer.

Pathways into EP for external transfer students:

1. Transfer students can apply to the EP program after completing two semesters with the required overall and science GPA of 2.7 and appropriate science courses. Students must have successfully completed at least one of the year long prerequisite science sequences: Anatomy & Physiology I & II with labs; General Physics I & II with labs; or Physiological Chemistry I and II with labs (or General Chemistry I & II with labs) prior to applying.
2. For admission after three semesters with the required overall and science GPA of 2.7, students must have successfully completed at least one of the year-long prerequisite science sequences: Anatomy & Physiology I & II with labs; General Physics I & II with labs; or Physiological Chemistry I and II with labs (or General Chemistry I & II with labs) and be on track to complete all prerequisite science course sequences before the end of their fourth semester.
3. For admission after four semesters, students must have the required overall and science GPA of 2.7 and have successfully completed all science prerequisites (Anatomy & Physiology I & II with labs; General Physics I & II with labs; or Physiological Chemistry I and II with labs (or General Chemistry I & II with labs).

External transfer students applying to the program should contact the Transfer Admissions Office.

Pathways into EP for internal UMass Lowell transfer students

1. UMass Lowell transfer students can apply to the EP program after completing two semesters with the required overall and science GPA of 2.7 and appropriate science courses. Students must have successfully completed at least one of the year long prerequisite science sequences: Anatomy & Physiology I & II with labs; General Physics I & II with labs; or Physiological Chemistry I and II with labs (or General Chemistry I & II with labs) prior to applying.

2. For admission after three semesters with the required overall and science GPA of 2.7, students must have successfully completed at least one of the year-long prerequisite science sequences: Anatomy & Physiology I & II with labs; General Physics I & II with labs; or Physiological Chemistry I and II with labs (or General Chemistry I & II with labs) and be on track to complete all prerequisite science course sequences before the end of their fourth semester.
3. For admission after four semesters, students must have the required overall and science GPA of 2.7 and have successfully completed all science prerequisites (Anatomy & Physiology I & II with labs; General Physics I & II with labs; or Physiological Chemistry I and II with labs (or General Chemistry I & II with labs). Students must have also successfully completed Intro to EP with a minimum grade of 2.7.

Internal transfer students applying to the program should send an email to the Exercise Physiology Program Director, Dr. Ferrara (Cynthia_Ferrara@uml.edu).

Upon acceptance into the EP program

Once accepted all students are expected to take all remaining science courses at UMass Lowell. Per UMass Lowell policy, taking a course required of the degree at another college or university requires permission of the Program Director prior to taking the course. Such permission will only be given for extenuating circumstances.

Nursing Retention, Continuance, Grading Policies, and Appeals Procedure

Academic Progression Policy

To qualify for continued matriculation in the nursing program, all students must maintain ongoing cumulative averages of 2.70 or better by achieving the following averages at the end of each semester:

1. a semester average of 2.70 or better,
2. not less than a grade C+ in any professional major course and
3. a semester average of 2.70 or better for professional courses attempted in the major. Students enrolled in nursing also must maintain a cumulative grade point average of 2.70 or better in required science courses. Students who fail to satisfy these will be dismissed from the nursing program.

Appeal Process for Program Dismissal

Students who are dismissed from the Baccalaureate Nursing Program may appeal the decision regarding their continuation in the program by submitting a letter of appeal to the Chair of the School of Nursing by the listed due date in their dismissal letter, so it can be forwarded to the Professional Review Committee. The appeal letter should address what happened, how it happened, what options you would like the committee to consider, and what resources you will use to be successful in the nursing program should you be allowed to continue. You may either bring your letter of appeal to the School of Nursing in HSSB-209 or send it as an attachment to Sadia_Fathi@uml.edu, Administrative Assistant. After carefully deliberating all the data available, the Committee will make their recommendations and a decision will be sent prior to the beginning of the semester to your University of Massachusetts Lowell email address.

Students must meet the conditions for continuation in the School of Nursing as described in their detailed probation conditions correspondence and per the undergraduate course catalog on Retention and Continuance in the College of Health Sciences and its Programs; this is a one-time probationary period. Failure to maintain all School and Department academic requirements subsequent to that, as outlined in the catalog will result in dismissal from the program with no further appeal to the School of Nursing.

Students who cannot continue in the Nursing Program must withdraw from all enrolled nursing courses and change their major. Students may select and apply for another major within the university if they qualify under university policies. The services of the Centers for Learning and the Office of Career Services are available to students for individual career counseling and guidance and to discuss other career options. Students also may choose to meet with the Counseling Center at UMass Lowell, which provides psychological counseling services, consultation and community referrals to help students gain a better understanding of and cope with their feelings, relationships, choices and academic studies. If you do not wish to remain at the university in another major, you must notify the Office of the Registrar by completing the [online withdrawal form](#) from .

HESI Policy

All pre-licensure nursing students will be required to take nationally normed tests throughout the curriculum. The specialty tests, which become part of the course grade, will be given in the following courses: Nursing Fundamentals, Pathophysiology, Health Promotion and Risk Reduction of Families I and II, and Pharmacology. In the final semester of the nursing program, students will be required to take a nationally normed comprehensive examination and this test score becomes part of the course grade.

All pre-licensure senior level-nursing students who are registered for the spring term will take a HESI Exit Exam while enrolled in 33.413 Role Transition. Those students who do not achieve the passing score of 90% on the first examination will be required to take a second HESI Exit Exam. If students who pass the first exam wish to take the second exam they will be able to do so. The HESI Exit Exam will be part of the final course grade in the 33.413 Role Transition theory course. If two exams are taken, the highest grade will be utilized. (Registered Nurse students are exempt).

Senior nursing students who do not achieve a HESI score of 800 or higher on the first HESI exit (comprehensive) exam must register for an approved review course and provide a copy of the course certificate prior to taking the second HESI exit exam.

Basic Math Competency Policy

All freshman and transfer students who are entering the nursing program, including those students who are on the waiting list for their junior year, must take and pass a basic math competency exam with a score of 90% or better. Students who do not achieve a successful score of 90% on the basic math competency exam will be required to take and pass a math enrichment course with a grade of 3.3 or higher. Students who do not achieve a score of 3.3 or higher will not be allowed to continue in the nursing program, and have no right to appeal this determination. (Registered Nurse students are exempt).

Medication Calculation Examination Policy

All pre-licensure nursing students must take and pass three medication calculation exams with a score of 90% or higher. An exam will be given in each semester of the junior year and in the fall semester of the senior year. In each of these semesters, students who do not achieve a successful score of 90% or higher on the first examination will be given a second opportunity to take an examination. Those students who do not pass the retake medication calculation examination at 90% will fail that clinical practicum. All second opportunity medication calculation exams will be given prior to entering the next clinical course. Students who fail this second exam will be unable to continue on the nursing program. (Registered Nurse students are exempt).

Transfer Policies for Registered Nurses

The School of Nursing is committed to encouraging registered nurses who possess a diploma or an associate degree to return for further study leading to a baccalaureate degree with a major in nursing.

Application for admission to the full-time day program of the University is made through the Admissions Office. Acceptance of credit for transfer courses is determined by the Chairperson of the Department, once official transcripts have been received. Several articulation agreements have been signed with associate degree programs in nursing. Course descriptions may be requested by the appropriate department chairperson to determine if courses meet specific curriculum requirements. Completed transfer of credit forms become a part of the students' transcripts.

Part time study is available to registered nurses through the day school and summer school. Faculty are available to advise prospective students upon request.

Registered nurses entering the Department through transfer admissions must meet the same requirements as other students, namely a 2.7 overall cumulative average and a 2.7 science cumulative average. A photocopy of current nursing license, current CPR certification and insurance coverage must be submitted to the Department, and a record of continuous coverage for both documents must be provided according to expiration dates.

Registered nurses are encouraged to utilize the opportunity to gain credit for previous learning through CLEP or equivalency examinations. All students must take 33.307 Concepts for Baccalaureate Nursing.

Registered Nurses who are graduates of diploma and associate nursing programs may be awarded advanced standing through a combination of transcript evaluation, course equivalency procedures, examinations, and/or articulation agreements for the following courses:

- 35.251 Physiological Chemistry I*
- 35.252 Physiological Chemistry II*
- 35.253 Physiological Chemistry Lab I*
- 35.254 Physiological Chemistry Lab II*
- 42.101 College Writing I
- 42.102 College Writing II

OR

- 30.201 Community Health
- 30.206 Human Nutrition
- 30.306 Introduction to Gerontology
- 35.101 Anatomy & Physiology I*
- 35.102 Anatomy & Physiology II*
- 35.103 Anatomy & Physiology I*
- 35.104 Anatomy & Physiology Lab II*
- 35.211 Microbiology*
- 35.213 Microbiology Lab*
- 47.101 General Psychology
- 47.260 Human Development I
- 48.101 Introduction to Sociology
- 84.121 General Chemistry I*
- 84.122 General Chemistry II*
- 84.123 General Chemistry Lab I*
- 84.124 General Chemistry Lab II*
- 92.283 Statistics for Behavioral Science

*Students must achieve a minimum cumulative grade point average of 2.7 in the combination of science courses identified.

Withdrawal from Nursing

