Welcome to the online academic catalog for the University of Massachusetts Lowell. The catalog includes all of the policies, requirements and course descriptions for graduate, undergraduate and continuing studies programs.

Choose a career path to view the appropriate academic catalog.

- Undergraduate
- Graduate
- Continuing Studies

Disclaimer

The Administration of the University of Massachusetts Lowell reserves the right to change any of the regulations, subjects or curricula, or portions thereof, contained in its catalogs without prior notice.

Arabic Studies Minor

Contact: Department of Cultural Studies
Phone: 978-934-4701
Office: Coburn Hall 113

The Arabic Studies Minor introduces students to critical approaches to the study of Islam, Muslim societies and cultures of the Middle East. The goal of this interdisciplinary minor in the humanities and social sciences is to broaden and deepen students’ understanding of Arabic societies and cultures in order to meet the demands of business, government and academia for skilled specialists in the language, culture, history and politics of the Middle East.

A minor in Arabic Studies consists of 18 to 24 credits (6 to 8) courses, at least two courses at the 300 level from the section of electives, including the following requirements:

Required Language courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.115</td>
<td>Arabic I and Culture</td>
</tr>
<tr>
<td>53.116</td>
<td>Arabic II and Culture</td>
</tr>
<tr>
<td>53.215</td>
<td>Arabic III and Culture</td>
</tr>
<tr>
<td>53.216</td>
<td>Arabic IV and Culture</td>
</tr>
</tbody>
</table>

Selection of Electives

Students may take 2 to 4 courses from the list below, two of which (6 credits) must be at the 300 level or above:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.393</td>
<td>History of the Middle East and Islamic World</td>
</tr>
<tr>
<td>45.296</td>
<td>Intro to World Religions</td>
</tr>
<tr>
<td>45.328</td>
<td>Justice, Trauma and War</td>
</tr>
<tr>
<td>46.233</td>
<td>Islam and Politics</td>
</tr>
<tr>
<td>46.334</td>
<td>Islam and Politics</td>
</tr>
<tr>
<td>46.368</td>
<td>Middle Eastern Politics</td>
</tr>
<tr>
<td>46.389</td>
<td>Politics and Terrorism</td>
</tr>
<tr>
<td>46.402</td>
<td>Women in Islam</td>
</tr>
<tr>
<td>46.406</td>
<td>Research Seminar: Middle East Politics</td>
</tr>
<tr>
<td>48.234</td>
<td>Study of Minorities</td>
</tr>
<tr>
<td>52.315</td>
<td>Islam and Medieval World</td>
</tr>
<tr>
<td>53.494</td>
<td>Directed Studies in Arabic</td>
</tr>
<tr>
<td>59.315</td>
<td>Islamic Culture</td>
</tr>
</tbody>
</table>
Asian Studies Minor

Coordinator: George Chigas, Ph.D.
Email: George.Chigas@uml.edu
Phone: 978-934-4341
Office: Coburn Hall 113B

Asian Studies is an interdisciplinary minor that explores the complex interaction between artistic, cultural, political, social, literary and religious spheres of life in Asia. Emphasis is placed not only on the diversity and achievements of Asian civilizations, but also on the ways an understanding of Asia may shed new light on western cultural traditions. Asian Studies encompasses the geographical areas of East Asia, South Asia, and Southeast Asia and includes courses that address the Asian American experience. Asian Studies minor courses are based primarily in the humanities and social sciences; classes other than language courses are taught in English. The minor is open to all students.

Students selecting an Asian Studies Minor are required to complete 6 to 8 courses (18 to 24 credits) in two or more disciplines; 6 credits must be at the 300 levels or above. Students are encouraged, but not required, to take an Asian language as part of the minor.

Cultural Studies Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.135</td>
<td>Cambodian Language and Culture (1 - 4)</td>
</tr>
<tr>
<td>53.493</td>
<td>Directed Study in Cambodian Culture</td>
</tr>
<tr>
<td>53.105</td>
<td>Chinese Language and Culture (1-4)</td>
</tr>
<tr>
<td>53.101</td>
<td>Japanese Language and Culture (1-4)</td>
</tr>
<tr>
<td>53.492</td>
<td>Directed Study in Japanese Literature</td>
</tr>
<tr>
<td>58.205</td>
<td>Studies in World Art</td>
</tr>
<tr>
<td>58.331</td>
<td>Asian Art</td>
</tr>
<tr>
<td>59.105</td>
<td>Comparative Arts</td>
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History Courses

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<tr>
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<tbody>
<tr>
<td>43.204</td>
<td>China and the Modern World</td>
</tr>
<tr>
<td>43.207</td>
<td>Women in China</td>
</tr>
<tr>
<td>43.242</td>
<td>World War II</td>
</tr>
<tr>
<td>43.320</td>
<td>American East Asian Relations</td>
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Political Science Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>46.316</td>
<td>Politics and Film</td>
</tr>
<tr>
<td>46.348/59.349</td>
<td>Literature, Politics and Genocide in Cambodia</td>
</tr>
<tr>
<td>46.361</td>
<td>Southeast Asian Politics</td>
</tr>
<tr>
<td>46.363</td>
<td>Politics of China</td>
</tr>
<tr>
<td>46.376</td>
<td>Democratic Movements in Southeast Asia</td>
</tr>
<tr>
<td>46.377</td>
<td>China and India in the Global Economy</td>
</tr>
</tbody>
</table>

Philosophy Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>45.296</td>
<td>Introduction to World Religions</td>
</tr>
<tr>
<td>45.340</td>
<td>Mysticism East and West</td>
</tr>
<tr>
<td>45.371</td>
<td>Buddhist and Zen Philosophy</td>
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</table>

Literature

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>42.277</td>
<td>American Ethnic Literature</td>
</tr>
<tr>
<td>42.378</td>
<td>Asian American Literature</td>
</tr>
</tbody>
</table>

Comparative Arts Minor

The Comparative Arts concentration surveys some of the fundamental aspects of music, literature, culture, and art; such as the nature of
aesthetic judgement, the task of art, literature and music criticism, including formalist, representational, and contemporary theories on viewing, analyzing, and interpreting the arts. In addition, with comparative analysis between the modes of visual, literary, and aural representation, different aspects of artistic theories are investigated. The concentration analyzes the principal forms and genres of the visual, literary, and aural elements in various cultural disciplines, providing and understanding for human creativity and expression.

Bachelor of Liberal Arts with a Comparative Arts Concentration consists of the following:

- a selection of two disciplines or concentrations within the BLA list of concentrations. One of the concentrations must be Comparative Arts [24 to 30 credits]
- a second concentration is selected according to the student's interest [24 to 30 credits]
- a completion of the competency requirement [12 credits].
- an overall GPA of 2.5 is required
- no minor is permitted

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>42.210</td>
<td>Drama</td>
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<tr>
<td>42.211</td>
<td>Poetry</td>
</tr>
<tr>
<td>42.218</td>
<td>Comedy</td>
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<tr>
<td>42.219</td>
<td>Tragedy</td>
</tr>
<tr>
<td>42.230</td>
<td>Film Classics</td>
</tr>
<tr>
<td>42.276</td>
<td>Irish American Literature</td>
</tr>
<tr>
<td>45.311</td>
<td>Philosophy and Literature</td>
</tr>
<tr>
<td>46.315</td>
<td>Politics of Arts and Culture</td>
</tr>
<tr>
<td>46.317</td>
<td>Politics and Music</td>
</tr>
<tr>
<td>45.333</td>
<td>Symbols and Society</td>
</tr>
<tr>
<td>48.260</td>
<td>Mass Media &amp; Communications</td>
</tr>
<tr>
<td>52.335</td>
<td>Cinema and the Italian Americans</td>
</tr>
<tr>
<td>50.376</td>
<td>French Cinema and Society</td>
</tr>
<tr>
<td>53.314</td>
<td>Philosophy and Science Fiction</td>
</tr>
<tr>
<td>58.101</td>
<td>Art Appreciation</td>
</tr>
<tr>
<td>58.105</td>
<td>Comparative Arts</td>
</tr>
<tr>
<td>58.300</td>
<td>Art History, Music and Culture</td>
</tr>
<tr>
<td>58.305</td>
<td>Theater in the Visual Arts</td>
</tr>
<tr>
<td>58.370</td>
<td>Art History and Film</td>
</tr>
<tr>
<td>59.494</td>
<td>Directed Studies in Comparative Arts</td>
</tr>
<tr>
<td>59.495</td>
<td>Advanced Tutorial in Comparative Arts</td>
</tr>
<tr>
<td>59.496</td>
<td>Practicum in Comparative Arts</td>
</tr>
<tr>
<td>74.356</td>
<td>American Musical Theater</td>
</tr>
<tr>
<td>74.466</td>
<td>Music of the Early Twentieth Century</td>
</tr>
</tbody>
</table>

Course Listing Comparative Arts

Cultural Studies Minor

Contact: Department of Cultural Studies
Phone: 978-934-4701
Office: Coburn Hall 113

The interdisciplinary minor in Cultural Studies requires 18-24 credits of coursework. At least six credits must be from courses which are numbered 300 or above.

The courses offered in this program are interdisciplinary in their content and structure and explore a topic in greater depth and from broader perspectives than is ordinarily possible in other courses. Many courses are team-taught by faculty chosen from various academic departments and colleges within the University. Courses emphasize the sources (artistic, literary, philosophical, and historical) of the period studied and focus on the aspirations and achievements of our own civilization.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>59.110</td>
<td>Foundations of Cultural Studies</td>
</tr>
<tr>
<td>59.205</td>
<td>Human Values in Western Culture I</td>
</tr>
<tr>
<td>59.206</td>
<td>Human Values in Western Culture II</td>
</tr>
<tr>
<td>59.208</td>
<td>Cultural Studies I</td>
</tr>
<tr>
<td>59.209</td>
<td>Cultural Studies II</td>
</tr>
<tr>
<td>59.248</td>
<td>Values in American Culture</td>
</tr>
<tr>
<td>59.313</td>
<td>The Culture of Ancient Greece</td>
</tr>
<tr>
<td>59.314</td>
<td>Society and Culture in the Early Middle Ages</td>
</tr>
</tbody>
</table>
Environment and Society Minor

Environment and Society is an interdisciplinary minor that provides students with analytical and communication skills, as well as the scientific foundation needed to succeed in environmental planning, environmental policy, environmental philosophy, sustainable development, environmental education, and other fields. Topics explored include climate change, sustainability, resource rights, law and regulation, environmental ethics, and the role of environmental issues in domestic and international conflicts.

Students are encouraged to participate in collaborative environmental research and service projects with government agencies, non-profit organizations, local businesses and other environmental actors such as state and national park systems.

A minor in Environment and Society requires completion of a minimum of 18 credits of coursework distributed as follows:

**REQUIREMENTS:** One foundation course and one capstone

**Foundation course (one social science)**

- Social Science Foundation Course (required)
  
  46.175 Introduction to Environmental Politics (Political Science)

  *(NB: Formerly "Introduction to Environmental Studies." We have requested the name change to eliminate confusion between Environment and Society and the Environmental Studies Program housed in EEAS (Environmental, Earth, and Atmospheric Sciences).)*

**1 Capstone course (choose 1 of following)**

- 81.416 Climate Change: Science, Communication, and Solutions
- 59.497 Directed Study in Environmental Policy

**STRONGLY RECOMMENDED**

In addition to three semesters of Gen Ed science, students are strongly urged to take a fourth science foundation course, such as

- 85.141 Weather and Climate
- 81.315 Principles of Ecology (with permission from instructor)
- 81.317 Principles of Ecology Laboratory

**ELECTIVE COURSES:** 3—4 courses selected from this list or by permission

Depending on whether student has elected the highly recommended 4th science course, student must select 3 or 4 courses from these regularly offered courses:

- 31.313 Principles of Environmental Health
- 41.367 Environmental Law
- 43.316 American Environmental History
- 45.327 Environmental Philosophy
- 46.357 Thoreau in Our Time
- 46.358 Global Environmental Policy
- 48.236 Environmental Sociology
- 48.330 Fast Food, Hot Planet: Sociological Approaches to Climate Change, Food Justice, and Community Sustainability
- 49.315 Intro to Environmental Economics
- 57.211 Sustainable Development
- 57.518 Comparative Environmental Studies
- 57.539 Justice and Trade in the Global Economy

**GOVERNANCE**
The Environment and Society minor is housed in the Sociology Department, and coordinated with the Political Science Department. The Environment and Society minor works in tandem with the Environmental Health minor (School of Health Sciences) and the Climate Change/Sustainability minor (Environmental, Earth, and Atmospheric Sciences) to ensure the best programmatic fit for each student.

The Environment and Society minor collaborates with the Climate Change Initiative to advance UML's Climate Action Plan, and to serve the region, the state, and beyond.

Contact:
Charlotte Ryan, Sociology Dept.
Email: Charlotte_Ryan@uml.edu

Susan Gallagher, Political Sciences Dept.
Email: Susan_Gallagher@uml.edu

- Course Listing Environment and Society

Film Studies Minor

Contact: Maria Matz, Ph.D., Coordinator, Department of Cultural Studies
Phone: 978-934-4364
Office: Coburn Hall, Room 113C

The interdisciplinary minor in Film Studies consists of 18-24 credits. Six credits must be at the 300 level or above. Courses relevant to the Film Studies minor are listed below. For course descriptions, see the department listing as indicated next to the course title. Additional courses to complete the required credits may be selected from the following list or other course listings in this catalog.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.386</td>
<td>Intellectual Property</td>
</tr>
<tr>
<td>41.372</td>
<td>Sports, Entertainment and Art Law</td>
</tr>
<tr>
<td>41.489</td>
<td>Seminar in Law: Visual Fine Arts</td>
</tr>
<tr>
<td>42.230</td>
<td>Film Classics</td>
</tr>
<tr>
<td>42.232</td>
<td>Turning Fiction into Film</td>
</tr>
<tr>
<td>42.241</td>
<td>Women in Film</td>
</tr>
<tr>
<td>42.341</td>
<td>Studies in Film</td>
</tr>
<tr>
<td>43.347</td>
<td>History of Documentary Film</td>
</tr>
<tr>
<td>43.348</td>
<td>Making an Historical Documentary</td>
</tr>
<tr>
<td>43.389</td>
<td>Ancient History in Film</td>
</tr>
<tr>
<td>45.316</td>
<td>Philosophy and Film</td>
</tr>
<tr>
<td>45.314</td>
<td>Philosophy of the Gothic Imagination</td>
</tr>
<tr>
<td>46.316</td>
<td>Politics and Film</td>
</tr>
<tr>
<td>48.112</td>
<td>Sociology goes to the movies</td>
</tr>
<tr>
<td>48.285</td>
<td>Film: From Gangster to Noir</td>
</tr>
<tr>
<td>50.340</td>
<td>Contemporary French Cinema</td>
</tr>
<tr>
<td>50.376</td>
<td>French Cinema &amp; Society (Gen. Ed)</td>
</tr>
<tr>
<td>50.378</td>
<td>Women in French Cinema</td>
</tr>
<tr>
<td>50.380</td>
<td>Francophone Identity through Cinema</td>
</tr>
<tr>
<td>52.335</td>
<td>Cinema &amp; the Italian Americans</td>
</tr>
<tr>
<td>52.374</td>
<td>Classics of Italian Cinema</td>
</tr>
<tr>
<td>52.378</td>
<td>Italian Cinema &amp; Culture</td>
</tr>
<tr>
<td>52.380</td>
<td>Italian Cinema: Directors &amp; Themes</td>
</tr>
<tr>
<td>54.374</td>
<td>Spanish Films: Short Takes</td>
</tr>
<tr>
<td>54.371</td>
<td>Hispanic Literature and Film</td>
</tr>
<tr>
<td>54.375</td>
<td>Latin American and Spanish Cinema</td>
</tr>
<tr>
<td>58.225</td>
<td>History of Picturing</td>
</tr>
<tr>
<td>58.370</td>
<td>Art History &amp; Film</td>
</tr>
<tr>
<td>59.374</td>
<td>Cinema Across Cultures</td>
</tr>
<tr>
<td>79.380</td>
<td>Understanding Movies: Cinema as Social Commentary</td>
</tr>
</tbody>
</table>

The list of approved courses may change from time to time depending on the offerings of the several departments involved; students should check with the appropriate coordinator to see which courses are currently approved.

Course Listing Film Studies
Gender Studies Minor

Gender affects everything in our lives: personal relationships, job opportunities, worldview, economic conditions, self-esteem, safety, etc. In our program, students learn how ideas about gender shape our knowledge of the world and our experience of everyday life. Gender Studies courses explore how research on gender (and its intersection with race, class, sexual orientation, age, and culture) has transformed our understanding of social institutions, human behavior, cultural expression, and intellectual inquiry.

The Gender Studies Program at University of Massachusetts Lowell is offered by the College of Arts and Sciences: Division of Fine Arts, Humanities, and Social Sciences, but any University of Massachusetts Lowell student can participate. Our curriculum is comprised of a wide range of designated courses in these departments: Criminology & Justice Studies, Cultural Studies, Economics, English, History, Legal Studies, Music, Philosophy, Political Science, Psychology, ESDR, and Sociology. Students create an individualized program to match their interests and career goals.

For assistance or information: Dr. Andrea Dottolo, Psychology Department and Director of Gender Studies.

Minor Requirements

The Gender Studies minor requires 18-24 credits in designated interdisciplinary courses. 6 credits must be taken at the 300 level or above. Gender Studies minors may also take courses within their major and designate them for the Gender Studies minor provided that the total number of credits in their major does not exceed 45 of the 120-credit minimum required for graduation.

Bachelor of Liberal Arts Concentration

A Bachelor of Liberal Arts concentration in Gender Studies requires 24-30 credit hours in designated interdisciplinary courses. At least half of these courses must be taken at the 300 level or above.

For more information on the program visit Gender Studies or email: genderstudies@uml.edu.

Courses

Required Course

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNDR.240</td>
<td>Introduction to Gender Studies</td>
</tr>
</tbody>
</table>

Gender Studies Courses

The following courses are approved for the Gender Studies Minor. Please note that new courses are approved each semester, and not all of the courses below are offered every semester.

Course descriptions may be found in the undergraduate catalog by linking to the appropriate department.

NOTE: The prefix for Introduction to Gender Studies (#240) varies according to the department in which it is taught.

American Studies
Legal Studies
English
History
Criminology & Justice Studies
Philosophy
Political Science
Psychology
Sociology
Modern Languages
Cultural Studies
Economic & Social Development of Regions
Music
Art
Honors
Gender Studies
Other Interdisciplinary Courses

American Studies

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>40.270</td>
<td>Women in American History</td>
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Legal Studies

<table>
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<tr>
<td>41.376</td>
<td>Family Law</td>
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<tr>
<td>41.381</td>
<td>Women &amp; the Law</td>
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### English

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>42.240</td>
<td>Literature and Women</td>
</tr>
<tr>
<td>42.241</td>
<td>Women and Film</td>
</tr>
<tr>
<td>42.243</td>
<td>Contemporary Women Writers</td>
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<tr>
<td>42.244</td>
<td>Women in the Middle Ages and Renaissance</td>
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<td>42.246</td>
<td>Gay/Lesbian Literature</td>
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<td>42.257</td>
<td>The Family in Literature</td>
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<td>42.328</td>
<td>Writing About Women</td>
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<tr>
<td>42.335</td>
<td>American Women Novelists</td>
</tr>
<tr>
<td>42.342</td>
<td>Women Writers and the Past</td>
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<td>42.345</td>
<td>British Women Novelists</td>
</tr>
<tr>
<td>42.395</td>
<td>Special Topics in English: Medieval Women Writers</td>
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<tr>
<td>42.395</td>
<td>Special Topics in English: Visual Rhetoric</td>
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### History

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<td>Women in China</td>
</tr>
<tr>
<td>43.228</td>
<td>Women in European History</td>
</tr>
<tr>
<td>43.270</td>
<td>Women in American History</td>
</tr>
<tr>
<td>43.301</td>
<td>The World of Things: Consumer Culture in the Modern West</td>
</tr>
<tr>
<td>43.319</td>
<td>Women, Gender and Science</td>
</tr>
<tr>
<td>43.338</td>
<td>War and Memory in Twentieth Century France</td>
</tr>
<tr>
<td>43.380</td>
<td>Work and Society</td>
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<td>43.385</td>
<td>Kennedy Presidential Politics</td>
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### Criminology & Justice Studies

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<td>44.360</td>
<td>Gender, Race, and Crime</td>
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<tr>
<td>44.422</td>
<td>Victimology</td>
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<tr>
<td>44.477</td>
<td>Intimate Partner Violence</td>
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### Philosophy

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<td>45.306</td>
<td>Feminist Theory Politics</td>
</tr>
<tr>
<td>45.360</td>
<td>The Goddess in World Religion</td>
</tr>
<tr>
<td>45.367</td>
<td>Feminism and Liberalism</td>
</tr>
<tr>
<td>45.375</td>
<td>Philosophy of Sex and Love</td>
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</table>

### Political Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
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<tr>
<td>46.220</td>
<td>Gender and Politics</td>
</tr>
<tr>
<td>46.225</td>
<td>Gender, Culture &amp; Politics</td>
</tr>
<tr>
<td>46.230</td>
<td>Law and the Legal System</td>
</tr>
<tr>
<td>46.320</td>
<td>Gender Law and Politics</td>
</tr>
<tr>
<td>46.325</td>
<td>Terrorism Seminar</td>
</tr>
<tr>
<td>46.326</td>
<td>Gender, Law, and Politics</td>
</tr>
<tr>
<td>46.327</td>
<td>Dynamics of Sexual Politics</td>
</tr>
<tr>
<td>46.330</td>
<td>Political Society and Technology Alternatives Seminar</td>
</tr>
<tr>
<td>46.336</td>
<td>Privacy and Politics</td>
</tr>
<tr>
<td>46.402</td>
<td>Women in Islam</td>
</tr>
<tr>
<td>46.406</td>
<td>The Politics of Identity in the Middle East</td>
</tr>
</tbody>
</table>

### Psychology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>47.335</td>
<td>Psychology and Women</td>
</tr>
<tr>
<td>47.351</td>
<td>Human Sexuality</td>
</tr>
<tr>
<td>47.523</td>
<td>Women in the Community</td>
</tr>
</tbody>
</table>

### Sociology
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>48.225</td>
<td>Sociology of Disability</td>
</tr>
<tr>
<td>48.231</td>
<td>Sociology of the Family</td>
</tr>
<tr>
<td>48.240</td>
<td>Sociology of Gender</td>
</tr>
<tr>
<td>48.242</td>
<td>Introduction to Gender Studies</td>
</tr>
<tr>
<td>48.305</td>
<td>Sociology of Family Law</td>
</tr>
<tr>
<td>48.362</td>
<td>Social Welfare Policy</td>
</tr>
<tr>
<td>48.370</td>
<td>Women in Society</td>
</tr>
<tr>
<td>48.405</td>
<td>Feminist Methodologies</td>
</tr>
<tr>
<td>48.410</td>
<td>Seminar on Sex and Gender</td>
</tr>
</tbody>
</table>

**Modern Languages**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>50.378</td>
<td>Women in French Cinema</td>
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</table>

**Cultural Studies**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>52.330</td>
<td>Italian Women Writers</td>
</tr>
<tr>
<td>54.335</td>
<td>Spanish Women Writers in Translation</td>
</tr>
<tr>
<td>58.340</td>
<td>Women &amp; Art</td>
</tr>
<tr>
<td>58.345</td>
<td>Pre-Raphaelite Art</td>
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</table>

**Economic and Social Development of Regions**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>57.353</td>
<td>Managing Workforce Diversity</td>
</tr>
<tr>
<td>57.420</td>
<td>Gender, Work and Public Policy</td>
</tr>
<tr>
<td>57.504</td>
<td>Gender Differences at Work</td>
</tr>
<tr>
<td>57.525</td>
<td>Gender, Work and Public Policy</td>
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**Music**

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>74.103</td>
<td>Gender Issues in Music</td>
</tr>
<tr>
<td>74.455</td>
<td>Women in Music</td>
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**Art**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>79.380</td>
<td>Understanding Movies: Cinema as Social Commentary</td>
</tr>
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**Honors**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>HON.320</td>
<td>Seminar: Special Topics in Honors</td>
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**Gender Studies**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>GNDR.200</td>
<td>Special Topics in Gender Studies (200-level)</td>
</tr>
<tr>
<td>GNDR.240</td>
<td>Introduction to Gender Studies</td>
</tr>
<tr>
<td>GNDR.300</td>
<td>Special Topics in Gender Studies (300-level)</td>
</tr>
<tr>
<td>GNDR.301</td>
<td>Gay and Lesbian Studies</td>
</tr>
<tr>
<td>GNDR.401</td>
<td>Practicum</td>
</tr>
<tr>
<td>GNDR.410</td>
<td>Directed Studies (400-level)</td>
</tr>
<tr>
<td>GNDR.490</td>
<td>Seminar in Gender Studies</td>
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</tbody>
</table>

**Other Interdisciplinary Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>59.239</td>
<td>Introduction to Gender Studies</td>
</tr>
<tr>
<td>59.240</td>
<td>Introduction to Gender Studies</td>
</tr>
<tr>
<td>59.307</td>
<td>Gender Issues in 19th Century American Literature and Popular Culture</td>
</tr>
<tr>
<td>59.308</td>
<td>Gender Issues in 20th Century American Literature and Popular Culture</td>
</tr>
<tr>
<td>59.310</td>
<td>Gender Violence in the United States</td>
</tr>
<tr>
<td>59.311</td>
<td>Men, Women, &amp; the Military</td>
</tr>
<tr>
<td>59.312</td>
<td>Issues in Human Reproduction</td>
</tr>
<tr>
<td>59.322</td>
<td>Gender, Work &amp; Family</td>
</tr>
<tr>
<td>59.340</td>
<td>Women in Art</td>
</tr>
</tbody>
</table>
Italian Studies Minor

Contact: Department of Cultural Studies
Phone: 978-934-4701
Office: Coburn Hall 113

The interdisciplinary minor in Italian Studies consists of 18-24 credits of coursework. Six credits at the 200 level or above are required for the Italian language component. At least six credits at the 300 level or above must be taken outside of the Italian language component. For course descriptions, see the department listing as indicated next to the course title.

Course Listing Italian Studies

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.331</td>
<td>Renaissance and Reformation</td>
</tr>
<tr>
<td>52.310</td>
<td>Special Topics in Italian Studies</td>
</tr>
<tr>
<td>52.325</td>
<td>Italian American Literature and Culture</td>
</tr>
<tr>
<td>52.330</td>
<td>Italian Women Writers</td>
</tr>
<tr>
<td>52.335</td>
<td>Cinema and the Italian Americans</td>
</tr>
<tr>
<td>52.371</td>
<td>Dante’s Divine Comedy</td>
</tr>
<tr>
<td>52.373</td>
<td>Italian Humanism</td>
</tr>
<tr>
<td>52.374</td>
<td>Classics of Italian Cinema</td>
</tr>
<tr>
<td>52.376</td>
<td>Pirandello: Theater and Influence</td>
</tr>
<tr>
<td>52.378</td>
<td>Italian Cinema and Culture</td>
</tr>
<tr>
<td>52.380</td>
<td>Italian Cinema: Directors and Themes</td>
</tr>
<tr>
<td>58.308</td>
<td>Art, Science and Technology in the Renaissance</td>
</tr>
<tr>
<td>58.321</td>
<td>Italian Renaissance Art</td>
</tr>
<tr>
<td>58.322</td>
<td>Baroque Art in Italy</td>
</tr>
<tr>
<td>58.330</td>
<td>Italian Mannerist Art</td>
</tr>
</tbody>
</table>

Latin American Studies Minor

Coordinator: Dr. Maria Matz - Professor of Spanish & Latin American Studies
Office - Coburn Hall #113C
Phone 978-934-4364
Email: Maria_Matz@uml.edu

Courses for a minor field in Latin American studies are selected in consultation with Professor Maria Matz of the Cultural Studies Department from a list of approved courses in history, economics, languages, and literature. Six credits at the 200 level or above are required for the Spanish language component. Coursework for the Latin American Studies minor must meet the following distribution requirement:

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish Language</td>
<td>6 credits</td>
</tr>
<tr>
<td>History/Economics</td>
<td>6-9 credits</td>
</tr>
<tr>
<td>Latin American Literature</td>
<td>6-9 credits</td>
</tr>
</tbody>
</table>

At least six hours in non-language courses must be taken in course work at the 300 level or above.

Students majoring in Spanish or Modern Languages (with Spanish option) may elect the Latin American studies minor but may not offer any course in Spanish language or literature (prefix: 54) as part of the 18-24 semester credits

Course Listing Latin American Studies

Technology, Society, and Human Values Minor

Technology, Society and Human Values is an interdisciplinary program that unites development theories with practice by integrating classroom learning and research with regional, national, and international economic and social development projects and research in which the faculty are engaged. Courses are taught in an interdisciplinary manner, with faculty trained in economics, history, planning, political science, psychology and sociology.

The program prepares students to assume professional roles involving research, consulting, and strategic planning in business, in local, state, national, and international development and planning agencies, and in nonprofit organizations working on economic and social development. Students, if they choose to continue their education, will be prepared to continue matriculation in a wide variety of graduate programs in the sciences, social sciences and humanities, including management and public policy.

Office of the Registrar
83 Broadway Street, Dugan 101, Lowell, MA 01854-5129
Theater Arts Minor

The interdisciplinary program in Theater Arts offers coursework in acting, directing, design, playwriting, technical theater, theater history, and dramatic literature.

Students may pursue Theater Arts either as a Minor or as a Concentration within the Bachelor of Liberal Arts major. The Minor requires 18 to 24 credits, with 6 credits at the 300 level or above. The BLA Concentration requires 24 to 30 credits, half of which must be at the 300 level or above.

For additional information contact the Theater Arts Program Director:
Nancy Selleck, Ph.D
Phone: 978-934-4185
Office: O'Leary Library - Room 449.

Courses should be distributed among the following 3 categories:

**Production Credit (at least 3 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEA.311</td>
<td>Play Production (3 cr)</td>
</tr>
<tr>
<td>THEA.493</td>
<td>Practicum in Theater</td>
</tr>
</tbody>
</table>

**Theater Arts workshops (at least 6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.233</td>
<td>Play Analysis</td>
</tr>
<tr>
<td>42.304</td>
<td>Playwriting</td>
</tr>
<tr>
<td>42.367</td>
<td>Advanced Playwriting</td>
</tr>
<tr>
<td>THEA.221</td>
<td>Stagecraft</td>
</tr>
<tr>
<td>THEA.261</td>
<td>Acting I</td>
</tr>
<tr>
<td>THEA.262</td>
<td>Acting II</td>
</tr>
<tr>
<td>THEA.265</td>
<td>Voice and Movement for Actors</td>
</tr>
<tr>
<td>THEA.343</td>
<td>Directing Workshop</td>
</tr>
<tr>
<td>THEA.401</td>
<td>Topics in Theater</td>
</tr>
<tr>
<td>THEA.311</td>
<td>Play Production</td>
</tr>
<tr>
<td>THEA.490</td>
<td>Performance Practicum (1 cr)</td>
</tr>
<tr>
<td>THEA.494</td>
<td>Directed Study in Theater</td>
</tr>
</tbody>
</table>

**Dramatic Literature/Theater History (at least 6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.218</td>
<td>Comedy</td>
</tr>
<tr>
<td>42.348</td>
<td>Modern American Drama</td>
</tr>
<tr>
<td>42.357</td>
<td>African-American Theater</td>
</tr>
<tr>
<td>42.359</td>
<td>Contemporary World Theater</td>
</tr>
<tr>
<td>42.360</td>
<td>Medieval and Renaissance Theater</td>
</tr>
<tr>
<td>42.361</td>
<td>Restoration Comedy</td>
</tr>
<tr>
<td>42.362</td>
<td>Modern Drama</td>
</tr>
<tr>
<td>42.363</td>
<td>English Renaissance Drama</td>
</tr>
<tr>
<td>42.382</td>
<td>Theater History 1 (Ancient to Early Modern)</td>
</tr>
<tr>
<td>42.383</td>
<td>Theater History 2 (19th Century to present)</td>
</tr>
<tr>
<td>42.423</td>
<td>Shakespeare I</td>
</tr>
<tr>
<td>42.424</td>
<td>Shakespeare II</td>
</tr>
<tr>
<td>50.442</td>
<td>Theater and Anti-Theater</td>
</tr>
<tr>
<td>55.351</td>
<td>Classical Drama</td>
</tr>
<tr>
<td>58.305</td>
<td>Theater and the Visual Arts</td>
</tr>
<tr>
<td>74.356</td>
<td>American Musical Theater</td>
</tr>
<tr>
<td>THEA.201</td>
<td>Introduction to Theater</td>
</tr>
</tbody>
</table>
Many aspects of our lives are influenced by what we do for work – how we spend our time, how much money we have, our lifestyle, and our leisure pursuits are all connected to our occupation. And work is not just an individual experience, but is deeply embedded in our social structure. Our labor market reflects and reproduces many societal inequalities, and at the same time workers united by their identity as workers have created lasting social change through the labor movement.

The interdisciplinary minor in Work, Labor and Society is intended to give students an analytic lens on work, something most of us take for granted as part of our everyday lives. The study of work is inherently interdisciplinary, and students in this program will be asked to reach beyond their own disciplinary boundaries to explore a range of approaches to the subject.

Courses

<table>
<thead>
<tr>
<th>Course ID</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>43.303</td>
<td>America in the Twenties and Thirties</td>
</tr>
<tr>
<td>43.304</td>
<td>European Social and Economic History</td>
</tr>
<tr>
<td>43.316</td>
<td>American Environmental History</td>
</tr>
<tr>
<td>43.379</td>
<td>US Industry in the Twentieth Century</td>
</tr>
<tr>
<td>43.380</td>
<td>Work and Society</td>
</tr>
<tr>
<td>43.432</td>
<td>Seminar: Lawrence Strike</td>
</tr>
<tr>
<td>46.397</td>
<td>Seminar: Labor Law and Politics</td>
</tr>
<tr>
<td>46.445</td>
<td>The Politics of Repression and Dissent</td>
</tr>
<tr>
<td>47.308</td>
<td>Industrial/Organizational Psychology</td>
</tr>
<tr>
<td>47.526</td>
<td>Workplace Diversity</td>
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<tr>
<td>48.341</td>
<td>Wealth, Status and Power</td>
</tr>
<tr>
<td>48.371</td>
<td>Sociology of Work</td>
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<tr>
<td>48.382</td>
<td>Social Movements</td>
</tr>
<tr>
<td>48.469</td>
<td>Seminar on Global Society</td>
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<tr>
<td>49.302</td>
<td>Labor Economics</td>
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<tr>
<td>57.211</td>
<td>Sustainable Development</td>
</tr>
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<td>57.503</td>
<td>Work and Technology</td>
</tr>
<tr>
<td>57.525</td>
<td>Gender, Work and Public Policy</td>
</tr>
<tr>
<td>57.537</td>
<td>Development Principles for Developing Economies</td>
</tr>
<tr>
<td>57.545</td>
<td>Justice and Trade in the Global Economy</td>
</tr>
</tbody>
</table>

Graduate Catalog Training

xxxxxxxx

This is training

**01.371 Educational Psychology**

Course ID: 2310

Course Details: An introduction to the study of human learning, this course covers topics such as efficiency in learning, testing, the psychology of learning, and theories of learning. For undergraduates only.

Max Credits: 3

Min Credits: 3

**01.391 Understanding Education**

Course ID: 2313

Course Details: The aim of the course is to assist students to build knowledge about educational structures and roles in diverse settings as they consider how education could figure as a calling. Using a broad range of inquiry methodologies and technologies, students will explore areas of self-selected interest in formal educational settings (K-12 or higher education) or informal educational settings (community or health settings, policy, etc.). These explorations will culminate in case presentations in the form of digital stories, in which students will share their findings and discuss future goals in the area of education.

Max Credits: 3

Min Credits: 3
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

01.607 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

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

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 at 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

19.680 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
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

26.001 Plastics Safety Lecture

Course ID: 4147

Course Details: All Plastics Engineering students enrolled in a plastics laboratory course are required to attend a one hour per week safety lecture for safety training.

Max Credits: 0
Min Credits: 0

26.002 Plastics Safety Lecture

Course ID: 4148

Course Details: All Plastics Engineering students enrolled in a plastics laboratory course are required to attend a one hour per week safety lecture for safety training. Continuation of 26.001.

Max Credits: 0
Min Credits: 0

46.337 Civil Liberties Law & Politics

Course ID: 5626

Course Details: A study of constitutional law focused on the evolution of the civil liberties decisions of the Supreme Court. The course will discuss the case law on freedom of religion, freedom of speech, freedom of the press, gun rights, search and seizure, rights of the accused, privacy, and other controversies that reflect the balance of liberty and authority in a free society.

Max Credits: 3
Min Credits: 3

46.338 Political Participation

Course ID: 5627

Course Details: Political movements; voting and elections, parties and interest groups; civil disobedience in American politics. Consideration of causes, fluctuations and trends.

Max Credits: 3
Min Credits: 3
46.340 American Politics And Law

Course ID: 5628

Course Details: Perspectives on American Politics and Law. Advanced study involving extensive reading, writing and discussion seeking understanding of the major transformations impacting contemporary American Society, Politics, Law, Economics and Culture; consideration of different interpretations of these changes, and the ways in which they are manifested in shifting political attitudes and coalitions, and new problems and conflicts.

Max Credits: 3
Min Credits: 3

46.341 Equal Rights

Course ID: 5629

Course Details: Advanced study in law and politics involving extensive reading, writing and discussion of the complex interrelationship between social change and the development of constitutional doctrine focusing upon the area of Equal Rights.

Max Credits: 3
Min Credits: 3

46.343 Congress

Course ID: 5631

Course Details: Legislative Politics. An advanced study of representation, campaigns and elections, and the functioning of the American national congress within the American political system.

Max Credits: 3
Min Credits: 3

46.344 American Presidency

Course ID: 5632

Course Details: An examination of the nature of the American presidency and its functioning within the American political system. Specific attention is given to the problems and evolution of the presidency since World War I.

Max Credits: 3
Min Credits: 3

46.350 Urban Politics and Policy

Course ID: 5637

Course Details: A study of political power in, and the political structures of urban areas and the major issues and conflicts currently confronting them.

Max Credits: 3
Min Credits: 3

46.351 Irish Politics

Course ID: 35710

Course Details: For students of Politics, Ireland is perhaps one of the most fascinating examples of a territory that has undergone, and continues to undergo dramatic transformations in its governing structures, its passionate struggles for freedom, civil wars, colonial resistance and modern nationalism. This class will study the political history of Ireland before and during its time as a part of the United Kingdom, through the partition of the island into two states, and up to the modern politics of both the Republic of Ireland and the British state of Northern Ireland. We will examine the results of the 1998 "Good Friday Agreement". Then we will dissect and evaluate modern Irish institutions of government, in the Republic and in the North. Students will research the competing ideologies and present arguments supporting the parties and organizations that propound these ideologies, like Sinn Fein, the IRA, the Uster Unionist Party and Unionist paramilitaries in the North; the Fine Gael and Fianna Fail in the South.
46.353 Public Policy and Administration

Course ID: 5639
Course Details: An examination of the little studied fourth branch of government. Bureaucratic power in the American political system is reconsidered.
Max Credits: 3
Min Credits: 3

46.355 Government Fiscal Policy

Course ID: 5641
Course Details: An examination of government's budgetary, taxation and expenditure decisions and activities.
Max Credits: 3
Min Credits: 3

46.357 Thoreau in Our Time

Course ID: 5643
Course Details: This course traces Henry David Thoreau's influence on major social and political transformations in American history from the abolitionist movement to the present day. We will focus first on Thoreau's writings on slavery, commercial development, environmental history, and individual liberty. Then we will study his formative role in the civil rights and environmental movements of the twentieth century. Finally, through a mix of outside speakers and student presentations, we will explore how his writings continue to shape ongoing struggles to contend with climate change, advance social justice, and promote a greater sense of fairness in American life. The course will involve at least one trip to Walden Pond and a tour of Thoreau's birthplace in Concord, Massachusetts. Course page: http://faculty.uml.edu/sgallagher/Thoreau_in_Our_Time.html.
Max Credits: 3
Min Credits: 3

46.358 Global Environmental Policy

Course ID: 5644
Course Details: This course explores contemporary international environmental issues from both theoretical and policy perspectives; consideration too of broader forces impacting international environmental politics.
Max Credits: 3
Min Credits: 3

46.359 British Politics

Course ID: 5645
Course Details: The context, background and forces shaping the contemporary politics of Great Britain.
Max Credits: 3
Min Credits: 3

46.360 European Politics

Course ID: 5646
Course Details: An analytical examination of selected modern European political systems, emphasizing similarities and differences in political culture, behavior, institutions, and performance.
Max Credits: 3
46.363 Politics of China

Course ID: 5649

Course Details: A study of the recent development of governmental institutions, parties, and ideology in China. Emphasis is placed on the processes of nation-building in the post World War II period.

Max Credits: 3
Min Credits: 3

46.366 Russian Politics

Course ID: 5652

Course Details: Conflict and Change in the former Soviet Union. An examination of the relationship of politics to the functioning of post-Soviet societies. The influence of politics on economy, education, family life, religion, etc.

Max Credits: 3
Min Credits: 3

46.368 Middle Eastern Politics

Course ID: 5654

Course Details: Utilizes an appreciation of Middle Eastern attitudes and values in developing insight into the tensions within the Middle East and between the Middle East and the western world.

Max Credits: 3
Min Credits: 3

46.370 Latin American Politics

Course ID: 5656

Course Details: The context, background and forces shaping the contemporary politics of the Latin American region.

Max Credits: 3
Min Credits: 3

46.371 Caribbean Politics

Course ID: 5657

Course Details: A comparative study of the political, social, cultural and economic forces that have led to the current situations in the countries of the Caribbean area (Mexico, Central America and the islands).

Max Credits: 3
Min Credits: 3

THEA.201 Introduction to Theatre

Course ID: 37380

Course Details: This course explores the arts and practices of theatre from classical to contemporary times. Students are introduced to the basic concepts and forms of theatre as well as to theories of its origins and purposes. Replaces 42.219 and 59.219; credit may not be earned for both 42/59.219 and THEA 201.

Max Credits: 3
Min Credits: 3

THEA.261 Acting 1
Course ID: 37383
Course Details: Theory and practice of acting including exercises in the elements and methods of acting and the preparation of a public performance. Replaces 42.261 and 59.261; credits may not be earned for both 42/59.261 and THEA 261.

Max Credits: 3
Min Credits: 3

THEA.262 Acting 2
Course ID: 37384
Course Details: A continuation of THEA 261 emphasizing techniques of scene study and characterization. Pre-requisite THEA 261 or the equivalent. Replaces 42/59.262; credits may not be earned for both 42/59.262 and THEA 262.

Max Credits: 3
Min Credits: 3

THEA.265 Voice and Movement
Course ID: 37534
Course Details: To discover the possibilities of you unique voice and physicality, to gain techniques to free up tension, release habitual blocks and inhibitions, and to explore creative expression through the voice and body, ultimately applying all of these elements to performance. This course uses techniques designed for voice, movement, and physical acting including Linklater, Alexander, Viewpoints, Grotowski, Yakim and others.

Max Credits: 3
Min Credits: 3

THEA.311 Play Production
Course ID: 37386
Course Details: Introduction to the design and technical aspects of theatre through hands-on experience working on campus productions. Focus on basic principles of set, lighting, props, costume, makeup, and sound production. May be repeated for credit.

Max Credits: 3
Min Credits: 3

THEA.340 Directing Workshop
Course ID: 37385
Course Details: Study of the process of directing plays of different styles. Students will direct scenes with other members of the workshop and their work will be analyzed by the instructor and fellow students. Replaces 42.343 and 59/343; credits may not be earned for both 42/59.343 and THEA 340.

Max Credits: 3
Min Credits: 3

THEA.401 Topics in Theatre
Course ID: 37389
Course Details: Advanced study of a selected area of theatrical production, history, texts, or theory. Repeatable for credit when topics differ. Replaces 42.414 and 59.414; repeated credit may only be earned when topics differ.

Max Credits: 3
Min Credits: 3

THEA.490 Performance Practicum
Course ID: 37388
Course Details:
Max Credits: 1
Min Credits: 1

THEA.493 Practicum in Theatre
Course ID: 37391
Course Details: Part-time, full-semester internship at a professional theatre. Program director's permission required. Replaces 42.495 and 59.495; may be repeated for credit with permission.
Max Credits: 3
Min Credits: 3

THEA.495 Senior Seminar in Theatre
Course ID: 37753
Course Details: Capstone-experience seminar focusing on advanced projects (in performance, dramaturgy, or design/tech) in the service of portfolio building and preparation for graduate study and/or work in the professional world of theatre. To be taken during the student's final year in the program. Instructors Consent required.
Max Credits: 1
Min Credits: 1

UTL.101 STEP 1: Inquiry Approaches to Teaching
Course ID: 37449
Course Details: This course provides students with an introduction to teaching in order for them to explore a career as a middle or high school math or science teacher. During the courses, students pairs teach math and/or science lessons in a local elementary school classroom and receive feedback from a mentor teacher. Additionally, students are introduced to the theory and practice that is necessary to design and deliver excellent instruction. This course is the first step for those students interested in exploring the STEM TEACHING MINOR with UTeach UMass Lowell.
Max Credits: 1
Min Credits: 1

UTL.102 STEP 2: Inquiry Based Lesson Design
Course ID: 37450
Course Details: Students who are exploring teaching as a career become familiar with the middle school setting by observing and discussing the middle school environment, and by teaching several lessons in a middle school classroom. They build upon and practice lesson design skills that were developed in Step 1 and also become familiar with excellent science and mathematics curricula for the middle school setting.
Max Credits: 1
Min Credits: 1

UTL.201 Knowing and Learning in Math and Science
Course ID: 37642
Course Details: The course starts by imparting the understanding that there is a science to learning and by having students examine ideas of what it means for an individual to know or understand something. This course focuses on several essential questions which enable students to explore how knowing and learning are structured with specific emphasis on mathematics and science. Students will come to understand what it means to know something, how we can understand student thinking and how theories of learning inform instructional decisions; in particular students will explore the idea that learning is a social activity. Students are prompted to reflect on their own ways of looking at various ideas and concepts and to consider alternative perspectives. Students will conduct an analysis of reasoning processes through a clinical interview process, one-on-one with learners engaging in problem solving. This course is required for the STEM TEACHING MINOR.
Max Credits: 3
WLS.240 Work, Labor and Society

Course Details: This foundational course has two overarching learning objectives: (1) to give students basic empirical knowledge and analytical tools to understand the context of work in the United States at the dawn of the twenty-first century and (2) to give students an understanding of how labor unions work, what has been their impact historically, and what their role is in contemporary society. Lowell and the Merrimack Valley will be used as a lens through which to examine these larger work and labor issues. The course will be explicitly interdisciplinary, drawing on readings from history, sociology, economics, political science, and psychology to offer an introduction to understanding work and labor through an analytic lens. In addition, the course will include a service-learning component in collaboration with the UML Labor Extension Program.

Max Credits: 3
Min Credits: 3

WLS.410 Internship in Work, Labor and Society

Course Details: This internship option allows students to take full advantage of the substantial links to the community that the UML Labor Extension program has built over many years of work in this region. The internship provides opportunities for students to learn through thoughtful engagement in community service, applying knowledge of work/labor issues gained in the classroom to the world outside the classroom. Students will be expected to spend a minimum of 100 hours during the semester at the internship site, and to have a designated supervisor on site as well as a faculty supervisor overseeing their work and ensuring it is a meaningful learning experience.

Max Credits: 3
Min Credits: 3

01.373 Teaching and Learning with Technology

Course Details:

Max Credits: 3
Min Credits: 3

01.632 The Inclusive School

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 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

**02.301 Early Literacy Community Experience I**

Course ID: 37208

Course Details: This is Part One of a two semester course that focuses on experiential learning associated with the Jumpstart Program. The course provides students in the education minor with the necessary skills for working with children in early childhood community agencies. Topics based on the National Association for the Education of Young Children (NAEYC) Standards which include child development, family and community, assessment, teaching and learning, literacy development, and professionalism will be the focus of the course.

- Max Credits: 3
- Min Credits: 3

**02.302 Early Literacy Community Experience II**

Course ID: 37209

Course Details: This is Part Two of a two semester course that enhances the experiential learning of students in the education minor participating in the Jumpstart Program. Building on the knowledge base of the first semester, the course allows students to deepen their understanding of the social, emotional and behavioral needs of children in early childhood settings and reflect on how they have integrated what they learned during the experience.

- Max Credits: 3
- Min Credits: 3

**02.401 Exploring Teaching**

Course ID: 31976

Course Details: This course is for third and fourth year undergraduates who are considering teaching as a career. Focusing on students, teachers, classrooms and schools, the course will provide an overview of the historical, philosophical, legal and societal influences that
shape education today. Field work in an elementary, middle or high school will be an integral component of the course.

Max Credits: 3
Min Credits: 3

02.420 Elementary Mathematics for Teaching: Numbers and Operations

Course ID: 2374

Course Details: This course examines the topic of Number and Operations for teaching mathematics to Elementary School students. The philosophy and content of this course reflect the National Council of Teachers of Mathematics Curriculum Focal Points for Pre-Kindergarten through Grade 8 Mathematics, as well as the Massachusetts Mathematics Curriculum Frameworks and the Common Core State Standards.

Max Credits: 3
Min Credits: 3

02.443 Methods of Teaching

Course ID: 33179

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

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

02.517 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

02.539 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 observances.

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

02.551 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

02.572 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

02.579 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.
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

**02.601 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

**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.
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 form 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

04.626 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: 2650

Course Details: 

Max Credits: 3
Min Credits: 3
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

04.759 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
05.592 Practicum I, Elementary Principal PK-6
Course ID: 30303

Course Details: The practicum is a two-semester (1+2=3 credits) 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=3 credits) 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=3 credits) 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 form 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=3 credits) 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 form 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=3 credits) 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 form 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=3 credits) 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 form 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

05.609 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

05.611 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

05.622 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**
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

05.760 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 phonetic 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

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

07.707 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
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

10.101 Technology and Human Built World

Course ID: 30309

Course Details:

Max Credits: 3
Min Credits: 3

10.201 Material Balances

Course ID: 30311

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

10.202 Energy Balance & Introduction to Thermodynamics

Course ID: 30312

Course Details: Continuation of Chemical Engineering Calculations I including real gas relationships, humidity, energy balances, and the combined mass-energy balance systems. Introduction to the first law of thermodynamics.

Max Credits: 3

Min Credits: 3

10.303 Fluid Mechanics

Course ID: 32001

Course Details: This course introduces the student to several fundamental concepts and applications of fluid mechanics. It overviews the basic properties of fluids, the study of fluid statics and fluid flow systems, and the development and application of the appropriate mass, momentum, and energy balance relationships needed to solve a variety of practical problems, with a particular focus on the macroscopic view. Emphasis is on the ability to apply the basic principles to the design and analysis of engineering systems involving applications in hydrostatics, internal, open-channel, and external flows, pump selection, flow measurement, etc. The course also focuses on proper problem solving strategy and on the correct use of units in engineering analysis.

Max Credits: 3

Min Credits: 3

10.304 Heat Transfer

Course ID: 33342

Course Details: Fundamental principles of heat transmission by conduction, convection, radiation and evaporation. Applications of these principles to the solution of industrial heat transfer problems and to the design calculations for heat exchange situations.

Max Credits: 3

Min Credits: 3

10.308 Introduction to Material Science and Engineering

Course ID: 2866

Course Details: A general overview of solid materials which 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 units structures, appropriate phase diagrams, their chemical and physical attributes, and the association of these to end use applications. Discussion of metals, ceramics, polymers, and to a limited degree, composites.

Max Credits: 3

Min Credits: 3

10.310 Separation Processes with Mass Transfer

Course ID: 2867

Course Details: Introduction to equilibrium staged and other separations, including distillation, adsorption, absorption, membrane and chromatographic based separations. Unifying fundamental relations and concepts are emphasized.

Max Credits: 3

Min Credits: 3

10.311 Chemical Engineering Thermodynamics

Course ID: 2868

Course Details: The first and second laws of thermodynamics, P-V-T relations, mathematics of property changes, generalized correlation's of thermodynamic properties, application of thermodynamics to problems of phase and chemical equilibria.
Max Credits: 3
Min Credits: 3

**10.316 Unit Operations Laboratory II**

**Course ID:** 2870

**Course Details:** Experimental projects treat heat and mass transfer, including staged operations, in a unit operations format. Process measurement and calibration emphasised. Written reports required.

Max Credits: 2
Min Credits: 2

**10.317 Applied Mathematics with Matlab**

**Course ID:** 2871

**Course Details:** The focus of this course will be to develop the students' problem solving skills for a broad range of technical applications. Matlab will be used as the programming environment. The course will be applications oriented with the appropriate level of mathematics and theory to support the use of the software to formulate, solve, and analyze technical problems. Applied numerical methods will be introduced as a means for solving a wide variety of problems.

Max Credits: 3
Min Credits: 3

**10.331 Introduction to Nuclear Engineering I**

**Course ID:** 1263

**Course Details:** Review of relevant nuclear physics topics including nuclear stability, various forms of radiation, radioactive decay, and the interaction of radiation with matter (including health effects). Emphasis placed on neutron reactions in various core and structure materials, neutron cross sections, and the development and analysis of the neutron balance equation for various reactor types. Key aspects of nuclear reactor core physics and shielding design (criticality, power generation, reactor kinetics, reactivity control, fuel depletion, fission product poisoning, etc.) are treated. (10.331 and 24.331 are the same)

Max Credits: 3
Min Credits: 3

**10.347 Elements of Thermodynamics and Heat Transfer**

**Course ID:** 2874

**Course Details:** Studies the development of the first and second laws of thermodynamics. Ideal gases. Properties of substances. Entropy, availability and lost work. Steam cycles, gas power-cycles, and vapor-compression refrigeration. Dimensionless parameters. Heat transfer by: steady state conduction, convection and radiation. Note: For Civil Engineers, Electrical Engineers and Industrial Management majors only.

Max Credits: 3
Min Credits: 3

**10.403 Chemical Reaction Engineering**

**Course ID:** 2876

**Course Details:** Review of principles underlying rates of transformation of matter and energy; effect of temperature and catalysis on chemical reactions. Introduction to the basic ideas underlying chemical reaction engineering. May be taken for graduate credit.

Max Credits: 3
Min Credits: 3

**10.405 Design Of Papers**

**Course ID:** 2877

**Course Details:** Fundamentals of the mechanical and optical testing of paper and allied products. Discussion of engineering mechanics
involved in various testing procedures. Statistical analysis of test data. Structure of materials revealed by physical tests. Laboratory projects designed to illustrate problems in development of paper products and associated required processes.

Max Credits: 3
Min Credits: 3

10.409 Engineering Economics and Process Analysis

Course ID: 2879

Course Details: This course brings together all the Chemical Engineering core principles applied to the development of economic process designs. Economic evaluations of manufacturing operations and projects including essential concepts in accounting, depreciation, time value of money, and the evaluation of investment alternatives are applied for process analysis and design objectives. The impact of management and production costs, product markets, regulatory, environmental and safe production practices, the analysis of corporate annual reports including balance sheets and income statements, and capital and operating costs are all considered in regard to efficient and economic processes. In addition to lecture materials students are required to complete comprehensive projects.

Max Credits: 3
Min Credits: 3

10.410 Chemical Plant Design

Course ID: 2880

Course Details: This course is the logical continuation of 10.409. The principles of technical and economic evaluation are applied to a chemical engineering problem. A group of students is given a statement of the problem. They are required to find information on raw materials, products, thermodynamic parameters and plant practices in order to develop the assumptions required to carry out an examination of technical and economic feasibility. Each group generates a final report for the problem. Homework is also assigned to assist the student in the specifics of the problems.

Max Credits: 3
Min Credits: 3

10.413 Process Dynamics & Control

Course ID: 2881

Course Details: An introduction to chemical process control. Description of processes and equipment by differential equations and the Laplace transform. Development of block diagrams. System stability is studied by both root locus and frequency response methods. May be taken for graduate credit.

Max Credits: 3
Min Credits: 3

10.415 Processes and Controls Laboratory

Course ID: 33359

Course Details: Experimental projects dealing with heat and mass transfer, separations and process control. Written and oral reports required.

Max Credits: 2
Min Credits: 2

10.420 Special Senior Projects

Course ID: 2884

Course Details: Original research projects primarily in the chemical engineering field and supervised by a staff member of the department. Written reports required.

Max Credits: 3
Min Credits: 3
10.434 Introduction to Nuclear Engineering II

Course Details: A continuation of 10.331/24.331 with further discussion of basic nuclear reactor theory and reactor operations. The 2nd half of the semester focuses on heat removal and energy conversion in pressurized and boiling water reactors, including heat transfer in fuel elements and shields and the heat transfer characteristics of boiling and non-boiling liquids. Engineered safety and overall reactor core and plant design considerations are also discussed. (10.434 and 24.434 are the same)

Max Credits: 3
Min Credits: 3

10.450 Nanoscale Transport Phenomena for Manufacturing Nanodevices

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 ship devices, electronic devices, medical devices and other emerging technologies.

Max Credits: 3
Min Credits: 3

10.491 Industrial Experience I

Course Details: Projects performed by students in the Cooperative Education Program at their place of employment and supervised by the employer and advisor from the department. Reports required upon completion of the project.

Max Credits: 12
Min Credits: 0

10.492 Industrial Experience II

Course Details: Projects performed by students in the Cooperative Education Program at their place of employment and supervised by the employer and advisor from the department. Reports required upon completion of the project.

Max Credits: 9
Min Credits: 1

10.493 Industrial Experience III

Course Details: Projects performed by students in the Cooperative Education Program at their place of employment and supervised by the employer and advisor from the department. Reports required upon completion of the project.

Max Credits: 9
Min Credits: 1

10.494 Select Topics: Paper Engineering

Course Details: Topics in paper engineering. Content may vary from year to year to reflect contemporary applications of paper engineering.

Max Credits: 3
10.496 Selected Topics: Paper Engineering

Course ID: 2895

Course Details: Topics in paper engineering. Content may vary from year to year to reflect contemporary applications of paper engineering.

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
**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

**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

**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

**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

**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

**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
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

10.544 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

10.552 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

10.720 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
14.203 Statics (alternate 22.211)

Course ID: 2964

Course Details: Discusses vector concepts of forces and moments of forces. Static equilibrium of particles, rigid bodies and simple structures. Static friction forces. Geometric properties of sections.

Max Credits: 3
Min Credits: 3

14.204 Strength of Materials (alternate 22.212)

Course ID: 2965

Course Details: Introduces the concept of stress and strain at a point, stress-temperature relationships, force and deformation analyses of bodies under axial, shearing, flexural, torsional and combined loadings, shear and bending moment diagrams, and Euler Columns.

Max Credits: 3
Min Credits: 3

14.205 Dynamics (alternate 22.213)

Course ID: 2966

Course Details: Vector development of kinematics of particles and rigid bodies with respect to fixed and moving coordinate systems of one, two, and three dimensions. The dynamics of particles, systems of particles, and rigid bodies. Angular momentum and the inertial properties of rigid bodies. Energy, impulse and momentum methods.

Max Credits: 3
Min Credits: 3

14.225 Surveying I

Course ID: 2970

Course Details: A presentation of the basic instruments used in survey processes including distance, angle and level measurements. Analysis and adjustment of random errors. Principles of closed and open traverses. Fieldwork practice in instrument use and office-type projects in contour mapping and the application of contoured topography to highway and water-control projects.

Max Credits: 3
Min Credits: 3

14.226 Geomatics

Course ID: 2971

Course Details: Principles and practice of route surveys and designs. Topics include simple and compound circular curves, intersections of straight and curved baselines, vertical alignment principles including parabolic easement curves, earthwork operations and determination of volumes. Includes office-type projects illustrative of the application of surveying information to Civil Engineering projects such as water resources, sanitary sewers and property subdivision. Fieldwork instruction in basic traverse surveys, gathering of topographic information, and the staking-out of buildings and circular curves.

Max Credits: 3
Min Credits: 3

14.286 Probability and Statistics for Engineers

Course ID: 2972

Course Details: Probability, statistics, reliability and decision with applications in engineering. Probability of events, discrete and continuous random variables, probability density functions and distributions, estimation, regression and correlation techniques, risk and reliability concepts.

Max Credits: 3
Min Credits: 3

14.301 Fluid Mechanics

Course ID: 2973

Course Details: Fluid properties, fluid statics, fluid dynamics including continuity, impulse-momentum and energy equations. Pipe flow, turbomachinery, similitude and modeling, laminar and turbulent flow, boundary layer and closed conduct design.

Max Credits: 3
Min Credits: 3

14.310 Engineering Materials

Course ID: 2975

Course Details: A treatment of the properties of engineering materials that influence the design, construction and maintenance of Civil Engineering works. Included are such materials as ferrous and non-ferrous metals, timber, asphalt, and cementitious materials. Supplemented by laboratory testing of various engineering materials.

Max Credits: 3
Min Credits: 3

14.311 Engineering Materials Laboratory

Course ID: 2976

Course Details: Experiments and written reports. Testing and measurement techniques and material standards illustrating behavior of materials, including metals, wood, and Portland cement concrete.

Max Credits: 1
Min Credits: 1

14.330 Soil Mechanics

Course ID: 2977

Course Details: Development of the fundamental principles of soil mechanics as utilized in soil and foundation engineering. Topics include: classification, index properties, strength and stress-strain behavior, effective stress principle, permeability, flow and consolidation. Introduction to basic soil mechanics laboratory practice.

Max Credits: 3
Min Credits: 3

14.332 Environmental Engineering Laboratory

Course ID: 2979

Course Details: Laboratory experiments to illustrate analysis of environmental samples and experimental techniques, normally used in support of water and wastewater treatment facilities. Course emphasizes data acquisition and analysis, and engineering report writing.

Max Credits: 1
Min Credits: 1

14.333 Geotechnical Laboratory

Course ID: 2980

Course Details: Laboratory experience that illustrates soil mechanics and fluid flow theory. Experiments are conducted in the soils and hydraulics laboratories. Course emphasizes data acquisition and analysis and writing engineering reports.

Max Credits: 1
Min Credits: 1
14.340 Transportation Engineering

Course ID: 2981

Course Details: Development of the basic principles pertaining to the movement of people and goods by modern transportation systems. Techno-economic characteristics of the various transportation modes. Aspects of planning, design and operation of land, air and water transportation facilities. Development, structure and function of the U.S. transportation system.

Max Credits: 3
Min Credits: 3

14.341 Transportation Engineering Laboratory

Course ID: 2982

Course Details: Practice techniques of data collection, analysis and presentation that are commonly used in the planning, design and operation of transportation facilities with primary emphasis on highway systems.

Max Credits: 1
Min Credits: 1

14.350 Structural Analysis I

Course ID: 2983

Course Details: Principles of structural analysis applied to typical civil engineering structures as the initial step in the total design concept. Emphasis on classical methods of analysis of statically determinate and indeterminate structures. The personal computer as an analytical tool.

Max Credits: 3
Min Credits: 3

14.352 Reinforced Concrete

Course ID: 2984

Course Details: Ultimate strength and elastic behavior of reinforced concrete structural members, continuity in building frames, deflections, shear reinforcement, development length and bar cutoffs, columns and footings.

Max Credits: 3
Min Credits: 3

14.362 Environmental Engineering

Course ID: 2985

Course Details: Physical, chemical and biological principles of the treatment of water and wastewater are considered along with their application to treatment systems. The system components of wastewater and water treatment plants are studied to provide a basic design capability. Hazardous waste site remediation is also discussed.

Max Credits: 3
Min Credits: 3

14.372 Civil Engineering Systems

Course ID: 2986

Course Details: Introduction to methods of operations research, management science and economic analysis used in the design, planning and managing of engineering systems. Main topics covered: systems modeling, optimization concepts, network analysis, mathematical programming, critical path analysis, decision analysis, economic consideration.

Max Credits: 3
Min Credits: 3
14.431 Foundation and Soil Engineering

Course ID: 2990

Course Details: The application of soil mechanics to the design and analysis of foundations and soil structures. Topics include: soil origin and deposition, subsurface exploration, bearing capacity and settlement analyses, design of shallow foundations, earth pressures, retaining structures, and slope stability.

Max Credits: 3
Min Credits: 3

14.452 Steel Design

Course ID: 2993

Course Details: An introduction to structural steel design with emphasis on use and interpretation of the AISC Manual and LRFD Specifications. Subjects include design of tension, compression, beams, and beam-column members, plus bolted and welded connections. Other topics may include composite beams, plate girders, building connections and plastic analysis and design.

Max Credits: 3
Min Credits: 3

14.460 Water Resources Engineering

Course ID: 2995

Course Details: This course is a continuation and extension of Fluid Mechanics, with a focus on engineering applications of hydraulic and hydrologic engineering. This course covers fundamental concepts of open-channel flow, hydraulic structures, design of open channels, surface-water hydrology, and groundwater hydrology.

Max Credits: 3
Min Credits: 3

14.466 Introduction to LEED

Course ID: 37656

Course Details: This course examines the principles of sustainability and how they are applied to engineering and the built environment. Areas covered include energy, water, materials, transportation, and green building principles. Issues of evaluation of sustainability, including life cycle analysis and rating systems, are also discussed. This course fulfills the educational requirements for eligibility to take the LEED (Leadership in Energy and Environmental Design) Green Associate exam.

Max Credits: 3
Min Credits: 3

14.470 Engineering Economics

Course ID: 2999

Course Details: Presentation of mathematical principles of economic analysis, with emphasis on defining alternatives and predicting consequences of proposed investments. Emphasis is placed on the economic, social and environmental impacts of proposed Civil Engineering projects. The attractiveness of investments is judged by present worth, annual worth, rate of return, and benefit-cost ratio techniques. Sensitivity analysis, depreciation and tax impacts in economic studies are also discussed.

Max Credits: 3
Min Credits: 3

14.475 Construction Management I

Course ID: 3000

Course Details: Development of management skills and techniques to plan, schedule, supervise, and control construction projects. Project estimating; labor costs and productivity; construction plans, specifications and contracts; labor relations; time, cost and quality control; construction equipment and project decision making and financing.

Max Credits: 3
14.480 Special Topics in Civil Engineering

Course ID: 3002

Course Details: Contemporary topics in selected areas of study within civil engineering. Course content is chosen by the instructor to meet the interests of the students.

Max Credits: 3
Min Credits: 3

14.481 Special Topics

Course ID: 3003

Course Details: Contemporary topics in selected areas of study within civil engineering. Course content is chosen by the instructor to meet the interests of the students.

Max Credits: 3
Min Credits: 3

14.483 Spec Topics: Civil Engineering

Course ID: 3004

Course Details: Contemporary topics in selected areas of study within civil engineering. Course content is chosen by the instructor to meet the interests of the students.

Max Credits: 3
Min Credits: 3

14.485 Capstone Design

Course ID: 3005

Course Details: Introduction to the essentials of engineering design and a forum for practicing the design process. Integrates many elements of the curriculum through a comprehensive design project to professional standards. Projects include the use of open-ended problems, feasibility analysis, complete design process, consideration of alternative solutions, and cost estimation. Students practice team effort, development of a system perspective, communication skills, reporting, and presentations.

Max Credits: 3
Min Credits: 3

14.491 Industrial Experience I

Course ID: 3007

Course Details: The new Cooperative Education program for undergraduates combines academic studies with work experience in appropriate positions in the public or private sectors. It permits students to participate in the flexible schedule of study and work that is related to their academic fields of study and to receive academic credit for the work experience. Requires 500 hours of cooperative education engineering experiences, on a full-time or part-time basis, during any academic semester or summer. All co-op work must be pre-approved by the Co-op Coordinator. (Effective with Class of 2001-02, students in CEE are able to earn three credits after the successful completion of both Industrial Experience I and II).

Max Credits: 12
Min Credits: 0

14.492 Industrial Experience II

Course ID: 3008

Course Details: The new Cooperative Education program for undergraduates combines academic studies with work experience in appropriate positions in the public or private sectors. It permits students to participate in the flexible schedule of study and work that is
related to their academic fields of study and to receive academic credit for the work experience. Requires 500 hours of cooperative education engineering experiences, on a full-time or part-time basis, during any academic semester or summer. All co-op work must be pre-approved by the Co-op Coordinator. (Effective with Class of 2001-02, students in CEE are able to earn three credits after the successful completion of both Industrial Experience I and II).

Max Credits: 3
Min Credits: 3

14.493 Industrial Experience III

Course ID: 3009
Course Details:
Max Credits: 3
Min Credits: 3

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, acoustical/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


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

14.553 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, steam 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 ground water flow models (MODFLOW) and the use of particle tracking models (GWPATH) to simulate the movement of solutes in ground water. 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

14.595 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

14.693 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: 
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

14.753 Doctoral Dissertation
Course ID: 3090
Course Details:
Max Credits: 3
Min Credits: 3

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

**15.113 Computer-Aided Design and Drafting**

Course ID: 3096

Course Details: Demonstrates CAD concepts using both class discussion and laboratory work. Using interactive computer graphics workstations, students will create several civil/architectural drawings that involve the processes of inserting and modifying lines, arcs, text, dimensions, and other geometric entities. AutoCAD is used in this course.

Max Credits: 2

Min Credits: 2

**15.123 Surveying I**

Course ID: 3098

Course Details: Basic principles of surveying: use, care, and adjustments of tape, engineers transit, engineers level, theodolite and electronic distance measuring devices; introduction to surveying processes by means of traverse computations, development of topographic information, introduction to global positioning systems, elementary photogrammetry, the Internet, and the use of the electronic computer in land surveying. Problems are used to illustrate basic principles.

Max Credits: 4

Min Credits: 4

**15.124 Surveying II**

Course ID: 3099

Course Details: Basic principles of route designing and surveying. An introduction to the preparation of calculations and plans for the construction of all routes of transportation. Class topics include route geometry determination, curve geometry, economic analysis using cost to benefit rationale. Determination of earthwork quantities and the use of the electronic computer in route surveying. Problems are used to illustrate basic principles.

Max Credits: 4

Min Credits: 4

**15.131 Environmental Chemistry I**

Course ID: 3100

Course Details: Emphasizes basic chemical theory. Reactions and equations are presented, along with an introduction to the structure and character of water, its impurities, and the chemical treatment schemes that have been devised to deal with them.

Max Credits: 3

Min Credits: 3

**15.152 Water Biology**

Course ID: 3102

Course Details: Covers the following topics: uses of biology lab tools; microscope basic chemistry; water molecules; physical properties; biochemistry; life functions; features of life and the cell; classification; viruses and monerans; simple water animals; simple water plants; protists and fungi; methods of transport, osmosis, diffusion, etc.; photosynthesis, respiration, ecosystems, and biomes.

Max Credits: 3

Min Credits: 3
15.242 Steel Design I

Course ID: 3110

Course Details: Provides an introduction to the analysis and design of structural steel elements based on AISC LRFD code requirements. Structural elements covered include tension members, columns, beams, and beam columns. Types of structures considered include simple and continuous spans, and braced and unbraced frames. Strength, serviceability, design economy and good design practice principles are discussed. Use of computer software to perform routine analysis and design tasks is reviewed and examples provided.

Max Credits: 3
Min Credits: 3

15.246 Hydraulics

Course ID: 3111

Course Details: Presents the properties of fluids, principles of hydrostatic pressure, fluid flow with applications to orifices, tubes, wires, and pipes. Two demonstration laboratory sessions will be held during the semester.

Max Credits: 3
Min Credits: 3

15.263 Wastewater Operations Laboratory I

Course ID: 3121

Course Details: In this lab, fundamental principles of biological wastewater treatment are explained. Students perform basic wet chemistry tests for monitoring and operating a biological wastewater treatment system.

Max Credits: 1
Min Credits: 1

15.274 Water Works Operations Lab I

Course ID: 3123

Course Details: Introduces the students to fundamental laboratory equipment as applied to the operation of water treatment facilities. The following determinations will be conducted: odor, color, turbidity, jar tests, pH, chlorine residual, acidity, alkalinity, hardness, chlorine, iron, manganese, phosphate, aluminum, nitrogen, cycle, coliform, microscopic analysis, heavy metals, and organics. Pre-Requisite: 15.131.

Max Credits: 1
Min Credits: 1

15.280 Industrial Waste Treatment

Course ID: 3124

Course Details: This course examines the state and federal regulations for industrial wastewater treatment. Basic chemistry is covered and physical-chemical treatment for neutralization, oxidation-reduction, metals removal, and cyanide destruction is reviewed in detail along with numerous sample problems. Common industrial waste treatment processes such as filtration, ion exchange, activated carbon, ultra filtration reverse osmosis and other membrane filtration techniques are presented. Chemical feed systems, polymer feed systems, chemical dosage calculations, jar testing, sludge handling, and dewatering methods and sludge calculations are also discussed.

Max Credits: 3
Min Credits: 3

15.315 Land Development Desktop

Course ID: 30318

Course Details:

Max Credits: 3
15.353 Forensic Engineering

Course ID: 32150

Course Details: This course is a survey of forensic engineering with particular emphasis on using engineering science and technology to investigate and reconstruct failures of engineered systems. Topics include qualifications of the forensic engineer, the scientific method, failure hypotheses, levels of confidence, physical evidence, field investigation techniques, examination and testing, codes and standards, and personnel safety. Other topics include ethics, the hired gun, junk science, the legal process, introduction to expert witness testimony, trial exhibits, Frye and Daubert decisions, bias, forensic engineering practice, and engineering reports.

Max Credits: 3

15.486 Transportation Elements

Course ID: 3151

Course Details: Transportation Elements is the study of a variety of issues associated with the planning, project evaluation, vehicle/driver/traffic characteristics, roadway capacity and social/economic/environmental impacts of transportation projects. Students will develop and retain a basic understanding of the environmental process and alternatives analysis as well as design considerations. Practical, real-world examples will be used to model the topics of each lecture. The concepts presented in this course directly relate to numerous other civil engineering fields.

Max Credits: 3

16.100 Introduction to Electrical and Computer Engineering

Course ID: 3154

Course Details: This introductory course is designed to expose students to many of the new developments in Electrical Engineering, especially those on-going in the Department. It will also provide information about co-op opportunities and career planning, while also allowing faculty in the Department to describe their courses and answer questions.

Max Credits: 1

16.201 Circuit Theory I

Course ID: 3159


Max Credits: 3

16.202 Circuit Theory II

Course ID: 3160

Course Details: Discusses the sinusoidal forcing function, complex numbers, phasors, sinusoidal steady-state conditions, impedance, average real power, reactive power and rms values, exponential forcing function, poles and zeros in the s-plane, concept of the system function and its use in determining the forced response and resonance, reactance cancellation and concept of s-plane vectors. The course also covers Thevenin's and Norton's theorems, superposition, reciprocity, and maximum power in the frequency domain, impedance and admittance. Introduction to matrices and their use in circuit analysis, magnetic coupling, mutual inductance, and ideal transformer. Engineering Science (100%).

Max Credits: 3
**16.207 Basic Electrical Engineering Laboratory I**

**Course ID:** 3161

Course Details: Experimental work designed to verify theory and to acquaint students with electrical measurement techniques: experiments on meters, bridges, and oscilloscopes. Experiments are correlated with course 16.201 and concern: resistive measurements, Kirchhoff's laws, network theorems, conservation of power and maximum power transfer, inductance and capacitance, and first and second-order transients, operational amplifiers.

**Max Credits:** 2  
**Min Credits:** 2

**16.208 Basic Electrical Engineering Lab II**

**Course ID:** 3162

Course Details: Presents experimental work designed to emphasize electrical measurement techniques of linear systems with time-varying signals. Waveform measurements with dc and ac meters as well as advanced use of the oscilloscope are also discussed. Experiments are integrated with course 16.202. Experiments cover: Kirchhoff's laws for phasors, bode plots, magnitude and phase measurements of impedance, network theorems, frequency response, resonance, inductance, maximum power transfer, and MATLAB techniques. Engineering Science (50%); Engineering Design (50%).

**Max Credits:** 2  
**Min Credits:** 2

**16.211 Fundamentals of Electricity I**

**Course ID:** 1269

Course Details: Serves as an introduction to direct current and alternating current analysis of electric circuits, with emphasis on energy and power. Covers design and use of multi-range voltmeters, ammeters, and ohmmeters, the use of bridges and oscilloscopes, phasor analysis of AC circuits, Trigonometric Fourier series, BODE plots, transformers, relays, solenoids, mechanical analogs and magnetic analogs with the application of Fourier and BODE techniques. Students will also be introduced to DC and AC motors and generators, residential circuits, equipment protection, and introduction to digital logic including minimization techniques. Availability and cost of instruments and components is stressed throughout this course. Not for EE majors. Engineering Science (100%).

**Max Credits:** 3  
**Min Credits:** 3

**16.212 Fundamentals of Electricity Laboratory**

**Course ID:** 3163


**Max Credits:** 1  
**Min Credits:** 1

**16.213 Fundamentals of Electricity I**

**Course ID:** 1269

Course Details: Serves as an introduction to direct current and alternating current analysis of electric circuits, with emphasis on energy and power. Covers design and use of multi-range voltmeters, ammeters, and ohmmeters, the use of bridges and oscilloscopes, phasor analysis of AC circuits, Trigonometric Fourier series, BODE plots, transformers, relays, solenoids, mechanical analogs and magnetic analogs with the application of Fourier and BODE techniques. Students will also be introduced to DC and AC motors and generators, residential circuits, equipment protection, and introduction to digital logic including minimization techniques. Availability and cost of instruments and components is stressed throughout this course. Not for EE majors. Engineering Science (100%).

**Max Credits:** 3  
**Min Credits:** 3

**16.214 Fundamentals of Sound Recording**
Course ID: 3164
Course Details: Similar to 16.211 but tailored for Sound Recording Technology students only
Max Credits: 3
Min Credits: 3

16.216 ECE Application Programming
Course ID: 3165
Course Details: Introduces C programming for engineers. Covers fundamentals of procedural programming with applications in electrical and Computer engineering and embedded systems. Topics include variables, expressions and statements, console input/output, modularization and functions, arrays, pointers and strings algorithms, structures, and file input/output. Introduces working with C at the bit manipulation level. Laboratories include designing and programming engineering applications.
Max Credits: 3
Min Credits: 3

16.233 History of Radio
Course ID: 3171
Course Details: Intended primarily for students majoring in the liberal arts. The course develops the theory of electricity from an historical perspective. Sufficient background in circuit theory, resonance, field theory and radio waves is given to provide an understanding of the principles of radio from its antecedents in the nineteenth century through the invention of the transistor in the mid twentieth century. The fundamental contributions of, for example Volta, Oersted, Morse, Maxwell, Faraday, Hertz, Lodge, and Marconi are considered. In the present century the technical advances of such figures as de Forest, Fleming, Fessenden, Armstrong and Shockley are studied. The growth, regulation and culture of American broadcasting are also central to the course. Laboratory work is required and students may use this course toward fulfilling the General Education (science/experimental component) requirement of the University. Not open to students in the College of Engineering.
Max Credits: 3
Min Credits: 3

16.265 Logic Design
Course ID: 3172
Max Credits: 3
Min Credits: 3

16.311 Electronics I Lab
Course ID: 3175
Max Credits: 2
Min Credits: 2

16.312 Electronics II Laboratory
Course ID: 3176

Max Credits: 2
Min Credits: 2

16.317 Microprocessors Systems Design I

Course ID: 3178

Course Details: Introduction to microprocessors. Uses assembly language to develop a foundation on the hardware which executes a program. Memory and I/O interface design and programming. Design and operation of computer systems. Study of microprocessor and its basic support components, including detailed schematics, timing and functional analysis of their interactions. Laboratories directly related to microprocessor functions and its interfaces (e.g. memory subsystem, I/O devices and coprocessors).

Max Credits: 3
Min Credits: 3

16.322 Data Structures

Course ID: 3179

Course Details: Covers algorithms and their performance analysis, data structures, abstraction, and encapsulation. Introduces structures and their physical storage representation. Studies stacks, queues, linked lists, trees, graphs, heaps, priority queues, and hashing. Discusses efficient sorting (quicksort and heapsort) and introduces experimental analysis of algorithms as applied to engineering applications. Examines several design issues, including selection of structures based on what operations need to be optimized (insertion, deletion, traversal, searching, sorting, evaluation), encapsulation of algorithms using class and template techniques, and how and when to use recursion (versus explicit stack-based techniques). Laboratories include programming of data structures in C++ and Java applied to Engineering.

Max Credits: 3
Min Credits: 3

16.333 Chemistry and Engineering of Electronic Materials

Course ID: 3180

Course Details: The production and processing of materials into finished products constitute a large part of the present economy. To prepare students for the use of a variety of traditional and new materials, this course will cover: atomic structure and chemical bonding, crystal geometry and defects, mechanical properties and phase diagrams of metals and alloys, electrical and optical properties of semiconductors, ceramics, and polymers; brief description of electronic, quantum electronic and photonic devices; benefits and difficulties of materials design with decreasing dimensions from millimeters to micrometers and to nanometers.

Max Credits: 3
Min Credits: 3

16.355 Electromechanics

Course ID: 3183

Course Details: Alternating current circuits, three phase circuits, basics of electromagnetic field theory, magnetic circuits, inductance, electromechanical energy conversion. Ideal transformer, iron-core transformer, voltage regulation, efficiency equivalent circuits, and three phase transformers. Induction machine construction, equivalent circuit, torque speed characteristics, and single phase motors. Synchronous machine construction, equivalent circuits, power relationships phasor diagrams, and synchronous motors. Direct current machines construction, types, efficiency, power flow diagram, and external characteristics.

Max Credits: 3
Min Credits: 3

16.360 Engineering Electromagnetics I

Course ID: 3184

Course Details: Waves and Phasors, Transmission lines as Distributed Circuits, Smith Chart Calculations, Impedance Matching, Transients on Transmission Lines, Vector Analysis, Electrostatics and Capacitance, Steady current flow in conductors and Resistance,
Magnetostatics and Inductance.

Max Credits: 3
Min Credits: 3

16.362 Signals and Systems I

Course ID: 3185

Course Details: A study of various continuous voltage/current time functions and their applications to linear time-invariant electrical systems. Review of pertinent topics from 16.202, such as system functions, S-plane concepts and complete responses. Step, ramp and impulse responses of linear circuits. Sifting integrals. Types of analog filter responses. Designs for Butterworth and Chebyshev filters. Fourier Analysis, Fourier Transforms, Convolution, Laplace Transforms, Parseval's Theorem. A large portion (30-40%) is devoted to teaching the students communication skills and the use of MATLAB for solving homework problems. A MATLAB based text is assigned to the course.

Max Credits: 3
Min Credits: 3

16.363 Introduction to Probability and Random Processes

Course ID: 3186

Course Details: This course employing probabilistic methods of signal and system analysis (an extension of 16.362) considers the random nature of the world faced by electrical engineers. The course addresses the issues of the nature and characterization of random events, especially noise and its effect on systems. The course is divided into three parts, 1) Introduction to discrete and continuous probability 2) Introduction to statistical methods and 3) random signals and noise and the response of linear systems to random signals. There will be frequent use of Monte-Carlo simulation techniques on the computer to allow students to verify theory and to learn the important technique of simulation. Applications of theory to manufacturing and reliability, noise analysis, spectral analysis, data communication, data collection, and system design will be presented. Prerequisite: 16.362

Max Credits: 3
Min Credits: 3

16.364 Engineering Mathematics

Course ID: 3187

Course Details: Complex number, Argand plane, derivatives of complex numbers, limits and continuity, derivative and Cauchy Riemann conditions, analytic functions, integration in the complex plane, Cauchy's integral formula, infinite series for complex variables. Taylor series, Laurent series, residue theory, evaluation of integrals around indented contours. Linear vector spaces, matrices and determinants, eigenvalues and eigenvectors.

Max Credits: 3
Min Credits: 3

16.365 Electronics I

Course ID: 3188

Course Details: A brief introduction to solid-state physics, leading to discussion of physical characteristics of p-n junction diodes, bipolar junction transistors, and field-effect transistors: active, saturated, and cutoff models of bipolar transistors and triode, constant current, and cutoff models of MOSFETs. Circuit models for diodes, and diode applications. Circuit models for transistors, and transistor applications in bipolar and MOS digital circuits and low-frequency amplifier circuits. Analysis of digital circuits and linear circuits based on application of circuit models of devices and circuit theory.

Max Credits: 3
Min Credits: 3

16.366 Electronics II

Course ID: 3189

Course Details: A continuation of 16.365 with discussion of differential amplifiers, operation amplifiers and op amp applications, transistor amplifiers at very high frequencies; direct-coupled and band pass amplifiers; small and large signal amplifiers; feedback amplifiers and oscillators. Active filters, wave form generation circuits including Schmitt trigger, multiplexers, and A/D and D/A
converters. Circuit design employing integrated circuit operational amplifiers and discrete devices. Circuit analysis using SPICE. An
electronic design project constitutes a major part of the course.

Max Credits: 3
Min Credits: 3

16.399 Capstone Proposal

Course ID: 3195

Course Details: This course discusses and presents the non-technical tools and procedures for bringing a potential product from the idea or basic concept stage through final design and to market. Fundamentals of market research, product safety and liability concerns, necessary technical communication skills. Economic concerns, patent, application procedures, design procedures and people skills necessary to be part of an engineering team.

Max Credits: 3
Min Credits: 3

16.400 Engineering Topics

Course ID: 3196

Course Details: This course introduces to the seniors developing the capstone proposal important concepts such as economics, environmental, sustainability, manufacturability, ethical, health, safety, social and political constraints and how these are related to the overall engineering processes. These will be used as an integral part of their capstone projects.

Max Credits: 1
Min Credits: 1

16.403 Microwave Engineering

Course ID: 3198

Course Details: An introductory course in the analysis and design of passive microwave circuits beginning with a 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

16.409 Directed Studies

Course ID: 3199

Course Details: Provides an opportunity for qualified Electrical Engineering students to investigate specific areas of interest. The actual project undertaken may be software or hardware oriented. The most important characteristics of the projects are that the end results represent independent study, that they are research and development oriented, and that they are accomplished in an engineering environment. Design reviews and progress reports are expected for each project. A final formal report to be permanently filed in the EE Department is required for each project. Engineering Design (100%).

Max Credits: 3
Min Credits: 3

16.410 Directed Studies

Course ID: 3200

Course Details: The purpose of this course is to provide an opportunity for qualified Electrical Engineering students to investigate specific areas of interest. The actual project undertaken may be software or hardware oriented. The most important characteristics of the projects are that the end results represent independent study and that they are research and development oriented, and that they are accomplished in an engineering environment. Design reviews and progress reports are expected for each project. A final formal report to be permanently filed in the EE Department is required for each project.
16.411 Medical Diagnostic Imaging

Course ID: 3201

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.

Max Credits: 3
Min Credits: 3

16.412 Directed Studies

Course ID: 3202

Course Details: The purpose of this course is to provide an opportunity for qualified Electrical Engineering students to investigate specific areas of interest. The actual project undertaken may be software or hardware oriented. The most important characteristics of the projects are that the end results represent independent study and that they are research and development oriented, and that they are accomplished in an engineering environment. Design reviews and progress reports are expected for each project. A final formal report to be permanently filed in the EE Department is required for each project.

Max Credits: 3
Min Credits: 3

16.413 Linear Feedback System

Course ID: 3203


Max Credits: 3
Min Credits: 3

16.414 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

16.418 Wireless Communication

Course ID: 3206

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.
16.421 Real Time Digital Signal Processing

Course ID: 3209
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 will be 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.

16.423 Introduction to Solid State Electronics

Course ID: 3211

16.427 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.

16.428 Alternative Energy Sources

Course ID: 3214
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.

16.429 Electric Vehicle Technology

Course ID: 3215
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.

16.431 R F Design
Course ID: 3217

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

16.435 Computational Electromagnetics

Course ID: 3219


Max Credits: 3
Min Credits: 3

16.441 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

16.444 Power Distribution System

Course ID: 3228

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. Prerequisite: 16.355

Max Credits: 3
Min Credits: 3

16.445 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

16.450 Advanced Digital System Design

Course ID: 30319

Course Details: 

Max Credits: 3
Min Credits: 3
**16.453 Software Engineering**

Course ID: 3230

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

**16.460 Biomedical Instrumentation**

Course ID: 3231

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

**16.461 Engineering Electromagnetics II**

Course ID: 3232

Course Details: Continuation of Magnetostatics, Maxwell's Equations for Time-varying Fields, plane waves: time-harmonic fields, polarization, current flow in good conductors and skin effect, power density and Poynting vector, wave reflection and transmission; Snell's Law, fiber optics, Brewster angle, radiation and simple antennas, electromagnetic concepts involved in a topical technology in development.

Max Credits: 3  
Min Credits: 3

**16.462 Antenna Theory and Design**

Course ID: 3233


Max Credits: 3  
Min Credits: 3

**16.467 Special Topics**

Course ID: 3237

Course Details:

Max Credits: 3  
Min Credits: 3

**16.468 Electro-optics & Integrated Optics**

Course ID: 3238

Course Details: An introduction to physical optics, electro-optics and integrated optics. Topics include: Waves and polarization, optical resonators, optical waveguides, coupling between waveguides, electro-optical properties of crystals, electro-optic modulators, Micro-Optical-Electro-Mechanical (MEMS) Devices and photonic and microwave wireless systems.

Max Credits: 3
16.469 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

16.470 VLSI Fabrication

Course ID: 3239

Course Details: Fabrication of resistors, capacitors, p-n junction and Schottky barrier diodes, BJTs and MOS devices and integrated circuits. Topics include: silicon structure, wafer preparation, sequential techniques in microelectronic 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

16.472 Embedded Real Time Systems

Course ID: 3241

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

16.473 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

16.474 Principles Of Solid State Devices

Course ID: 3242

Course Details: Principles of Solid State Devices: Crystal properties and growth of semi-conductors, atoms and electrons, Bohr's model, quantum mechanics, bonding forces and energy bands in solids, charge carriers in semiconductors, drift of carriers in electric and magnetic fields, carrier lifetime and photoconductivity, junctions, forward and reverse bias, reverse bias breakdown (Zener effect), tunnel diodes, photodiodes, LED, bipolar junction transistors, field effect transistors. A design project is included in the course.

Max Credits: 3
16.480 Microprocessor Systems II & Embedded Systems

Course ID: 31985

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

16.481 Operating Systems

Course ID: 3246

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

16.482 Computer Architecture and Design

Course ID: 3247


Max Credits: 3
Min Credits: 3

16.483 Network Design: Principles, Protocols & Applications

Course ID: 3248

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

16.484 Computer Vision and Digital Image Processing

Course ID: 3249

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
16.490 Fiber Optic Communication

Course ID: 3252

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

16.491 Industrial Experience

Course ID: 3253

Course Details: This three credit course is for co-op or industrial experience. It may be taken three times and the co-op internship should be for at least 500 hours in order to be eligible for credit. Only 3 credits may be used toward the BSEng in CpE or EE degree. Registration for this course is conditional on the approval of the Department Co-op coordinator. A grade of Satisfactory or Unsatisfactory is given.

Max Credits: 12
Min Credits: 0

16.492 Industrial Experience II

Course ID: 3254

Course Details: Industrial work experience by permission of coordinator only.

Max Credits: 3
Min Credits: 3

16.493 Industrial Experience III

Course ID: 3255

Course Details: This three credit course is for co-op or industrial experience. It may be taken three times and the co-op internship should be for at least 500 hours in order to be eligible for credit. Only 3 credits may be used toward the BSEng in CpE or EE degree. Registration for this course is conditional on the approval of the Department Co-op coordinator. A grade of Satisfactory or Unsatisfactory is given. Prerequisite: Permission of Instructor

Max Credits: 3
Min Credits: 3

16.499 Capstone Project

Course ID: 3256

Course Details: The purpose of the Capstone Project is to provide the student with a design experience which resembles entry level engineering assignments. It is expected that the project encompass a minimum of three technical areas within the CpE or EE discipline, and include some aspects of each step in the development of a marketable product i.e. Research, Design & Development, Manufacture, Marketing & Service. A formal technical report must be submitted prior to the submission of a course grade. Prerequisite 16.399 and 16.400

Max Credits: 3
Min Credits: 3

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 DSIP 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


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


Max Credits: 3
Min Credits: 3

16.510 Digital Signal Processing

Course ID: 3266


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 S11, S12, S21 and S22 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


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

16.527 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
16.529 Electric Vehicle Technology

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 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


Max Credits: 3
Min Credits: 3

16.533 Microwave Engineering

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 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 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
Course Details: Information transmission and deterministic signals in time and frequency domains. Relationship between correlation and power or energy spectra. 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

16.552 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


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


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 system.

Max Credits: 3
Min Credits: 3

16.574 Advanced Logic Design

Course ID: 3310


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

16.577 Verification of Digital Systems

16.581 Computer Vision and Digital Image Processing

16.582 Wireless Communications

16.583 Network Design: Principles, Protocols and Applications
16.584 Probability and Random Processes

Course ID: 3318


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 junctions diodes, (rectifiers, varaeors, tunnel diodes and photodetectors and solar cells); bipolar junction transistors, field effect transistors (juntion FET, MEFET, 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

16.612 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, m access networks for converged services: xDSL and HFC networks, and IP TV service.

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

16.659 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
**16.666 Storage Area Networks**

Course ID: 3359
Max Credits: 3
Min Credits: 3

**16.669 Opto Electronic Devices**

Course ID: 30326
Max Credits: 3
Min Credits: 3

**16.688 Theoretical Acoustics**

Course ID: 3369
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
Max Credits: 3
Min Credits: 3

**16.715 Special Topics**

Course ID: 3381
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

16.754 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

16.757 Doctoral Dissertation
Course ID: 29830
Course Details:
Max Credits: 7
Min Credits: 7

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
**17.130 Electrical Basics and Laboratory**

Course ID: 3412

Course Details: This course introduces the basic principles of electrical engineering, including the concepts of voltage, current, resistance, inductance and capacitance. Ohm's Law, Kirchhoff's Laws, superposition, Thévenin's theorem, and Norton's theorem will be covered. Alternating current concepts, frequency response and filters are discussed. The use of laboratory power supplies and measuring instruments such as oscilloscopes, voltmeters, ammeters and ohmmeters are demonstrated. Written reports are required.

Max Credits: 2
Min Credits: 2

**17.213 Electric Circuits I**

Course ID: 3420

Course Details: Discusses: electrical circuits; voltage, current and resistance; energy, power and charge; Ohm's Law, Kirchhoff's Current Law and Kirchhoff's Voltage Law; simplification and conversion techniques for networks containing sources and/or resistance; Thévenin's and Norton's theorems; fundamentals of magnetism and magnetic circuits; properties of capacitance and inductance and associated transient behavior of circuits.

Max Credits: 3
Min Credits: 3

**17.354 PSPICE Simulation**

Course ID: 3438

Course Details: OrCAD's Capture is used as the schematic entry tool to generate circuits that will be simulated using PSPICE. AC and DC independent and dependant sources and device models will be used in these circuits that will be evaluated by various simulation methods using voltage, current and frequency sweeping as well as temperature and time sweeps. The graphical analysis tool, Probe, will be used to display the results of the simulations and Probe's mathematical functions will be used to further analyze the simulation results. All of these functions will be presented in a combination of lecture, homework, and hands-on PC lab environment. Applications learned in class will be reinforced by homework problems which will then be applied in the PC lab. Pre-Requisite: 17.355

Max Credits: 3
Min Credits: 3

**17.361 Project Laboratory A**

Course ID: 3444

Course Details: The project lab runs for 14 weeks with design, fabrication, and testing of the project during the weeks one through twelve, and the last two weeks for presentation of the projects to the class. It is expected that all projects be presented operational and meeting the design performance requirements. There are exceptions to this. In the case of non-working projects the progress and final report will be heavily relied on for grading.

Max Credits: 2
Min Credits: 2

**17.383 Microprocessors A**

Course ID: 3453

Course Details: Introduces the microprocessor and microprocessor programming through an integrated set of experiments and related lectures. Topics include: binary, decimal, and hexadecimal numbers; the microprocessor; memory devices; structure of microprocessor-based systems; programming and instruction sets; addressing modes; arithmetic, logical, and shift instructions; branch conditions and instructions; indexed addressing; the stack; subroutines; assembly language; floating-point routines; and software development techniques. Approximately one-half of the course time will be an associated laboratory, culminating with a programming project. Pre-Requisite: 17.341

Max Credits: 3
Min Credits: 3
17.384 Microprocessors B

Course ID: 3454

Course Details: Extends the skills developed in 17.393 to interfacing the microprocessor to the outside world through an integrated set of experiments and related lectures. Topics include: architecture of microprocessor-based systems; microcontrollers; parallel I/O ports; interrupts; A/D and D/A converters; programmable timers; handshaking; and serial communications. The course will contain a three-week project applying the functions learned to a real world design. Approximately one-half of the course time will be an associated laboratory.

Max Credits: 2
Min Credits: 2

17.391 Project Laboratory B

Course ID: 3455

Course Details: The project lab runs for 14 weeks with design, fabrication, and testing of the project during the weeks one through twelve, and the last two weeks for presentation of the projects to the class. It is expected that all projects be presented operational and meeting the design performance requirements. There are exceptions to this. In the case of non-working projects the progress and final report will be heavily relied on for grading. May do project at work (all requirements of reports, presentation, etc. still required). Pre-Requisites: 17.361, or 17.353 and 17.358 and 17.365

Max Credits: 2
Min Credits: 2

17.392 Project Laboratory C

Course ID: 3456

Course Details: The project lab runs for 14 weeks with design, fabrication, and testing of the project during the weeks one through twelve, and the last two weeks for presentation of the projects to the class. It is expected that all projects be presented operational and meeting the design performance requirements. There are exceptions to this. In the case of non-working projects the progress and final report will be heavily relied on for grading. May do project at work (all requirements of reports, presentation, etc. still required).

Max Credits: 2
Min Credits: 2

17.410 System Engineering and Analysis

Course ID: 37880

Course Details: This course describes the entire development of complex systems form needs and requirements analysis through the life cycle design process. Phases of system design form conceptual to detailed design are described. Program management and control techniques, including risk management and configuration management, are discussed. Analysis of alternatives and decision making under risk and uncertainty are covered. Mathematical tools for quantitative analysis are described. Costing issues are discussed and the "ilities" (i.e., reliability, maintainability, supportability, etc.) are introduced.

Max Credits: 3
Min Credits: 3

17.485 Fundamentals of Communication Systems

Course ID: 3481

Course Details: The course will provide an overview of various techniques and technologies used in communication systems. Signal analysis and linear system analysis will be discussed along with various nonlinear techniques. Various modulation techniques to be discussed will include linear modulation (AM), angle modulation (FM), and several types of digital modulation. Issues related to wireless systems as well as computer communication will be addressed.

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

18.693 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

19.508 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 perceptive, 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, "conducive production", and measurement strategies. Principles applied through practical design problems.
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.
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 Biostatics 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

19.598 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: 3
Min Credits: 3

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:
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

19.632 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 form 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

19.687 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.
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 epidemiology to model exposure-response relationships. Topics include general linear models, logistic regression, mixed models, generalized linear models, linear models, generalized linear mixed models, principal component analysis (factor analysis,) and survival models. Students should have working familiarity with SPSS.

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

19.702 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

19.704 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.
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
Min Credits: 1

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

19.727 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

19.733 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
19.737 Independent Study: Epidemiology

Course Details:
Max Credits: 6
Min Credits: 6

19.739 Graduate Project - Work Environment

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 Details:
Max Credits: 3
Min Credits: 3

19.763 Continued Graduate Research

Course Details:
Max Credits: 3
Min Credits: 3

19.999 Intercampus Graduate Research

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

20.314 Manufacturing Production

Course Details:
Max Credits: 3
Min Credits: 3

20.402 Manufacturing Operations
Course ID: 3726
Course Details:
Max Credits: 3
Min Credits: 1

20.499 Industrial Technology Capstone Project

Course ID: 3751
Course Details:
Max Credits: 3
Min Credits: 3

20.535 Microprocessor Application

Course ID: 3761
Course Details:
Max Credits: 3
Min Credits: 3

22.200 Mechanical Engineering Project I

Course ID: 32997
Course Details: Students work on engineering design/build/test (DBT) projects under the supervision of a mechanical engineering faculty member. Projects can include student club based DBT projects.
Max Credits: 1
Min Credits: 1

22.201 Mechanical Design Laboratory I

Course ID: 3796
Course Details: Course emphasis is on introducing the use of computer aided design tools in the engineering problem solving process. Assigned design projects require the use of both wire frame and solid modeling tools. Lecture and lab activities are used to support project requirements, and to provide more in-depth understanding of computer aided engineering design and drawing.
Max Credits: 2
Min Credits: 2

22.202 Mechanical Design Laboratory II

Course ID: 3797
Course Details: This is an introductory course in manufacturing processes covering the basic machine tool practices utilized in the manufacturing of a product. The objective of the course is to develop a broad understanding of manufacturing operations and their relationship to engineering product design. Students manufacture, fabricate and measure the accuracy of a mechanical assembly from design drawings, using lathes, milling machines, drill presses and other conventional processes.
Max Credits: 2
Min Credits: 2

22.211 Statics

Course ID: 3798
Course Details: The application of Newton's Laws to engineering problems in statics. The free-body diagram method is emphasized. Topics include vector algebra, force, moment of force, couples, static equilibrium of rigid bodies, trusses, friction, properties of areas, shear and moment diagrams, flexible cables, screws, bearings, and belts.
22.212 Strength of Materials

Course Details: Stress and deformation analysis of bodies subjected to uniaxial loading, thermal strain, torsion of circular cross-sections, shear flow in thin-walled sections, bending of beams, and combined loading. Application of equilibrium, compatibility and load-deformation relations to solve statically determinate and indeterminate systems.

Max Credits: 3
Min Credits: 3

22.213 Dynamics (alternate 14.205)

Course Details: Calculus based vector development of the dynamics of points, particles, systems of particles, and rigid bodies in planar motion; kinematics of points in rotating and non-rotating frames of reference in one, two, and three dimensions; conservation of momentum, and angular momentum; principle of work and energy.

Max Credits: 3
Min Credits: 3

22.242 Thermodynamics

Course Details: The first and second laws of thermodynamics are introduced and applied to the analysis of thermodynamic systems in terms of work, heat, energy transformation, and system efficiency. The use of tables, graphs, and equations of state is introduced to obtain various properties of pure substances. The concepts of work, heat and energy, as well as their relationships, are studied. The theory and application of reversible and irreversible thermodynamic process, Carnot cycles, and entropy are studied in relation to the energy analysis of engineering systems. Energy balances and ideal efficiencies of steady flow engineering systems are analyzed.

Max Credits: 3
Min Credits: 3

22.296 Mechanical Behavior of Materials

Course Details: Properties and characterization of engineering materials. The behavior of engineering materials is studied experimentally to develop an understanding of properties important in materials selection and engineering design. Structure-property-processing relationships are discussed. Topics include stress, strain, strength, stiffness, thermal expansion, hardness, tensile and bending tests, strain gages, corrosion, microstructure of metals, polymers, ceramics and composites.

Max Credits: 3
Min Credits: 3

22.300 Mechanical Engineering Project II

Course Details: Students work on engineering design/build/test (DBT) projects under the supervision of a mechanical engineering faculty member. Projects can include student club based DBT projects.

Max Credits: 1
Min Credits: 1

22.302 Mechanical Engineering Laboratory I: Instrumentation

Course Details:
Course Details: Students set up and conduct specific experiments designed to study: 1) fundamental ME instrumentation systems; 2) fundamental experimental techniques and 3) basic physical principles of mechanical systems. Experiments are divided into two areas; solid-mechanical and thermo-fluids. Students develop models for use in validating and comparing with experimental results. Written communication techniques are emphasized.

Max Credits: 3
Min Credits: 3

22.311 Applied Strength of Materials

Course ID: 3812

Course Details: Strength of materials principles are applied to the stress analysis of machine components and structures. The effects of buckling and combined bending, torsion, and axial loadings are studied together with the effects of stress risers due to geometrical complexities. Topics include: 3D stress transformations; principal stresses; Mohr's circle; failure criteria; stress concentration factors; equilibrium and energy methods; plates; global, local and inelastic buckling; finite elements; fracture and fatigue.

Max Credits: 3
Min Credits: 3

22.321 Mechanical Design I

Course ID: 3814

Course Details: Design and kinematic analysis of linkages. Course topics include linkage synthesis and motion analysis (position, velocity and acceleration) and technical writing. These topics are integrated in a semester-long design-build-test project utilizing commercial CAD and simulation software. This project involves project management, teamwork, design, creation of shop-quality drawings, manufacturing and assembly as well as performance testing of a three-position double-dwell linkage. Schedules (Gantt charts), progress reports and final reports are submitted.

Max Credits: 3
Min Credits: 3

22.322 Mechanical Design II

Course ID: 3815

Course Details: Design of cams and gear trains and control of mechanical devices. Course topics include: cam sizing and manufacture, cam and gear train kinematics, dynamic force analysis, machine balancing, introduction to the control of mechanical systems. The major project involves the design, analysis, manufacture, and dynamic testing of a cam having specified performance requirements; computer aided design (CAD) and computer numerically controlled (CNC) milling machines are applied. Dynamic simulation (MATLAB) is used throughout the course.

Max Credits: 3
Min Credits: 3

22.341 Conduction & Radiation Heat Transfer

Course ID: 3817

Course Details: The theory of steady state and transient heat conduction in solids is developed and applied. The concepts of Biot and Fourier numbers are covered and their applications are studied. The principals of thermal radiation with application to heat exchange between black and non-black body surfaces are studied. The use of radiation networks (electrical network analogy) is examined. Surface radiation properties are extensively covered. Design projects are integrated into the course.

Max Credits: 3
Min Credits: 3

22.342 Convective Processes

Course ID: 3818

Course Details: Internal and external flows with friction, Reynold's number, laminar and turbulent flows. Mathematical development of the hydrodynamic boundary layer. Boundary layer separation and fluid dynamic drag. Flow in pipes. Forced and free convective heat transfer, the thermal boundary layer, Reynolds' analogy, Prandtl and Grashof numbers. Empirical engineering convection relations. Students engage in a design project throughout the term.
22.361 Mathematical Methods for Mechanical Engineers


22.381 Fluid Mechanics

Course Details: A calculus-based engineering course which deals with the development of basic fluid mechanic relations. Emphasis is placed on the control-volume approach for solving problems. Topics include fluid behavior and fluid properties: hydrostatic pressure and forces; buoyancy and stability; continuity, momentum, and Bernoulli equations; similitude and dimensional analysis; scale analysis and modeling; internal and external flows with friction; Reynolds number; laminar and turbulent flows; mathematical development of the hydrodynamic boundary layer; boundary layer separation and fluid dynamic drag; fluid flow in pipes and ducts.; friction and minor losses.

22.400 Mechanical Engineering Project III

Course Details: Students work on engineering design/build/test (DBT) projects under the supervision of a mechanical engineering faculty member. Projects can include student club based DBT projects. Completion of 22.400, 22.300, and 22.200 can count as a mechanical engineering technical elective (academic petition required).

22.403 Mechanical Engineering Lab II: Measurement Engineering

Course Details: Continuation of Mechanical Engineering Lab I. Focuses on digital data acquisition systems used on mechanical engineering equipment. Students design measurement systems composed of various transducers, their associated signal conditioners and digital data acquisition and recording devices. Statistical methods are emphasized. Experiments require the students to provide calibration and to select appropriate sampling rates and test durations. Systems under test range from simple multisensor laboratory apparatus to actual operating mechanical systems.

22.423 Capstone Design

Course Details: Students perform independent design work and participate in team efforts to develop conceptual designs from functional requirements. Perform design analysis and synthesis, modeling, fabrication, testing, cost estimating, and documenting the essential elements of the system design.

22.425 Design of Machine Elements
Course ID: 3837

Course Details: The principles of mechanics and commonly used failure theories are applied to the design and analysis of machine elements subjected to static and dynamic (fatigue) load conditions. Elements studied include power screws, bolts, springs, bearings, gears, lubrication, shafts, brakes, clutches, and belts.

Max Credits: 3
Min Credits: 3

22.426 Grean Energy Engineering

Course ID: 36920

Course Details: Introduces a comprehensive range of green energy sources, and the tools and techniques to use that energy. A strong emphasis is given to residential applications, particularly those that are cost effective. Topics include solar energy, photovoltaic, wind power, geothermal heating, and bio-fuel production and use. Course will also investigate architectural considerations essential to effective implementation of green energy. Course is open to Seniors in engineering and science and those with a solid knowledge of vector notations and college algebra. Familiarity with the MATLAB computing environment would be useful.

Max Credits: 3
Min Credits: 3

22.441 Analysis of Thermo-Fluid Processes

Course ID: 3841

Course Details: Topics covered include: heat exchanger analysis and design; thermodynamic analysis of : gas power cycles, steam and combined cycles, and refrigeration cycles; mixtures of ideal gases; air-vapor mixtures and psychrometric charts with application to air conditioning systems; flow of a compressible fluid through a variable area passage: Mach number, choking conditions, and normal shock.

Max Credits: 3
Min Credits: 3

22.450 Nanoscale Transport Phenomena for Manufacturing Nanodevices

Course ID: 36698

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 ship devices, electronic devices, medical devices and other emerging technologies.

Max Credits: 3
Min Credits: 3

22.451 Dynamic Systems Analysis

Course ID: 3844

Course Details: Dynamic modeling of mechanical, electrical, electro-mechanical, hydraulic and thermal components. Application of ordinary differential equations, Laplace transforms, and numerical simulation for the response of these systems; response due to initial conditions and to transient and sinusoidal inputs using both time and frequency domain approaches considered. Use of block diagrams and numerical simulation using MATLAB and Simulink for linear time invariant systems is emphasized. Project work includes model identification and synthesis from measured data for first and second order systems.

Max Credits: 3
Min Credits: 3

22.453 Mechatronics
Course ID: 3845
Course Details: Devices and methods to monitor and control mechanical systems, with particular emphasis on the use of embedded microprocessors.
Max Credits: 3
Min Credits: 3

22.457 Vibrations
Course ID: 3847
Course Details: Fundamentals of vibration analysis of 1, 2 and multi DOF mechanical systems including the effects of damping; free response, forced response to transient and steady state harmonic and periodic excitations; the significance of natural modes, resonance frequency, mode shape, and orthogonality; vibration control, vibration isolators and absorbers; introduction to vibration measurement. Computer problems include the design of vibration control devices. A measurement project involves the use of an accelerometer, signal conditioning and analysis instrumentation.
Max Credits: 3
Min Credits: 3

22.473 Design Theory and Constraints
Course ID: 3851
Course Details: Concepts of world class design and manufacturing of modern products, including the issues of Design for Quality (DFQ), cost and the customer will be studied. Tools and techniques to be studied include Total Quality Management (TQM), statistical process control, process capability studies, six sigma quality, design efficiency ratings, design for cost, design of experiments, Analysis of Variance (ANOVA) of the mean and signal-to-noise ratio, and quality function deployment. Industrial case studies are used and student project work is required.
Max Credits: 3
Min Credits: 3

22.483 Aerodynamics and Flight Mechanics
Course ID: 3856
Max Credits: 3
Min Credits: 3

22.486 Ocean Engineering
Course ID: 3859
Max Credits: 3
Min Credits: 3

22.491 Industrial Experience I
Course ID: 3860
Course Details:
Max Credits: 3
Min Credits: 3
**22.492 Industrial Experience II**

Course ID: 3861

Course Details:
Max Credits: 3
Min Credits: 3

**22.493 Industrial Experience III**

Course ID: 3862

Course Details:
Max Credits: 9
Min Credits: 3

**22.499 Directed Studies in Mechanical Engineering**

Course ID: 3865

Course Details: This course provides seniors in Mechanical Engineering with the opportunity to pursue the study of a technical topic or project, individually under the supervision of a faculty member and, if desired, a responsible project engineer from industry. The course is to result in a term paper or technical report.

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

**22.513 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
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 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

**22.527 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

22.559 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, nanofluids,
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

22.581 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


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

22.591 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 polymers. 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

22.602 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

22.741 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
22.751 Adv Projects In Mechanical Engineering

Course ID: 3964
Max Credits: 3
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

23.101 Engineering Graphics

Course ID: 3974

Course Details: This course presents material in both class and laboratory format. Topics covered include: geometric constructions; multi-view sketching and projection; sectional views; isometric and oblique drawing; and dimensioning.

Max Credits: 2
Min Credits: 2

23.102 Engineering Design and Graphics

Course ID: 3975

Course Details: This course presents material in both class and laboratory format. Topics covered include: dimensioning, print reading, auxiliary views, graphs, screw threads, gears, and the design process. Working in teams, a major design project with written and oral reports is required.

Max Credits: 3
Min Credits: 3

23.200 Computer Aided Drafting (CADrf)

Course ID: 3979

Course Details: This course introduces the student to the use of CAD for construction of basic shapes and multi view drawings. It is a project oriented course introducing the student to graphic design using AutoCAD. AutoCAD, as it is applied in 23.200, is a two dimensional CAD program used to produce computer design models. Course stresses hands-on work with AutoCAD. Course is a fundamentals approach and requires no experience with other CAD programs. Pre-Requisite: 23.101

Max Credits: 3
Min Credits: 3

23.221 Statics

Course ID: 3981
Course Details: Statics is the study of objects in equilibrium and the forces acting on that object. Students will develop mathematical models to predict and analyze forces and their distributions with the use of the free body diagram. The concepts presented in this course directly relate to other mechanical and civil engineering fields. Students must have a basic understanding of trigonometry, geometry, physics and calculus. This course is in a combined section with CET.

Max Credits: 3
Min Credits: 3

23.222 Dynamics

Course ID: 3982

Course Details: This course introduces the student to the kinematics and kinetics of particles, systems of particles, and rigid bodies. This course covers the basic methods of analysis including Newton's 2nd Law (force, mass, acceleration), Work and Energy, and Impulse and Momentum. This course is in a combined section with CET.

Max Credits: 3
Min Credits: 3

23.223 Mechanics of Materials

Course ID: 3983

Course Details: This course discusses the principles of strength of materials and the relationships between externally applied forces and internally induced stresses in various types of structural and machine members and components. Included are axial, torsional, and flexural loadings, stress-strain relationships, deformation of materials, elastic deformation, principal stresses, temperature effects, Mohr's circle, shear and bending moment diagrams, the design of beams, and the deflection of beams.

Max Credits: 3
Min Credits: 3

23.241 Elements of Thermodynamics I

Course ID: 3984

Course Details: This course presents a thorough treatment of the concepts and laws of thermodynamics. The first law (energy) and the second law (entropy), properties of liquids and gases, and common power cycles (Rankine and Otto) are covered. Included is an overview of the global energy problem and power generation technologies, both established and novel.

Max Credits: 3
Min Credits: 3

23.242 Applied Fluid Mechanics

Course ID: 3985

Course Details: This course addresses the Properties of Fluids and basic concepts of Continuity, Momentum, Hydrostatics, and Fluid Flow Kinematics. Analysis of flow of real fluids in pipes, ducts and open channels is conducted. The study of compressible flows, fluid couplings as well as flow measurement techniques will also be discussed.

Max Credits: 3
Min Credits: 3

23.243 Elements of Thermodynamics II

Course ID: 3986

Course Details: This course is a continuation of Thermodynamics I analyzing in more detail various real world, practical power generation cycles, such as Rankine, reheat, regenerative, Otto, and Diesel. Also covered are refrigeration cycles, the basics of psychrometry, and the thermodynamics of combustion.

Max Credits: 3
Min Credits: 3

23.262 Engineering Data Analysis

Course ID: 3987

Course Details: This course introduces the student to the collection, analysis, and interpretation of data. Topics include probability distributions, single and multiple regression and correlation analysis, analysis of variance, and computer software for data analysis.

Max Credits: 3
Min Credits: 3
Course ID: 3987

Course Details: This course introduces students to basic statistical techniques, probability, risk analysis, and predictive modeling, and how they impact engineering and manufacturing activities in both analytical and forward looking activities. Topics covered include basic statistics, probability, combinations, permutations, regression, correlation, and predictive model development with the objective of building working statistical models for a technical environment. Pre-Requisites: 92.126, Proficiency in MS Excel or equivalent.

Max Credits: 3
Min Credits: 3

23.295 Materials Science

Course ID: 3988

Course Details: Properties of materials, selection of materials and processing of materials for appropriate applications are the focus of this course. Case studies are utilized to demonstrate failures which need not have occurred. Materials which are considered include metals and alloys, ceramics, polymers, and composites.

Max Credits: 3
Min Credits: 3

23.314 Manufacturing Productivity

Course ID: 3994

Course Details: The course will focus upon three primary categories of manufacturing improvement: theory of constraints/workflow, work definition and design, and quality improvement. Each students should understand and be conversant in the principles of productivity and able to lead a productivity improvement project upon successful completion of the course. Case studies will be used to illustrate the proper implementation of productivity improvement principles.

Max Credits: 3
Min Credits: 3

23.353 Forensic Engineering

Course ID: 32150

Course Details: This course is a survey of forensic engineering with particular emphasis on using engineering science and technology to investigate and reconstruct failures of engineered systems. Topics include qualifications of the forensic engineer, the scientific method, failure hypotheses, levels of confidence, physical evidence, field investigation techniques, examination and testing, codes and standards, and personnel safety. Other topics include ethics, the hired gun, junk science, the legal process, introduction to expert witness testimony, trial exhibits, Frye and Daubert decisions, bias, forensic engineering practice, and engineering reports.

Max Credits: 3
Min Credits: 3

23.414 Engineering Economics

Course ID: 4004

Course Details: This course introduces students to accounting and finance operations and principles, and how they impact engineering and manufacturing activities in both analytical and forward looking planning activities. Topics covered include financial statements, costing, depreciation, time value of money, cash flows, capital budgeting, and capital recovery with the objective of building working financial models for a technical environment. Pre-Requisites: 49.201 Economics I or instructor permission. Proficiency in MS Excel or equivalent.

Max Credits: 3
Min Credits: 3

23.475 Heat Transfer

Course ID: 4021

Course Details: This course focuses on the study of the fundamentals of heat transfer. Case studies are utilized to enhance the students' knowledge of the basic principles of heat transfer and to develop their problem-solving ability in conduction, convection and radiation.
23.485 Introduction to SolidWorks

Course ID: 4027

Course Details: This course introduces the student to the use of CAD for construction of basic shapes and multiview drawings. It is a project oriented course introducing the student to graphic design using SolidWorks. SolidWorks is a three dimensional solid modeling program used to produce computer design models. Pre-Requisite: 23.200 or some experience with another CAD program is required.

Max Credits: 3
Min Credits: 3

23.492 Directed Study: Special Topics

Course ID: 4028

Course Details: Covers basic mechanical comprehension as it relates to solving problems associated with mechanical systems. Materials covered will be in the form of theoretical equations simplified and applied directly to physical components used for demonstration & verification.

Max Credits: 3
Min Credits: 3

24.331 Introduction to Nuclear Engineering I

Course ID: 1263

Course Details: Review of relevant nuclear physics topics including nuclear stability, various forms of radiation, radioactive decay, and the interaction of radiation with matter (including health effects). Emphasis placed on neutron reactions in various core and structure materials, neutron cross sections, and the development and analysis of the neutron balance equation for various reactor types. Key aspects of nuclear reactor core physics and shielding design (criticality, power generation, reactor kinetics, reactivity control, fuel depletion, fission product poisoning, etc.) are treated. (10.331 and 24.331 are the same)

Max Credits: 3
Min Credits: 3

24.419 Nuclear Reactor Operator Training I

Course ID: 4047

Course Details: This course provides an introductory overview of nuclear physics and related theory and the various systems associated with the operation of the UMASS Lowell Nuclear Research Reactor (UMLRR). The course is intended for students who want to learn about the operations of the UMLRR and who are interested in a career in nuclear engineering and science. The course provides a multidisciplinary systems approach to education and training, which emphasizes "learning by doing". In a practical setting, students study and learn basic nuclear theory and design aspects of real-world systems associated with nuclear reactor operations. Knowledge is gained by working closely with experienced reactor operators and staff, and through independent study.

Max Credits: 3
Min Credits: 3

24.420 Nuclear Reactor Operator Training II

Course ID: 4048

Course Details: Continuation of 24.419. 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

24.434 Introduction to Nuclear Engineering II
Course ID: 36717

Course Details: A continuation of 10.331/24.331 with further discussion of basic nuclear reactor theory and reactor operations. The 2nd half of the semester focuses on heat removal and energy conversion in pressurized and boiling water reactors, including heat transfer in fuel elements and shields and the heat transfer characteristics of boiling and non-boiling liquids. Engineered safety and overall reactor core and plant design considerations are also discussed. (10.434 and 24.434 are the same)

Max Credits: 3
Min Credits: 3

**24.495 Directed Studies**

Course ID: 4053

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

**24.504 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

24.519 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

24.766 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
25.3CE Cooperative Education

Course ID: 37567

Course Details: This zero credit course is specifically designated for Plastics, Chemical, And Mechanical Undergraduate Engineering students who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program and have secured their first, full-time co-op employment. The co-op is designed to provide students the opportunity to develop and enhance their hands-on, technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.

Max Credits: 0
Min Credits: 0

25.4CE Cooperative Education

Course ID: 37566

Course Details: This zero credit course is specifically designated for Plastics, Chemical, and Mechanical Undergraduate Engineering students who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program and have secured their first, full-time co-op employment. The co-op is designed to provide students the opportunity to develop and enhance their hands-on, technical and professional skills within an Industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.

Max Credits: 0
Min Credits: 0

25.103 Environmental Biotechnology

Course ID: 34562

Course Details: This UML TEAMS Academy course will investigate the chemical and biological impact of human activity on aquatic environments. A specific focus of this course will be to observe the behavior of microorganisms impacted by pollutants introduced into the environment by humans. Students will explore possible engineering solutions to alleviate the problems caused by pollutants. This course can be described as "inquiry based discovery" and will rely heavily on laboratory investigations and laboratory based projects analyzing environmental samples collected in the field. This course is open only to high school students accepted to the UML-TEAMS Academy. Instructor permission required.

Max Credits: 3
Min Credits: 3

25.107 Introduction To Engineering I

Course ID: 4112

Course Details: This course provides a hands-on introduction to engineering and the engineering design process. Through assignments and projects, students learn how to: identify a problem, develop alternative solutions, select the best alternative, make critical decisions, and work as a team. The course is intended for freshmen in all engineering majors and provides an overview of the different engineering disciplines. Lecture and lab component.

Max Credits: 2
Min Credits: 2

25.108 Introduction To Engineering II

Course ID: 4113

Course Details: This course is intended for first-year engineering students and provides an introduction to technical communications, teamwork and other skills. Topics vary depending on the department and include data analysis, computer-aided drafting/design/modeling program usage, report-writing and/or oral presentation. Depending on the department, software introduced may include Excel, PowerPoint, AutoCad, Matlab and/or MathCad. Team-based labs and projects may be employed. Students should enroll in the sections corresponding to their major or intended department to develop relevant skills.

Max Credits: 2
Min Credits: 2
25.130 Introduction to Nano-Engineering

Course ID: 30335

Course Details: The multi-billion dollar investment in nanoscience and nanotechnology is beginning to yield new products, including better sunscreens and wear-resistance materials. "Introduction to Nano-Engineering" is an overview of engineering at the nanoscale, including measurement techniques, nanoelectronics, nanomaterials, design of nanodevices, nanomanufacturing, and the societal impact of nanotechnology. "Lecture" material is accompanied by open-ended questions for chat-room discussion and five virtual laboratories. Targeted for the general public. This is an interdisciplinary course.

Max Credits: 3
Min Credits: 3

25.151 Assistive Technology & Electronics

Course ID: 34563

Course Details: UML-TEAMS Academy students will explore basic electronics physics in a hands-on laboratory environment. Students will apply their knowledge as they learn how to breadboard, test, and troubleshoot a series of lab projects. Students will use CAD tools as they learn how to fabricate printed circuit boards. The course culminates with groups projects that apply the engineering design process and electronics to design and build a product for disabled clients in our community. This course is open only to high school students accepted to the UML-TEAMS Academy. Instructor permission required.

Max Credits: 3
Min Credits: 3

25.200 Community-based Engineering Project I

Course ID: 32562

Course Details: Students work on multi-disciplinary teams and apply their engineering problem-solving skills on community-based design projects.

Max Credits: 1
Min Credits: 1

25.210 Professional Development Seminar

Course ID: 36962

Course Details: The Professional Development Seminar is designed to provide students with the necessary structure, resources, and support to successfully secure and engage in their first cooperative education experience. Through a variety of teaching methodologies and assignments, students will participate in a sequence of learning activities including self-assessment, industry research, and the development of co-op learning objectives. Students will prepare to engage in the job search process through resume writing, strategic interviewing, professional networking and through learning professional behavior and presentation skills. The goal of the course is to assist each student in developing a sound plan of action to successfully participate in the cooperative education experience.

Max Credits: 1
Min Credits: 1

25.300 Community-based Engineering Project II

Course ID: 32563

Course Details: Students work on multi-disciplinary teams and apply their engineering problem-solving skills on community-based design projects.

Max Credits: 1
Min Credits: 1

25.310 Co-op assessment 1

Course ID: 36964

Course Details: The primary goal of this seminar is to assist students in the overall assessment of their overall cooperative education
experience. Through facilitated small group discussion, individual consultation and hands on practice, students will have an opportunity to identify and articulate their technical and professional skills, and explore how these skills and their co-op employment might be translated and leveraged into future work environments and their academic program at UML.

Max Credits: 1
Min Credits: 1

25.400 Community-based Engineering Project III

Course ID: 32564

Course Details: Students work on multi-disciplinary teams and apply their engineering problem-solving skills on community based design projects. Completion of 25.400, 25.300, and 25.200 can count as a mechanical engineering technical elective (academic petition required).

Max Credits: 1
Min Credits: 1

25.401 Engineering Capstone Design Project

Course ID: 32565

Course Details: Integrative design experience in engineering. Students work on multi-disciplinary teams and apply their engineering problem-solving skills on open-ended, real-world projects. Projects may be service-oriented in concept and teams may include members from other Departments and Colleges. Emphasis on communication, team-work, report-writing, oral presentations. This course may be used as a Technical elective for all Engineering Departments. Alternatively, this course may be used as a substitute for the culminating Capstone course in Electrical and Computer Engineering (16.499), Mechanical Engineering (22.423) and Plastics Engineering (26.416). Prerequisite: senior status & permission of instructor.

Max Credits: 3
Min Credits: 3

25.410 Co-op Assessment 2

Course ID: 36967

Course Details: This seminar is designed to support and assist students in the continued assessment of their cooperative education experience. Through a deepening of their work in Co-op Assessment 1, students will review their overall performance in the cooperative education program, while continuing to demonstrate their technical and professional skills through written work and public presentations to multiple audiences. It is expected that students will clearly define their future academic and career goals, enhance their professional networks, and develop a future plan to support their engineering aspirations.

Max Credits: 1
Min Credits: 1

25.490 Industrial Experience

Course ID: 35536

Course Details:

Max Credits: 0
Min Credits: 0

25.491 Industrial Experience I

Course ID: 4128

Course Details:

Max Credits: 12
Min Credits: 0

25.550 Introduction to Nanotechnology
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 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

26.4CE Co-op Experience

Course ID: 37824
Course Details: This zero credit course is specifically designated for Plastics, Chemical, and Mechanical Undergraduate Engineering students who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program and have completed their first, full-time co-op employment. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an Industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.
Max Credits: 0
Min Credits: 0

26.201 Polymer Materials I

Course ID: 1258
Course Details: This introductory course in plastics materials first evaluates how commercial plastics were developed, characterized and compared throughout the relevant industry. Various ASTM testing protocols are reviewed followed by an initial study of commodity plastic materials, including polyethylene, poly (vinyl chloride), polystyrene, diene rubbers and other selected and relatively high-volume resins. Applicable commercial polymerization methods are introduced along with comparative structure/property relationships. Initial comparisons are drawn as between commodity thermoplastic resins and thermoset compositions. Comparative end-use applications are continuously discussed along with a consideration of selected environmental issues (recyclability).
Max Credits: 3
Min Credits: 3

26.202 Polymer Materials II

Course ID: 4149
Course Details: A critical review of the commercial family of materials known as engineering thermoplastics including an examination of relatively important thermoset polymer systems. Major commercial polymerization reactions are reviewed (e.g. applicable chain growth or step-growth polymerizations) including comparative market performance based upon mechanical, thermal, chemical properties and environmental considerations. Also considered are selective high performance plastic materials suitable for use at elevated temperatures and in other relatively extreme working environments. Recommended Pre-Req: 26.201 Polymer Materials I.
Max Credits: 3
Min Credits: 3

26.210 Professional Development Seminar

Course ID: 33446
Course Details: The Professional Development Seminar is designed to provide students with the necessary structure, resources, and support to successfully secure and engage in their first Plastics Cooperative Education experience. Through a variety of interactive teaching methodologies and assignments, students will participate in a sequence of learning activities including self-assessment,
industry research, and the development of co-op learning objectives. Students will prepare to engage in the job search process through resume-writing, strategic interviewing, professional networking and learn professional behavior and presentation skills. The goal of the course is to assist each student in developing a sound plan of action to successfully participate in the cooperative education experience.

Max Credits: 1
Min Credits: 1

26.211 Engineering Mechanics

Course ID: 4153

Course Details: Equilibrium of structures subjected to forces and moments. Area and mass moments of inertia, Internal forces, shear and bending moments acting on loaded structures, including cantilevers, beams, trusses, bridges and machine frames. Friction.

Max Credits: 3
Min Credits: 3

26.215 Plastics Processing Engineering Laboratory I

Course ID: 4155

Course Details: A plastics laboratory courses to study plastics properties and processability. This course focuses on physical property testing of plastics. The property tests covered in this lab course include tensile properties, flexural properties, pendulum impact resistance, drop impact resistance, bulk properties, surface properties, and melt flow rate. The effect of temperature on many of these properties is also evaluated.

Max Credits: 1
Min Credits: 1

26.216 Plastics Process Engineering Laboratory II

Course ID: 4156

Course Details: This laboratory introduces students to the processes of plastics single screw extrusion, plastics injection molding, blow molding and sheet thermoforming. Experiments are designed so that the student will understand the theory of polymer conversion techniques by the interaction between process variables and materials characteristics.

Max Credits: 1
Min Credits: 1

26.218 Introduction to Design

Course ID: 4157

Course Details: This course is designed to teach basic principles of technical drawing, fundamentals of design, dimensioning and tolerances. Basic concepts of manufacturing and rapid prototyping are covered. The lecture component covers theoretical information, and the lab component covers hands-on learning, where students learn to use a commercial CAD software.

Max Credits: 2
Min Credits: 2

26.247 Thermodynamics

Course ID: 4159

Course Details: The principles of thermodynamics, a study of the first and second laws of thermodynamics with applications to classic power generation and refrigeration systems. The concepts of entropy, reversibility, irreversibility and availability.

Max Credits: 3
Min Credits: 3

26.306 Methods of Experimental Analysis

Course ID: 4163
Course Details: Basic concepts dealing with the interpretation of experimental engineering results. Deterministic vs. stochastic processes. Elementary probability theory and common distributions. Graphical analysis and mathematical modeling. Statistical parameters and their applications to quality control, and tests of significance. Design of experiments (DOE) for process development and optimization.

Max Credits: 3
Min Credits: 3

26.310 Co-op Assessment I

Course ID: 35650

Course Details: The primary goal of this seminar is to assist students in the overall assessment of their overall cooperative education experience. Through facilitated small group discussion, individual consultation and hands on practice, students will have an opportunity to identify and articulate their technical and professional skills, and explore how these skills and their co-op employment might be translated and leveraged into future work environments and their academic program at UML.

Max Credits: 1
Min Credits: 1

26.314 Fluid Flow

Course ID: 4164


Max Credits: 3
Min Credits: 3

26.315 Plastics Process Laboratory III

Course ID: 4165

Course Details: This laboratory introduces students to the processes of twin screw extrusion compounding, advanced injection molding and process monitoring, the plastics recycling process, and extrusion rheological measurements for plastics. Experiments are designed so that the student will understand the theory of polymer conversion techniques by the interaction between process variables and material characteristics.

Max Credits: 1
Min Credits: 1

26.316 Plastics Process Engineering Laboratory IV

Course ID: 4166

Course Details: This laboratory introduces students to the processes of blowm film extrusion, sheet extrusion, tubing extrusion with statistical quality control, twin screw compounding of nano-composites and over-molding. Experiments are designed so that the student will understand the theory of polymer conversion techniques by the interaction between process variables and material characteristics.

Max Credits: 1
Min Credits: 1

26.348 Heat Transfer

Course ID: 4168

Course Details: This course covers the theory and application of steady and transient heat conduction, convection, and radiation. Particular emphasis is placed on heat transfer problems in plastics processing and modern engineered systems. Computational methods and analysis of heat exchangers are covered.

Max Credits: 3
Min Credits: 3
26.373 Plastics Mold Engineering I

Course ID: 4169

Course Details: Course work entails the introduction to the fundamentals of plastics mold and die engineering with the objective to develop an overall appreciation of the mold engineer's job. Emphasis is placed on an integrated approach to mold engineering which includes the interrelationships of polymeric materials, engineering principles, processing, and plastics product design, mold and die design/construction, and design communications. Laboratory consists of the actual design of an old or mold components with emphasis on CAD and computerized Material Database. A semester project is required. Junior status or permission of instructor.

Max Credits: 3
Min Credits: 3

26.377 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

26.378 Plastics Process Engineering II

Course ID: 4171

Course Details: This course will study the basic extrusion processes of blown film, flat film, tube, pipe, pipe, extrusion coating, coextrusion, injection molding, thermoforming, rotational molding and blow molding with emphasis on how polymeric materials, machine components and process variables affect properties of the products produced with each process. Recommended Pre-Req: 26.377 Plastics Process Engineering I.

Max Credits: 3
Min Credits: 3

26.381 Polymer Science for Engineers I

Course ID: 33717

Course Details: An introduction to polymer science with a focus on making polymers. Topics covered include the chemistry, kinetics, and statistics of step and chain polymerizations and copolymerizations, polymerization processes. Industrially relevant polymers and commercial polymerization processes will be highlighted, with coverage of the health and safety aspects of various approaches to the preparation of various polymers given.

Max Credits: 3
Min Credits: 3

26.382 Polymer Science for Engineers II

Course ID: 33718

Course Details: An introduction to polymer science with a focus on polymer properties and behavior. Topics covered include analytical techniques (chemical, thermal, and microstructural analysis of polymers, measurement of molecular weight distribution, etc.), as well as the underlying physical, rheological and solution properties that make these techniques possible. Recommended Pre-Req: 26.381 Polymer Science for Engineers I

Max Credits: 3
Min Credits: 3

26.383 Polymer Science I Lab

Course ID: 34579
Course Details: Synthesis of polymers by step growth, condensation, suspension and free radical emulsion polymerization techniques. Fundamental concepts in polymerization kinetics and mechanism will be covered as well as structure-property considerations and polymerization with functional groups.

Max Credits: 1  
Min Credits: 1

**26.384 Polymer Science II Lab**  
Course ID: 34580

Course Details: Polymer characterization techniques including molecular weight distribution by gel permeation chromatography, crystallinity and order by differential scanning calorimetry; polymer morphology and surface properties, and spectroscopic (nuclear magnetic resonance, Raman, infrared) and mechanical (tensile, dynamic mechanical, rheological) techniques will also be covered. Recommended Pre-Reqs: 26.381 Polymer Science for Engineers I and 26.383 Polymer Science I Lab; Co-Req: 26.382 Polymer Science for Engineers II.

Max Credits: 1  
Min Credits: 1

**26.403 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

**26.404 Process Control**  
Course ID: 4172

Course Details: Basic principles of control systems used with plastics processing equipment. Included are instrumentation, signal conditioning, data acquisition, feedback control, process monitoring, data reduction, and SPC/SQC.

Max Credits: 3  
Min Credits: 3

**26.406 Polymer Structure, Properties and Applications**  
Course ID: 4173

Course Details: The fundamental relationships between molecular structure, properties and end-use applications of plastics materials will be explored in detail. Molecular structural features include chemical composition, molecular size and flexibility, intermolecular order and bonding, and supramolecular structure. Properties include processability, mechanical, acoustic, thermal, electrical, optical and chemical properties, price, and balance of properties. Applications include rigid solids, flexible solids, foams, film and non-plastic applications.

Max Credits: 3  
Min Credits: 3

**26.409 Senior Research Plastics I**  
Course ID: 4175

Course Details: Individual research projects in plastics chemistry, properties, processing, products, and industry organization. Students will review the existing literature, obtain materials and equipment, plan and carry out research programs and submit final reports for publication.

Max Credits: 3  
Min Credits: 3
26.410 Coop Assessment II

Course ID: 4176

Course Details: This seminar is designed to support and assist students in the continued assessment of their cooperative education experience. Through a deepening of their work in Co-op assessment 1, students will review their overall performance in the cooperative education program, while continuing to demonstrate their technical and professional skills through written work and public presentations to multiple audiences. It is expected that students will clearly define their future academic and career goals, enhance their professional networks, and develop a future plan to support their engineering aspirations.

Max Credits: 2
Min Credits: 2

26.418 Product and Process Design

Course ID: 4183

Course Details: Theoretical principles and sound engineering practice involved in the design of new end products made from polymers, applying the total systems approach to the balance between product design, choice of materials, tool design, and process techniques, as they affect competitive choices for commercial success. A semester project is required. Recommended Pre-Reqs: 26.373 Plastics Mold Engineering I and 26.378 Plastics Process Engineering II.

Max Credits: 3
Min Credits: 3

26.450 Nanoscale Transport Phenomena for Manufacturing Nanodevices

Course ID: 36698

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 ship devices, electronic devices, medical devices and other emerging technologies.

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, supramolecular 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

**26.524 Process Analysis Instrument and Control**

Course ID: 4227


Max Credits: 3
Min Credits: 3

**26.528 Plastics Information 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.
26.532 Adhesives and Adhesion

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: 1

26.533 Coatings Science and Technology I

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

26.535 Rubber Technology

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 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 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 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.
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/geoothermal 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

26.551 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, aminos, 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 rents 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

26.582 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: 9
Min Credits: 1

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 and 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

26.675 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

Max Credits: 1  
Min Credits: 1

26.743 Masters Thesis Plastics Engineering

Course ID: 4334

Max Credits: 3  
Min Credits: 3

26.746 Master's Thesis - Plastics Engineering

Course ID: 4336

Max Credits: 6  
Min Credits: 6

26.749 M S Grad Res Plastics

Course ID: 4337

Max Credits: 9  
Min Credits: 9

26.763 Continued Graduate Research

Course ID: 4346

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

30.102 Introduction to Public Health
Course ID: 37903
Course Details: Public health topics, both historical and contemporary are of importance to all citizens and to societal decisions. This survey course provides a foundation for understanding public health through exposure to current health care and policy issues viewed through the perspective of multiple disciplines. Methodology for understanding population health and developing critical thinking and decision-making skills in the analysis of public health issues using a population-based perspective will be developed. The course will provide an ecological understanding of the causation and prevention of disease with an emphasis on health issues that affect society as a whole.
Max Credits: 3
Min Credits: 3

30.104 Topics in Health
Course ID: 38079
Course Details: This introductory course is designed to provide students with the opportunity to explore a variety of topics and issues in health through reading and discussing recently published articles. Using classroom discussions as the major format for this course, students will be encouraged to think critically about current topics and issues in health to strengthen their analytical skills. This course will also assist students in developing oral presentation and communication skills that are necessary in the health field.
Max Credits: 3
Min Credits: 3

30.120 Life Skills
Course ID: 4440
Course Details: This course is designed to assist new students adjust to, and succeed in college and beyond. Course subject matter has been created in conjunction with the National Collegiate Athletic Association (NCAA). This course has been specifically designed to meet the needs of the student-athletes who are current members of our campus community. Successful completion of this course will give the participants the skills necessary to be successful students, athletes and citizens academically, socially, personally and professionally.
Max Credits: 3
Min Credits: 3

30.204 Introduction to Exercise Physiology
Course ID: 4446
Course Details: This course serves as an introductory course to the field of Exercise Physiology. It is designed as a program foundation to the profession and to professional behavior. Students will be exposed to what happens in both the fitness centers and in the cardiac or pulmonary rehabilitative facilities. The course will serve as a precursor to the remaining upper division major courses.
Max Credits: 3
30.210 Clinical Calculations

Course Details: This elective course is designed for students beginning the nursing program. It reviews the mathematics necessary to compute drug calculations using dimensional analysis. This course covers the metric system of weights and measures. The focus of the course is on the computation of drug dosages for oral and parenteral medications with emphasis on the application of skills necessary to calculate intravenous infusions and medications.

Max Credits: 1
Min Credits: 1

30.214 Careers in Health

Course Details: This introductory survey course is designed to give those students interested in health careers the opportunity to explore a variety of career path options in the health field. The goal of this course is to help students recognize their interests, knowledge, skills, and aspirations so that they can begin to make educated career decisions. The knowledge students will gain throughout this course will help them discern their own career path in the health care industry.

Max Credits: 1
Min Credits: 1

30.305 Exercise Physiology Lecture

Course Details: This course is designed to enable students to understand the acute and chronic physiologic effects of exercise on the human body. Topics will include bioenergetics, cardiopulmonary and cardiovascular physiology, neuromuscular physiology, special populations, and exercise prescription for apparently healthy athletic and clinical populations. Special topics in exercise physiology and environmental physiology will also be covered.

Max Credits: 4
Min Credits: 4

30.306 Introduction to Gerontology

Course Details: This course examines human aging from a multidisciplinary and developmental perspective. The course will focus on the adult years of the life span. The social-psychological factors involved in adjustments to the aging process, to retirement, to family, to leisure, to aloneness, to death and bereavement will be discussed together with such special concerns of the elderly as widowhood, finances, religion, sexuality and health problems. Rehabilitative strategies such as remotivation and reality orientation are included.

Max Credits: 3
Min Credits: 3

30.308 Global Health

Course Details: The focus of this course is on examining health issues from a global perspective including issues related to maternal and child health, aging, infectious diseases, sanitation, and health inequality. Nutritional and environmental health issues in diverse societies are analyzed. Social determinants of health and access to health care in developing and developed countries are emphasized.

Max Credits: 3
Min Credits: 3

30.309 Universal Design in the Promotion of Health

Course Details: This course is designed to provide students with an understanding of the principles of universal design and their application in the promotion of health. Students will learn about the design of environments, products, and communication systems that are accessible to and inclusive of people with a wide range of abilities and disabilities. This course will focus on the design of spaces and systems that are adaptable and accommodating to the needs of all individuals, including those with disabilities.

Max Credits: 3
Min Credits: 3
Course Details: This is a three-credit interdisciplinary undergraduate blended course (face-to-face and online). The course is designed to examine the principles of universal design and investigate challenges of equity, access and inclusion in healthy communities. Undergraduate students from a variety of disciplines will examine universal design and Assistive Technology (AT) that enhances the participation of individuals with a physical, emotional, sensory or intellectual and cognitive disability in education, community development, health care, recreation and public policy. The course reviews design concepts and the use of Assistive Technology as it relates to education, communication, vocation, recreation, and mobility for individuals with disabilities. Laws focusing on assistive technology in the home, school, community, and the workplace will be examined. The course explores both 'low tech' and 'high tech' types of assistive technologies that are available to support people with disability, based on the ICF model of disability. Interaction with users of assistive technology is accomplished through an experiential learning project. Students will engage in a team project that completes a thorough examination of a particular access or functional challenge and the use of universal design and AT to increase participation and minimize the effects of the person's impairments.

Max Credits: 3  
Min Credits: 3

30.315 Kinesiology

Course ID: 1250

Course Details: This course combines the study of mechanics, kinematics, kinetics, anatomy and neuromuscular physiology to teach the examination and evaluation of human movement. The major focus of the course is in qualitative evaluation of movement. Topics also include quantitative evaluation, body mechanics, posture and gait evaluation with a focus on identification of abnormal movement patterns. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3  
Min Credits: 3

30.319 Pathophysiology

Course ID: 34614

Course Details: This course provides an overview of the dynamic aspects of disease processes as they present in major body systems.

Max Credits: 3  
Min Credits: 3

30.320 Legal Issues in Nursing

Course ID: 34664

Course Details: This course provides an overview of legal issues nurses encounter in clinical practice. Case studies will be used to identify common risks to safety and quality of care. to examine the legal process when lawsuits are filed and to identify preventive strategies which improve quality of care and therefore, decrease legal risks for nurses.

Max Credits: 3  
Min Credits: 3

30.322 Independent Study Health Promotion

Course ID: 4462

Course Details: This course focuses on a health promotion project. Must have faculty approval for the course. Can be for 1, 2, or 3 credits.

Max Credits: 1  
Min Credits: 1

30.402 Global Health Experience

Course ID: 36715

Course Details: The Global Health Experience provides an experiential learning experience in health within a country outside of the United States. Students will study the health issues of a given country while examining the socio-cultural, economic and environmental determinants of health within that society. The strengths and weaknesses of the existing health care system will be analyzed. Students will explore the culture, environment, and health care system under the direction of School of Health and Environment faculty.
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.

31.100 Environmental Health Seminar
Course ID: 35835
Course Details: This required, non-credited seminar for Freshman and Sophomore Environmental Health Students explores current affairs and controversies in environmental health theory and practice. Readings and outside speakers will supplement short lectures, faculty and student-led discussions.

31.201 Community Health and Environment
Course ID: 4476
Course Details: This course emphasizes the concepts, philosophy, and principles of public health and their relationship to physical, mental, and social well-being of the community. The focus is on the prevention of disease, the promotion and maintenance of health, and the provision of environmental and personal health services through organized community effort.

31.203 Technology in Public Health
Course ID: 31960
Course Details: A lecture and hands-on course designed to help students better understand the role of computers and information technology in public health. Students will be guided through the use of various software applications that enhance public health efforts, including: word processing, database design and management, spreadsheets, presentations, geographical information systems (mapping health data), and internet based applications for social networking to address health related issues, as well as other uses. Discussions of what the future may hold for health information technology will also be included. Hands-on assignments will help students become more proficient with PC based software.

31.204 Intro to Health Promotion
Course ID: 4478
Course Details: This course focuses on the role health education plays in the development of healthful patterns of living. A philosophy of health education emphasizing holistic health will be generated. The organization and administration of school, community, health care facility, and workplace health education programs are introduced.

31.206 Research Methods in Public Health
Course ID: 32566
Course Details: Introduction to research methodologies used in the study of community and environmental health problems. Students will discuss actual research studies conducted by UMASS Lowell faculty in the College of Health Sciences.

Max Credits: 3
Min Credits: 3

31.301 Program Planning in Health Promotion

Course ID: 4479

Course Details: This course is primarily designed to introduce undergraduate students studying Health Education to the concepts and principles underlying the educational strategies geared toward promoting health and preventing disease in a variety of settings. The course emphasizes practical utility of the concepts as they relate to the students' future health education/promotion efforts. The importance of a needs assessment and program evaluation will be especially focused upon in the course, as well as strategies integrating these valuable tools into curriculum design.

Max Credits: 3
Min Credits: 3

31.303 Social Determinants of Health

Course ID: 4481

Course Details: This course introduces students to the concept of social determinants of health, and strongly emphasizes the influence of social power relations on public health. An examination of a set of major health issues, at both the international and national levels provides the framework for students to learn and understand these concepts. A set of learning modules begins with identifying major contemporary health problems, definitions of health and health promotion as established through the World Health organization, and an exploration of social power relations and how they can shape public health. The course then moves to examine a set of specific health issues to see how they have been shaped by their social determinants. Juniors only.

Max Credits: 3
Min Credits: 3

31.304 Politics of Health

Course ID: 4482

Course Details: The course addresses a range of contemporary health problems (primarily in the U.S.) that are described and analyzed in their social context. Areas for consideration will include: political, economic, scientific/technological, environmental, and cultural factors. Students will be introduced to health education theories and methods that support the development of strategies for social change. Juniors only.

Max Credits: 3
Min Credits: 3

31.305 Introduction to Epidemiology

Course ID: 4483

Course Details: This course is designed to introduce basic epidemiological methods used in the study of current major health problems. Content includes explanation of the scope and focus of epidemiology, simple measures of disease frequency and association used in the study of the distribution and determinants of disease, types of epidemiological study designs, and practical applications. Emphasis on interpretation of epidemiological information and application of findings Prerequisite: Community Health and an elementary statistics course. Required for seniors in Community Health Education; open by permission to other upper division students in Health Professions.

Max Credits: 3
Min Credits: 3

31.306 Socio-Ecological Health Assessment

Course ID: 4484

Course Details: Systems thinking, ecological and spatial principles and techniques are used to assess multiple contemporary health issues such as health literacy, emergence, reemergence of infectious diseases, climate change impacts and dimensions, aging population, and war and violence among other topics. The practical component of the course includes mapping and spatial analysis projects. Juniors only.
31.313 Principles of Environmental Health

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.

31.316 Environmental Health in Practice

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 course will provide in-depth 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.

31.321 Health Care Systems

Course Details: This course describes and analyzes the nature and functions of health care services and health professionals. The course examines the impact of social, political, economic, ethical, professional, legal, and technological forces on them and the system they comprise. Juniors and Seniors only.

31.370 Food Safety and Agriculture

Course Details: This course focuses on food safety and agriculture using a production-consumption life cycle model. Multiple ecological, socio-economic and regulatory aspects of food production, preparation, and consumption systems are explored. The course has an integrated theoretical and experiential learning component.

31.371 Chemicals and Health

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.

31.403 Mind, Body and Health
Course ID: 4492

Course Details: The interconnectedness of the mind, body, and spirit is integral to achieving "wellness". It is also important to acknowledge the impact each of these three aspects of wellness has upon each of the others. The growing body of research indicating the significant effects of things such as stress, anger, optimism, and healthy relationships on health status will be analyzed and evaluated. Practical strategies related to health advisement will be shared and experimented with during the semester. In this senior level course, we will explore these and many other areas of mind, body, and spirit awareness that are critical to consider when conducting health education programs.

Max Credits: 3
Min Credits: 3

31.405 Communication Techniques in Health Promotion

Course ID: 4494

Course Details: This course focuses upon the communication techniques and mass media approaches necessary to promote and implement effective health promotion programs and activities. Awareness and sensitivity toward cultural, ethnic, and religious diversity will be particularly emphasized when discussing various communication techniques in relation to particular health issues.

Max Credits: 3
Min Credits: 3

31.409 Service Learning in Community Health

Course ID: 4496

Course Details: This course is designed to serve as a service learning experience in the fall semester of students' senior year in Health Education. Students will be expected to participate in a pre-determined community health project happening in the City of Lowell for a minimum of 40 hours. During the course of this experience, students will provide the community health organization with their time, knowledge, and effort, and will, in return, gain tremendous experience in the organization, development, implementation, and/or evaluation of Community Health Education and Promotion Projects. Collaboration with various professionals involved in the programs and projects will certainly add to students' understanding of what a Health Educator does! An integral piece of this service learning experience will be the bi-monthly seminar geared toward assuring the connection between the community experience and the theoretical and academic framework from which it is derived Through the use of readings, discussions, student presentations, and guest speakers, students will gain wonderful experience in terms of what it means to "build the capacity of a community".

Max Credits: 3
Min Credits: 3

31.410 Community Health Practicum

Course ID: 4497

Course Details: Full-time health education field experience (28 hours per week). Students continue at the prepracticum site, participating in the development, implementation and evaluation of health education programs and take an active part in the total community health education process. Seniors only.

Max Credits: 10
Min Credits: 10

31.414 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

31.416 Environmental Health Practicum

Course ID: 32048
Course Details: This course is designed to provide students real world practical experience in the field of environmental health, as final preparation for their BS Degree. This 32 hour/week internship opportunity situates students in an environmental health setting most conducive to his or her needs and interests. Placements can vary from health boards and health departments to non-profit agencies, government agencies, university research institutes, and industry. Students work directly with an academically and professionally qualified preceptor to assure their progress in the field. The faculty supervisor is responsible for periodic meetings and correspondence to also assure appropriate development.

Max Credits: 10
Min Credits: 10

31.417 Climate Change: Science, Communication, and Solutions

Course ID: 36711

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

31.493 Directed Study

Course ID: 4499

Course Details:

Max Credits: 3
Min Credits: 1

33.210 Nursing Fundamentals

Course ID: 34582

Course Details: This course enables students to begin their basic knowledge of nursing. The course provides an organizing framework, based on Gordon's functional health patterns, that is strictly nursing. Therapeutic nursing interventions are incorporated into the more detailed discussion of each of the functional health patterns. A separate laboratory component is included for demonstration and practice of nursing interventions. At the conclusion of this course students will demonstrate competency in performing basic nursing intervention for individuals in a clinical setting.

Max Credits: 2
Min Credits: 2

33.210L Nursing Fundamentals Lab

Course ID: 34583

Course Details:

Max Credits: 1
Min Credits: 1

33.301 Research in Nursing and Health Care

Course ID: 4545

Course Details: This course provides an overview of the research process. Health care research interests and the methodology of various disciplines are examined. Through a review of research studies, students examine the basic steps in the process of research. Ethical problems in the world of research are explored and students learn how research influences health care practice and policy.
Max Credits: 3
Min Credits: 3

33.306 Health Assessment

Course ID: 4550

Course Details: This combined didactic and laboratory course builds on the students' professional nursing education and experiences through the inclusion of health assessment information as applied to the professional nursing role in the community setting. Emphasis is on systematic data collection including thorough history taking, physical examination, screening and risk-factor recognition.

Max Credits: 3
Min Credits: 3

33.307 Concepts for Baccalaureate Nursing

Course ID: 4551

Course Details: This course is designated as a transition course for registered nurse students pursuing a baccalaureate degree with a major in nursing. This course aims to refine critical thinking skills and analyze nursing's unique contribution to health care. Consideration is given to the interrelationships of theory, research, and practice. Special emphasis is placed on the concepts of health promotion and risk reduction as they relate to individuals and families who are at risk for or experiencing health problems. This course includes a practicum component that focuses on the development of interventions to promote the health of individuals and families at risk.

Max Credits: 3
Min Credits: 3

33.308 Health Promotion in Nursing

Course ID: 4552

Course Details: This course is designed as a transition course for registered nurse students pursuing a baccalaureate degree with a major in nursing. It introduces the theory and research related to the concepts of health promotion and risk reduction. These concepts are presented as essential components of professional nursing practice. This course includes a clinical practicum which focuses on the development of interventions to promote the health of individuals and families. This course aims to refine critical thinking skills and analyze nursing's unique contribution to health care. Consideration is given to the interrelationships of theory, research and practice.

Max Credits: 2
Min Credits: 2

33.309 Health Promotion in Nursing Practice Practicum

Course ID: 33015

Course Details: This course is a clinical practicum which focuses on the development of interventions to promote the health of individuals and families. This course aims to refine critical thinking skills and analyze nursing's unique contribution to health care. Consideration is given to the interrelationships of theory, research and practice.

Max Credits: 3
Min Credits: 3

33.311 Hlth Promotion and Risk Reduction of Families Practicum I

Course ID: 4554

Course Details: This community-based clinical course is focused on health promotion of young families including childbearing women, infants, children, and adolescents. A portion of the clinical experience consists of establishing a relationship by the student with a family, first four semesters of nursing curriculum.

Max Credits: 4
Min Credits: 4

33.312 Concepts of Professional Nursing
Course ID: 4555
Course Details: Nursing as a health profession is introduced in this foundation course. The concepts of health promotion, communication, critical thinking, culture, nursing theory and research, and therapeutic nursing interventions are presented. Within the context of the American Nurses’ Association Standards of Clinical Nursing Practice, standards of professional performance are introduced and standards of care are emphasized. First four semesters of nursing curriculum.

Max Credits: 2
Min Credits: 2

33.313 Nursing Assessment and Skills
Course ID: 4556
Course Details: This course introduces students to the foundations of communication, nursing assessment, and psychomotor skills guided by standards of nursing practice. Emphasis is placed on the integration and application of these skills through the use of critical thinking.

Max Credits: 2
Min Credits: 2

33.313L Nursing Assessment and Skills Lab
Course ID: 33014
Course Details: This laboratory course introduces students to the foundations of communication, nursing assessment, and psychomotor skills guided by standards of nursing practice. Emphasis is placed on the integration and application of these skills through the use of critical thinking.

Max Credits: 1
Min Credits: 1

33.315 Health Promotion Family Practicum II
Course ID: 4558
Course Details: In this clinical course, students provide nursing care to adult clients and their families. The focus is the development of specifically tailored therapeutic interventions to promote the health of these clients and assist with potential or actual health problems.

Max Credits: 4
Min Credits: 4

33.318 Pharmacology
Course ID: 30340
Course Details: This course focuses on the study of pharmacology. Pharmacology is the study of drugs prescribed to prevent, cure or care for disease processes. The nursing focus highlights major health problems across the lifespan to include pharmacological management.

Max Credits: 3
Min Credits: 3

33.319 Pathophysiology
Course ID: 30878
Course Details:
Max Credits: 3
Min Credits: 3

33.320 Community-Focused Health and Policy
Course ID: 37806
Course Details: This course provides a foundation to community health nursing with the community, family and individual as Client. This course presents an overview of the US health care delivery system with an emphasis on the role of government in healthcare, Medicaid, and current efforts at healthcare reform.

Max Credits: 3
Min Credits: 3

**33.321 Independent Study**

Course ID: 30341

Course Details: Independent Study on a topic chosen by the student and agreed on by the faculty member.

Max Credits: 1
Min Credits: 1

**33.322 Independent Study**

Course ID: 30342

Course Details: Independent Study on a topic chosen by the student and agreed on by the faculty member.

Max Credits: 2
Min Credits: 2

**33.323 Independent Studies**

Course ID: 30865

Course Details: Independent Studies

Max Credits: 3
Min Credits: 3

**33.324 Community-Focused Project Implementation**

Course ID: 37882

Course Details: This course focuses on improving the health of one aspect of the community. Students analyze health problems in identified communities. Interventions for community as client are developed and implemented and the effectiveness of applied interventions in evaluated.

Max Credits: 2
Min Credits: 2

**33.325 Community-Focused Project Dissemination**

Course ID: 37883

Course Details: This one credit course focuses on the dissemination of the results of a community based program. Students develop presentations which describe methods used to identify, intervene and evaluate the health problems of a community. Students are required to present their findings at a formal dissemination venue identified by faculty.

Max Credits: 1
Min Credits: 1

**33.412 Community Health and Health Policy**

Course ID: 4569

Course Details: This course analyzes the development of policy and its impact on the health of populations. Students apply epidemiology and community health science to population-based nursing practice. Students identify a community health problem that can be addressed through health promotion activities.
Max Credits: 4
Min Credits: 4

33.413 Role Transition

Course ID: 4570

Course Details: This capstone course focuses on the transition to the professional nursing role. Content includes professional issues, trends, and leadership and management principles which impact on nursing practice. Students analyze nursing practice in relation to the standards of professional performance.

Max Credits: 4
Min Credits: 4

33.420 Leadership in Nursing

Course ID: 37884

Course Details: This course focuses on leadership roles, responsibilities, and opportunities for the professional nurse. Course content includes professional issues, trends, and leadership and managerial principles pertinent to healthcare and nursing practice. Students explore professional perspectives, norms, and ethical standards essential in values-driven management and leadership.

Max Credits: 3
Min Credits: 3

33.421 Selected Topics in Nursing

Course ID: 37885

Course Details: Selected Topics in Nursing is a course for advanced undergraduates in the RN-BS option. The content will vary from semester to semester depending on the research interest of the faculty member(s) teaching the course.

Max Credits: 3
Min Credits: 3

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 compliment 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 psychotherapeutic 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

33.613 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.
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:
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

33.690 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

33.701 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

33.730 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

33.743 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 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 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

33.777 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
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 prospected 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
34.605 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/lymphedema 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

34.610 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
34.612 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: philosophy of science and causation, problem and hypothesis identification, review and analysis of scientific literature, methods of hypothesis testing, data analysis and interpretation and critique/ evaluation of research results.

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

34.640 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
**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: This three-credit course is designed to serve as a service-learning experience in the final year for doctoral physical
therapy students. The course is designed to provide relevant and meaningful service opportunities for culturally competent physical therapy services with a focus on prevention, health promotion, fitness, and wellness to individuals, groups, and communities. The service learning experience will prepare students for active civic participation in a diverse society. Through the use of readings, discussion, reflection and presentations students will gain an understanding what it means to build the capacity of a community and develop the competency skills of an entry level physical therapy practitioner.

Max Credits: 3
Min Credits: 3

34.650 Clinical Education Experience I

Course ID: 4732

Course Details: A ten-week full time clinical education experience designed to integrate basic physical therapy evaluation and treatment procedures with an emphasis on the musculoskeletal and cardiopulmonary systems. Students are directly supervised by licensed physical therapists in acute care and outpatient settings.

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: This twelve-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.

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
**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

**35.101 Human Anatomy and Physiology I**

Course ID: 4746

Course Details: This course provides a basic knowledge of the structure and function of the human body. An overview of the general organization of the body introduces the course. Following a discussion of basic human chemistry, the anatomy and physiology of cells, tissues, organs, and organ systems are studied with special emphasis placed on homeostasis and interaction among the various systems. The topics treated are body plan, chemistry, cytology, histology, the integumentary system, the skeletal system, the muscular system, and the nervous system. Clinical applications will be presented.

Max Credits: 3

Min Credits: 3

**35.102 Human Anatomy and Physiology II**

Course ID: 4747

Course Details: A continuation of the basic knowledge of human structure and function. The topics treated are cardiovascular system, lymphatic system, respiratory system, endocrine system, digestive system, metabolism, urinary system, and reproductive system.

Max Credits: 3

Min Credits: 3

**35.103 Human Anatomy and Physiology Laboratory I**

Course ID: 4748

Course Details: Laboratory exercises are designed to reinforce didactic material by providing hands-on experience with the subject matter. Students actively participate in simple chemical analysis, microscopic observations, and studies of anatomical models and preserved specimens. Students perform simple physiological tests on themselves and work in small groups to discuss conclusions.

Max Credits: 1

Min Credits: 1

**35.104 Human Anatomy and Physiology Laboratory II**

Course ID: 4749

Course Details: Laboratory exercises are designed to reinforce didactic material by providing hands-on experience with the subject matter. Students actively participate in simple chemical analysis, microscopic observations, and studies of anatomical models and preserved specimens. Students perform simple physiological tests on themselves and work in small groups to analyze results and discuss conclusions.

Max Credits: 1
35.107 Bodies and Bones

Course ID: 35013

Course Details: This course is open only to high school students accepted to the UML TEAMS Academy. This course uses an investigative approach to examine concepts related to the fields of Anatomy and Biochemistry. Select topics will be studied and applied to clinical situations and forensic cases. Assessment techniques will be used in hands-on laboratory activities and forensic simulations. The course will emphasize investigations using the scientific method, observation, and critical analysis. This course is open only to high school students accepted to the UML TEAMS Academy.

Max Credits: 3

Min Credits: 3

35.205 Introduction to Nutritional Science

Course ID: 36735

Course Details: This course introduces students to the major in Nutritional Science. Objectives of the major are covered along with beginning nutritional and food science principles, history of the profession, career options, and legal aspects of practice as a nutrition educator. An integrated survey of nutrition science as it relates to human physiological chemistry, food chemistry and biochemistry will also be discussed. This course will include guest speakers from within the department and outside the university. This course will be restricted to nutritional science majors.

Max Credits: 3

Min Credits: 3

35.206 Human Nutrition

Course ID: 4756

Course Details: This course provides an overview of nutrition and the components of a nutritious diet during the various stages of the life cycle. It emphasizes the impact of nutrition on the major contemporary health problems in the United States. Nutrition issues, trends and research, and their effect on society and the legislative process will be explored.

Max Credits: 3

Min Credits: 3

35.210 Nutrition and Health

Course ID: 38081

Course Details: This course is an introductory course to the science of nutrition as it applies to everyday life and health. Focus will include the six major nutrients: carbohydrates, lipids (fats), protein, vitamins, minerals, and water and their importance in the human body. Digestion, absorption, and metabolism in the human body will be introduced. The course will also examine energy balance and weight management as they relate to nutrition and fitness. The impact of culture, demographics and ethnicity on nutritional intake will be discussed. Students will explore the relationship between nutrition and health through laboratory experiences.

Max Credits: 3

Min Credits: 3

35.211 Basic Clinical Microbiology & Pathology

Course ID: 4759

Course Details: Studies the fundamentals of microbiology with major emphasis on structure, function, growth, metabolism, and classification of clinically important microorganisms. The human body’s response to invading microbes and an introduction to the ecological aspects of microorganisms in the environment with particular stress on their significance, activities (beneficial and detrimental) and control measures will also be studied.

Max Credits: 3

Min Credits: 3

35.213 Basic Clinical Microbiology & Pathology Laboratory
Course ID: 4760
Course Details: Laboratory investigations of basic properties and characteristics of microorganisms are conducted. Students will perform commonly used techniques for collecting, handling, and studying clinically important microorganisms.
Max Credits: 1
Min Credits: 1

35.251 Physiological Chemistry I

Course ID: 4762
Course Details: This course provides a foundation in basic chemistry for students majoring in the Health Sciences. Basic concepts covered include: properties of matter, energy, atomic and molecular structure, isotopes and radioactivity, chemical bonding, chemical formulae and reactions. Quantitative aspects of chemical processes, chemical equilibrium and the behavior of gases, including blood gases and their transport are discussed. Properties of water and solutions are studied and include units of concentration, osmotic, osmolality, and physiological fluid and electrolyte balance. The chemistry of acids, bases and buffers is reviewed with emphasis on physiological buffer systems. Quantitative aspects, acid/base balance, compensatory mechanisms and elementary diagnosis are discussed. The chemistry of inorganic trace elements and their physiological roles are investigated. Concepts of organic chemistry are introduced, including the structure and function of carbon, isomerism and the properties and selected reactions of the major functional groups important in human biochemistry.
Max Credits: 3
Min Credits: 3

35.252 Physiological Chemistry II

Course ID: 4763
Course Details: This course is designed to provide a foundation in basic biochemistry for students majoring in the Health Professions. Selected concepts in organic chemistry are integrated into this framework. Aspects of amino acid and protein structure are studied. The structure and function of enzymes, their effects on reaction energetics and dynamics and the diagnostic uses of enzyme assays in clinical medicine are covered. The plasma proteins, hemoglobin, and the structure and function of miscellaneous cellular proteins are reviewed. The chemistry of the nucleic acids, protein anabolism and catabolism are studied along with selected metabolic disturbances and genetic disease. The structure and chemical properties of the simple and complex carbohydrates and lipids their metabolic pathways and cycles, and selected pathologies are studied in detail. Diagnostic tests relating to carbohydrate and lipid abnormalities are included. The course concludes with a study of chemical communication mechanisms, which includes neurotransmitters, hormonal secretions, and immunoglobulins.
Max Credits: 3
Min Credits: 3

35.253 Physiological Chemistry Laboratory I

Course ID: 4764
Course Details: Laboratory experiments are conducted to complement the material covered in 35.251. Exercises dealing with properties of matter, chemical equations, qualitative analysis, energy, osmosis, chemical equilibrium and acids/bases/buffers will be performed. The qualitative properties of alcohols, aldehydes, ketones, acids and esters will be explored.
Max Credits: 1
Min Credits: 1

35.254 Physiological Chemistry Laboratory II

Course ID: 4765
Course Details: Laboratory experiments are conducted to complement the material covered in 35.252. The chemistry of the basic biochemical molecules will be explored, including proteins, enzymes, carbohydrates, lipids, and nucleic acids. Selected aspects of metabolism and the assay of clinically significant materials will be studied.
Max Credits: 1
Min Credits: 1

35.435 Medical & Clinical Genetics
Course Details: This course covers the clinical and pathological aspects of human genetics with emphasis on prevention, diagnosis, and treatment of genetic diseases. Mendelian, cellular, and molecular genetics are reviewed, as is the metabolic basis of inherited diseases. Students learn principles of genetic counseling and how they integrate with other health care disciplines. These genetic counseling precepts are applied when students research and analyze a condition occurring in their own family, and write a report that embodies the results of this research. Following a review of DNA chemistry and dynamics, molecular alterations that cause human diseases is extensively discussed, including SNP activity, gene therapy techniques, and epigenetic mechanisms. Transcription and translation, the “switching on and off” of genes, and other DNA activity is discussed. The genetics of cancer, somatic cell genetics, and immunogenetics are integrated into genetic counseling. Laboratory techniques such as autoradiography, DNA extraction and analysis by electrophoresis, DNA profiling, automated DNA sequencing, RFLP analysis, PCR amplification, microarray analysis, and cloning methodology are presented. Pre-implantation diagnosis, germ-line alteration, and embryo cloning will also be discussed, along with their legal, ethical, and moral implications. Current progress on the Human Proteome, Transcriptome, and Kinome Projects will also be reported. Applications of genomics will be pervasive throughout the course.

Max Credits: 3
Min Credits: 3

36.241 Clinical Laboratory Theory

Course Details: This course is designed to introduce the theoretical principles and applications of diagnostic techniques and the procedures of the clinical laboratory including phlebotomy. It will define and describe both qualitative and quantitative, manual and automated laboratory techniques, particularly in hematology.

Max Credits: 3
Min Credits: 3

36.243 Clinical Laboratory Theory Lab

Course Details: A laboratory course designed to expose prospective clinical scientists to many of the essentials skills, methods, and procedures basic to professional performance in the clinical laboratory; to explain and demonstrate to students and have them perform these methods; to develop an understanding of these techniques and to provide a technical background, an approach to testing that the student can build upon and use in future courses.

Max Credits: 1
Min Credits: 1

36.273 Introduction to Clinical Laboratory Science

Course Details: This course is intended to provide the student with an overview of the medical laboratory. Topics include the history of the field, hospital and laboratory professional organizations, state and federal regulations, and careers in the clinical setting, in research and in industry. The role of the medical laboratory scientist in the clinical setting will be explored further through examination of each laboratory department.

Max Credits: 2
Min Credits: 2

36.311 Medical Bacteriology I

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

36.313 Medical Bacteriology Laboratory I
Course ID: 4784

Course Details: This course is designed to introduce the student to pathogenic microorganisms, media and techniques used in the identification of these organisms. Emphasis will be based upon the isolation, identification and differentiation of pathogenic microorganisms common to man. In addition, quality control and antimicrobial susceptibility testing will be covered.

Max Credits: 2
Min Credits: 2

36.321 Clinical Hematology

Course ID: 4786

Course Details: A study of the human hematopoietic system and its relationship to other organ systems. Discussions will include morphological and biochemical relationships of erythropoiesis and leukopoiesis in health and disease states. A study of the mechanics of blood coagulation as it relates to health and disease states will also be included.

Max Credits: 3
Min Credits: 3

36.323 Clinical Hematology Laboratory

Course ID: 4787

Course Details: This course is designed to emphasize current hematological and coagulation procedures used in today's clinical laboratory. The implications of these tests to diagnose, monitor and evaluate the various hematological disorders are also discussed.

Max Credits: 2
Min Credits: 2

36.331 Clinical Immunology

Course ID: 4788

Course Details: An introduction to the principles of immunology including: the study of antigens and antibodies and their interactions and controls; description of cellular events and the immune response, and in vivo and in vitro antigen-antibody interactions with clinical relevance. Immunological aspects of transplantation, autoimmune disease, immunodeficiencies and cancer pathogenesis are also discussed.

Max Credits: 3
Min Credits: 3

36.336 Life Cycle Nutrition

Course ID: 37040

Course Details: Biology of the life cycle including development, growth, maturation, and aging and its impact on nutritional requirements of humans from the zygote to the elderly is considered. How to meet these nutritional requirements is discussed relative to the feeding issues and context of each major life stage. Course emphasizes the critical analyses of beneficial and adverse outcomes of various nutrient intakes and dietary patterns of the nutritional status and well-being through integration of nutrition and other health sciences in understanding nutritional needs during the life cycle. Analysis of cultural, environmental, psychosocial, physical, and economic factors affecting nutritional status through the life span will also be discusses. Methods of nutritional assessment for each stage of the life cycle will be examined.

Max Credits: 3
Min Credits: 3

36.341 Organic Reactions & Structure

Course ID: 4789

Course Details: This course surveys the principles of organic chemistry important for the study of clinical chemistry and human biochemistry. The chemistry of carbon compounds, bonding and the concepts of isomerism will be studied. Detailed information is presented on each of the major functional classes of organic compounds, including: hydrocarbons, halides, alcohol, phenols, ethers, aldehydes, ketones, carboxylic acids and their derivatives, amines, organosulfur compounds. Emphasis is placed on chemical structure, physical and chemical properties, common and IUPAC nomenclature, and chemical reactions and their mechanisms. Selected aspects
of the properties and synthesis of polymeric materials are presented. Qualitative analysis of organic compounds is discussed with emphasis on the use of spectral techniques, including infra-red and nuclear magnetic resonance spectroscopy for the elucidation of chemical structure.

Max Credits: 3  
Min Credits: 3

36.343 Organic Reactions & Structure Laboratory

Course ID: 4790
Course Details: Laboratory exercises are performed to supplement the material covered in 36.341.
Max Credits: 1  
Min Credits: 1

36.345 Community Nutrition

Course ID: 36921
Course Details: This course explores the role of the nutrition professional in community needs assessment, intervention development and evaluation, and in forming domestic nutrition policy. Nutrition problems in contemporary communities and of selected target groups in the United States and in developing countries are examined. Programs and strategies to meet nutrition needs outside the acute care setting, such as nutrition education and food assistance are explored. Local, state, and national nutrition policy and initiatives in nutrition will also be examined.
Max Credits: 3  
Min Credits: 3

36.350 Human Biochemistry

Course ID: 4791
Course Details: This course is an in-depth study of biochemical substances and their reactions in the body, with major emphasis placed on metabolism at the cellular level and examined in the tissues of the various organs where these reactions occur. Correlation of biochemical processes underlying pathologic conditions will be made whenever practical.
Max Credits: 3  
Min Credits: 3

36.351 Clinical Chemistry I

Course ID: 4792
Course Details: This course is designed to provide students with knowledge and theory of techniques used in the Clinical Chemistry laboratory for measurement of amino acids, proteins, carbohydrates, and lipids in body fluids. Students will learn to use, interpret and evaluate the performance of these laboratory methods and develop the ability to recognize levels of these biochemical components in both normal and pathophysiological states. Examination and comparison of laboratory results will be used to diagnose or rule out disease. Techniques reviewed range from general to specific assays and from the classical to state-of-the-art methodologies. In addition, students will be able to assess the quality of laboratory generated values determine when values are invalid and suggest ideas to troubleshoot clinical laboratory methods.
Max Credits: 3  
Min Credits: 3

36.353 Clinical Chemistry Laboratory I

Course ID: 4793
Course Details: This course is designed to introduce the clinical techniques of biochemical measurement in body fluids. These techniques range from general to specific assays and from the classical to the up-to-date state of the art methodologies. Biochemical measurements of the following in the normal state and alterations due to pathophysiology are discussed: amino acids, proteins, carbohydrates and lipids. Quality control of assay procedures is emphasized.
Max Credits: 2
36.361 Clinical Laboratory Instrumentation

Course ID: 4794

Course Details: This course is designed to provide an in-depth knowledge of clinical chemistry laboratory instrumentation. Emphasis is placed on theoretical concepts, instrument components and design, calibration and troubleshooting of modern instrumentation, and analytical methodologies in the clinical laboratory. Additionally, qualitative and quantitative applications of instrumental techniques are covered. Computer applications are included where appropriate. The following spectroscopic instruments are studied: ultraviolet, visible and infra red absorption, fluorescence, turbidimetry and nephelometry, reflectance, flame emission and atomic absorption spectroscopy. Electrochemical methods of analysis are reviewed, including potentiometric techniques, voltammetry and coulometry. Chromatographic instrumentation and methods are discussed, such as column and thin layer chromatography, high pressure liquid chromatography, gas chromatography, and ion exchange chromatography.

Max Credits: 3
Min Credits: 2

36.363 Clinical Laboratory Instrumentation Laboratory

Course ID: 4795

Course Details: Laboratory exercises will be performed to supplement the material covered in 36.361.

Max Credits: 2
Min Credits: 2

36.371 Nutrition and Metabolism

Course ID: 4796

Course Details: This class is advancement into the biochemical and physiologic process through which the nourishment of the human organism is accomplished and how the interactions among nutrients, other aspects of the environment, and the body result in perturbations affecting human health. The process of human nourishment proceeds within the context of an organism with an intricate structure, unique composition, and specific capacities for adaptive change. Basic information from many disciplines relating to body function and structure will be summarized. This will serve as setting the stage for detailed discussions, which describe the nutritional biochemistry and metabolism of the body for the normal state, and for states where nutrient availability is altered or disease is imposed.

Prerequisites: 35.206

Max Credits: 3
Min Credits: 3

36.372 Obesity & Weight Control

Course ID: 4797

Course Details: Etiology, pathophysiology, and treatments of obesity, anorexia nervosa, and bulimia are reviewed. Role of hereditary, neurological, metabolic, and environmental mechanisms are discussed. Particular emphasis on obesity.

Max Credits: 3
Min Credits: 3

36.373 Clinical Laboratory Sciences Seminar

Course ID: 4798

Course Details: This course is designed to familiarize the student with different interview skills and approaches to resume writing, the process of implementing a laboratory information system, good education practices and team building skills. Students will evaluate current research designs and work in a team to create a presentation to express their opinions as educated consumers.

Max Credits: 1
Min Credits: 1

36.406 Biochemistry of Lipids
Course ID: 4799

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 antioxidants 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

36.410 Clinical Microbiology Practicum

Course ID: 4801

Course Details: Supervised clinical training in an affiliated clinical laboratory, designed to reinforce knowledge and skills gained in lecture and laboratory and at the same time introduce the student to the daily activities of the clinical microbiology laboratory. Emphasis will be placed on quality control, methodology and clinical interpretation.

Max Credits: 2
Min Credits: 2

36.411 Medical Mycology & Parasitology

Course ID: 4802

Course Details: Intensive study of classification, morphology, physiology, genetics and ecology of medically important fungi and parasites. Emphasis on epidemiology, pathogenicity and diagnosis.

Max Credits: 3
Min Credits: 3

36.413 Medical Mycology & Parasitology Laboratory

Course ID: 4804

Course Details: The laboratory is designed to emphasize principles and procedures used in the isolation, cultivation, and identification of medically important fungi and parasites.

Max Credits: 2
Min Credits: 2

36.414 Infectious Disease

Course ID: 4805

Course Details: The course is designed for students in the health and biological sciences and is offered for both undergraduate and graduate students. A general microbiology course is advised as a prerequisite. The focus of the course is 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 significant episodes of emerging infections and current technology in diagnosis and treatment of infectious disease in the new millennium.

Max Credits: 3
Min Credits: 3

36.416 Molecular Diagnostics Lab

Course ID: 4807

Course Details: This course is designed to instruct students in the principles and techniques used in Molecular Diagnostics in the clinical laboratory setting. Students will be given both lecture and laboratory instruction in basic molecular testing methodologies. At the completion of this course, the student will have a basic understanding of molecular diagnostic principles and will be proficient in molecular diagnostic laboratory techniques including DNA extraction, PCR using SINEs and STRs, restriction enzyme digestion, ELISA, bacterial transformation, DNA sequencing and microarrays.

Max Credits: 1
36.420 Clinical Hematology Practicum

Course ID: 4808

Course Details: Supervised clinical training in an affiliated clinical laboratory. Designed to reinforce knowledge and skills gained in lecture and laboratory and at the same time introduce the student to the daily activities of a clinical hematology laboratory. Emphasis will be placed on quality control, methodology, and clinical interpretation and correlation.

Max Credits: 2
Min Credits: 2

36.430 Clinical Immunohematology Practicum

Course ID: 4809

Course Details: Supervised clinical training in an affiliated clinical laboratory is designed to reinforce knowledge and skills gained in lecture and laboratory and, at the same time, introduce the student to the daily activities of the clinical immunohematology laboratory. Emphasis will be placed on quality control, methodology and clinical interpretation and correlation.

Max Credits: 2
Min Credits: 2

36.431 Clinical Immunohematology

Course ID: 4810

Course Details: Lecture and case study discussions look at the major red cell antigen/antibody systems that are of importance in understanding transfusion therapies, blood antigen and antibody testing, compatibility testing, and pathological diseases. Emphasis is on differentiation and clinical significance of each system. Donor selection regulations, component preparation, adverse transfusion reactions, and hemotherapy will also be discussed.

Max Credits: 3
Min Credits: 3

36.433 Clinical Immunohematology Laboratory

Course ID: 4811

Course Details: Practical laboratory experience in blood banking, illustrating the concepts stressed in the lecture including ABO and Rh typing, identification of other red cell antigens, antibody screening and identification, direct antiglobulin testing, crossmatching, and other techniques performed in the Clinical Immunohematology laboratory.

Max Credits: 2
Min Credits: 2

36.434 Advanced Topics in Hemostasis

Course ID: 4812

Course Details: This course will constitute an in-depth study of the hemostatic mechanism. Current research and case studies on the roles of vessel endothelium, platelet function, clotting procoagulants and fibrinolysis will be presented. Students will diagnose pathologic hemostatic states, such as hemorrhage or thrombophilia, due to deficiencies and impairments of these roles, including the impact of natural and acquired anticoagulants/inhibitors and anticoagulant therapy.

Max Credits: 1
Min Credits: 1

36.450 Clinical Chemistry Practicum

Course ID: 4814

Course Details: Supervised clinical training in an affiliated hospital clinical laboratory. Designed to reinforce knowledge and skills gained in lecture and laboratory and at the same time introduce the student to the daily activities of the clinical laboratory. Emphasis will...
be placed on quality control, methodology and clinical interpretation and correlation.

Max Credits: 2
Min Credits: 2

**36.451 Urinalysis Practicum**

Course ID: 4815

Course Details: A one-week clinical rotation in an affiliated laboratory designed to give the student experience in microscopic examination and evaluation of urine sediments. Emphasis is on correlating physical and chemical characteristics with sediment evaluation and diagnoses as well as on quality control, methodology, and clinical interpretation and correlation. Additional routine tests of a physical and chemical nature will be performed and demonstrated.

Max Credits: 0
Min Credits: 0

**36.452 Clinical Chemistry II**

Course ID: 4816

Course Details: This course will provide students with knowledge and theory of techniques associated with determinants of acid-base balance, blood gases, electrolytes, osmolality, hemoglobin, toxicology, therapeutic drug monitoring and endocrinology. Students learn to interpret and evaluate the performance of these laboratory methods and develop the ability to recognize levels of these biochemical components in both normal and pathophysiological states. Laboratory techniques range from general to specific assays and from the classical to state-of-the-art methodologies. In addition, students will be able to assess the quality and validity of laboratory generated values, determine when values are invalid and suggest ideas to troubleshoot methodologies. Students will also be able to produce and analyze statistical data for use in correlation, comparison and evaluation of laboratory techniques. Prerequisite: 35.351

Max Credits: 3
Min Credits: 3

**36.453 Laboratory Management and Ethics**

Course ID: 4817

Course Details: This course will acquaint the student with the many managerial, educational, technical, and administrative theories and practices, as well as moral and ethical issues that may confront the health care professional functioning within a clinical or research laboratory setting. In addition, it will present the varied career opportunities that are available for graduates.

Max Credits: 2
Min Credits: 2

**36.454 Clinical Chemistry Laboratory II**

Course ID: 4818

Course Details: This course, a continuation of 36.353, is designed to instruct the student in the analytical procedures and methods currently used in the clinical laboratory. Manual and automated methods utilized in the assessment of such topics as acid-base balance, porphyrins, toxicology and vitamins will be introduced. In addition, methods associated with the routine examinations of urine and other body fluids will be introduced. Quality control, laboratory safety and professional performance are emphasized.

Max Credits: 2
Min Credits: 2

**36.463 Vitamins and Minerals**

Course ID: 4819

Course Details: Detailed analysis of the digestion, absorption, transport, and intermediary metabolism of vitamins and minerals as essential nutrients. The chemical and biochemical characteristics of vitamins and minerals are examined to account for the physiological functions.

Max Credits: 3
Min Credits: 3
36.465 Lab Methods in Nutrition Assessment

Course ID: 31884

Course Details: This course provides the student 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

36.472 Nutrition and Gene Expression

Course ID: 4821

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.

Max Credits: 3
Min Credits: 3

36.474 Senior Seminar

Course ID: 4823

Course Details: This course is designed to familiarize the student with different types of questions used in the national certification exams and to give the student the opportunity to practice taking mock certification examinations.

Max Credits: 1
Min Credits: 1

36.481 Medical Nutrition Therapy I

Course ID: 4824

Course Details: This course is intended to provide students with current knowledge and application in dietary prevention, treatment, and long-term management of obesity, diabetes, cardiovascular diseases, and upper gastrointestinal diseases. Topics include nutrition counseling and communication skills, professional ethics, medical terminology, clinical laboratory values, dietary menu planning and analysis in specific situations, evaluating nutritional status, case studies for these diseases. This course will stress the steps in the nutrition care process, determine appropriate methods for screening patients for nutritional risk, and help the student assess the nutritional status of patients.

Max Credits: 3
Min Credits: 3

36.482 Medical Nutrition Therapy II

Course ID: 37039

Course Details: This course is a continuation of Medical Nutrition Therapy I that will provide students with current knowledge and application in dietary prevention, treatment, and long-term management of patients with trauma, burns, HIV, cancer, liver, lower gastrointestinal diseases, celiac disease, and renal diseases. Topics include nutrition counseling and communication skills, professional ethics, medical terminology, clinical laboratory values, dietary menu planning and analysis in specific situations, evaluating nutritional status, case studies for these diseases, and will examine enteral and parental nutrition support for critically ill patients. Students will also develop a basic knowledge related to the principles of fluid and electrolytes balance as well as acid-base balance as they relate to the nutritional care of patients/clients.

Max Credits: 3
Min Credits: 3

36.483 Senior Research

Course ID: 4825

Course Details: This course is designed to familiarize the student with different types of questions used in the national certification exams and to give the student the opportunity to practice taking mock certification examinations.

Max Credits: 1
Min Credits: 1
Course Details: Students along with their faculty advisor will structure a research project commensurate with the students' areas of interest. A paper embodying the results of the research project will be prepared.

Max Credits: 2
Min Credits: 2

36.484 Senior Research

Course ID: 4826

Course Details: Continuation of 36.483

Max Credits: 2
Min Credits: 2

36.493 Clinical Laboratory Sciences Directed Studies

Course ID: 4827

Course Details: Students along with their faculty advisor will structure an acceptable project in one of four areas: research, program development, teaching, or clinical practicum. Students are eligible to earn three credits in accordance with departmental policy.

Max Credits: 3
Min Credits: 3

36.494 Directed Research in Nutrition

Course ID: 4828

Course Details: Students with their faculty advisor structure a research project in the area of nutrition. A paper embodying the results of the project will be prepared.

Max Credits: 3
Min Credits: 3

36.496 Senior Research in Nutrition

Course ID: 4829

Course Details: Continuation of 36.494.

Max Credits: 3
Min Credits: 3

36.506 Biochemistry of Lipids

Course ID: 4832

Course Details: This advanced course in the nutritional biochemist 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.
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 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

36.733 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.
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

38.101 Freshman Seminar

Course ID: 35271

Course Details: The Freshman Seminar will introduce new students to UMASS Lowell, the College of Health Sciences. Class participants will participate in weekly activities to improve study skills, communication skills, and problem solving. They will also learn important information about careers in Exercise Physiology and health-related fields.

Max Credits: 1
Min Credits: 1
38.202 Introduction to Exercise Physiology

Course ID: 4875

Course Details: This course introduces students to the major in Exercise Physiology. Objectives of the major are covered along with beginning fitness principles, history of the profession, career options, and legal aspects of practice. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

38.301 Junior Seminar

Course ID: 35272

Course Details: The Junior Seminar, offered spring semester to Exercise Physiology majors, will orient students to information required for their Practicum experience during their Senior Year.

Max Credits: 1
Min Credits: 1

38.305 Exercise Physiology I

Course ID: 4881

Course Details: This first course of a two-course sequence will examine the short and long term effects of exercise on the oxygen transport systems. The lecture portion of this course will introduce the students to understanding the concepts of physiological and metabolic functioning of the human body during all forms of physical activity. Students taking this course are advised that the capability to exercise moderately and maximally will be necessary. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 4
Min Credits: 4

38.307 Exercise Physiology I Laboratory

Course ID: 4882

Course Details: This course must be taken concurrently with 38.305. It offers students the opportunity to test and evaluate physiological concepts and skills discussed in the lecture. Student physical examinations completed prior to each academic year should include cardiopulmonary status indicating exercise capability. Documentation must be provided to the Department prior to entering this laboratory course. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 1
Min Credits: 1

38.315 Kinesiology

Course ID: 1250

Course Details: This course combines the study of mechanics, kinematics, kinetics, anatomy and neuromuscular physiology to teach the examination and evaluation of human movement. The major focus of the course is in qualitative evaluation of movement. Topics also include quantitative evaluation, body mechanics, posture and gait evaluation with a focus on identification of abnormal movement patterns. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

38.317 Kinesiology Laboratory

Course ID: 4884

Course Details: All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 1
38.356 Pharmacology

Course ID: 31962

Course Details: All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

38.406 Exercise Physiology II

Course ID: 1249

Course Details: This course provides a continuation of Exercise Physiology I and deals with the short and long effects of exercise on the skeletal and neuromuscular systems. This portion of the sequence also provides an integration of the physiological systems when considering the effect of exercise. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 4
Min Credits: 4

38.408 Exercise Physiology II Laboratory

Course ID: 4887

Course Details: This course is designed to provide the student with hands on experience in a variety of laboratory techniques and field techniques for the assessment of human performance. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 1
Min Credits: 1

38.412 Clinical Practicum I and II

Course ID: 4888

Course Details: This course is an off-campus experience in either a cardiac/pulmonary rehab clinical facility or fitness setting. Students experience practical applications of the concepts and theories learned in the classroom settings. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 4
Min Credits: 4

38.417 Research Methods in Exercise Physiology

Course ID: 4889

Course Details: This course involves an in-depth study of current research methods and topics with specific applications to the field of Exercise Physiology. The content includes the sources of data acquisition, research design, testing procedures, and treatment of data. Each student must participate in a senior research project utilizing information gained from the lecture portion of the class. All 1st 2nd and 3rd year course work in the exercise physiology major. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

38.418 Senior Seminar

Course ID: 4890

Course Details: The Senior Seminar, offered concurrently with 38.412 Clinical Practicum, will be an on-campus discussion of the practicum experience.

Max Credits: 3
38.420 Advanced Study in Exercise Physiology

Course ID: 4891

Course Details: This course is a capstone course in Exercise Physiology. Students summate and synthesize classroom and clinical experiences in Exercise Physiology in the preparation of a final project. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

38.421 Directed Study Health Promotion

Course ID: 30347

Course Details: All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

38.422 Exercise Prescription & Programming

Course ID: 4892

Course Details: This course provides an essential foundation for exercise prescription and programming, and sound educational practice. Factors that impede or enhance exercise compliance and progress are explored. Clinical teaching skills, safety, and professional behavior are also addressed. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.

Max Credits: 3
Min Credits: 3

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

40.248 Values in American Culture

Course ID: 1248

Course Details: Deals with the development and interrelationship of American views on individualism, nature, science, technology, democracy, ethnicity, and the American dream. Readings begin with the Puritans and end with contemporary essayists. Deals with the development and interrelationship of American views on individualism, nature, science, technology, democracy, ethnicity, and the American dream. Readings begin with the Puritans and end with contemporary essayists.

Max Credits: 3
Min Credits: 3
40.257 The Family in American Literature

Course ID: 4950
Course Details: A study of literary selections dealing with traditions of family life, the individual, and social change.
Max Credits: 3
Min Credits: 3

40.274 Literature of Beat Movement

Course ID: 31963
Course Details: A survey of fiction and poetry by Beat Movement authors, including Lowell native Jack Kerouac, Allen Ginsberg, William Burroughs, Herbert Huncke, Gregory Corso, and Lawrence Ferlinghetti.
Max Credits: 3
Min Credits: 3

40.311 South in American Literature

Course ID: 4951
Course Details:
Max Credits: 3
Min Credits: 3

40.376 African American Literature

Course ID: 4957
Course Details: An upper-level survey covering African American literature from slave narratives through contemporary literature. Authors covered typically include Frederick Douglass, Booker T. Washington, W.E.B. Du Bois, Zora Neale Hurston, Langston Hughes, Richard Wright, Ann Petry, Ralph Ellison, Toni Morrison, and Lucille Clifton.
Max Credits: 3
Min Credits: 3

40.401 American Studies Seminar

Course ID: 4958
Course Details: A required seminar for American studies majors normally taken during the second semester of the junior year or during the senior year. Students undertake a research project leading to the writing of a major paper with a theme that combines more than one discipline.
Max Credits: 3
Min Credits: 3

40.491 Directed Studies in American Studies

Course ID: 4959
Course Details: An investigation of a topic using an interdisciplinary approach and leading to the writing of a major paper. The course provides an opportunity for a student to work closely with an instructor on a topic of special interest.
Max Credits: 3
Min Credits: 1

40.496 Practicum Experience in American Studies

Course ID: 4960
Course Details: Allows students an opportunity to combine their formal education with an off campus project. After developing a proposal for the practicum under the guidance of an instructor, the student spends a portion of his or her time working with persons engaged in business, the arts, museums, the professions, community service, or government. The coordinator for American studies maintains a file of organizations that accept students.

Max Credits: 3
Min Credits: 3

40.497 Practicum in American Studies

Course ID: 4961

Course Details: Allows students an opportunity to combine their formal education with an off campus project. After developing a proposal for the practicum under the guidance of an instructor, the student spends a portion of his or her time working with persons engaged in business, the arts, museums, the professions, community service, or government. The coordinator for American studies maintains a file of organizations that accept students.

Max Credits: 3
Min Credits: 3

41.103 Introduction to Paralegal Studies

Course ID: 4963

Course Details: Familiarizes students with the role of a paralegal in both the public and private sector. Other topics will include principles of jurisprudence and basic legal concepts and terminology.

Max Credits: 3
Min Credits: 3

41.210 Restorative Justice

Course ID: 37755

Course Details: This course will introduce students to the fundamental principles and practices of restorative justice as a method of building positive peace. Students will develop a working knowledge of the general theories of restorative justice, as well as practical hands-on experience with peacemaking circles. Traditional assumptions about justice and the adversarial legal process will be explored and challenged. The relationship between restorative justice, restorative practices, and other conflict resolution methods such as mediation will be discussed. Practical challenges in implementing restorative justice on the ground will also be examined.

Max Credits: 3
Min Credits: 3

41.234 Criminal Law

Course ID: 4964

Course Details: Studies substantive criminal law, with emphasis on general principles of criminal culpability, such as the act requirement, the mens rea requirement, and causation. The course will also cover the law of attempted crimes, accomplice liability, and defenses. The elements of specific crimes, such as homicide, burglary, robbery, and larceny will be studied in depth.

Max Credits: 3
Min Credits: 3

41.250 Disability and the Law: Legal Rights of People with Disabilities

Course ID: 35292

Course Details: An examination of the history and progress of the disability rights movement in America, the current state of the law and trends ad prospects for the future, with particular focus on those laws designed specifically to address the needs of people with disability.

Max Credits: 3
Min Credits: 3

41.261 Introduction to Legal Concepts

Course ID: 4966

Course Details: Allows students an opportunity to combine their formal education with an off campus project. After developing a proposal for the practicum under the guidance of an instructor, the student spends a portion of his or her time working with persons engaged in business, the arts, museums, the professions, community service, or government. The coordinator for American studies maintains a file of organizations that accept students.

Max Credits: 3
Min Credits: 3
Course Details: Serves as an introductory legal course. It is a survey of many specific topics, such as product liability, consumer law, intellectual property, and ethics. More importantly, the course emphasizes critical legal thinking and human values.

Max Credits: 3
Min Credits: 3

41.262 Introduction to Business Law

Course Details: Introduces the student to the fundamentals of criminal and tort law. The main emphasis is on all aspects of contract law including the agreement consideration, writing third-party rights, illegality, performance, and remedies. Also covered is agency law concerning all situations where one party is working for another in the business world. This course is highly recommended for pre-law students, CPA's, and paralegals.

Max Credits: 3
Min Credits: 3

41.360 Legal Issues in Racism

Course Details: A study of racial discrimination in the United States. Emphasis will be placed on relevant constitutional provisions, statutory provisions, and on United States Supreme Court cases.

Max Credits: 3
Min Credits: 3

41.363 Corporate and Property Law

Course Details: Studies the law and its impact on the business world. Partnerships, limited partnerships, and joint ventures are studied at the outset of the course. The main emphasis is on elements of the corporate structure. The last part of the course deals with personal and real property with coverage of wills and trusts. This course is highly recommended for pre-law students, CPA's, and paralegals.

Max Credits: 3
Min Credits: 3

41.365 The Legal Environment of Business

Course Details: This class explores the intersection of business and the law in American society in the 21st century. This class builds on the concepts covered in Business Law and Explores current legal topics that affect doing business in the United States and abroad. Topics covered include: The U.S. Constitution and the court system, white collar crime, cyberlaw, the laws of intellectual property, international trade, consumer protection, bankruptcy, product liability, administrative law and labor and employment law.

Max Credits: 3
Min Credits: 3

41.366 International Law

Course Details: Introduces the body of international rules, customs, and regulations which are in force between nations. Specific legal issues involving a study of multinational, cultural, political, economic, and ethnic perspectives are addressed. Topics covered include human rights, war prevention, foreign policy, tort and criminal liability, business trade practices, and dispute settlement. Recommended at the senior level.

Max Credits: 3
Min Credits: 3

41.367 Environmental Law
Course ID: 4977
Course Details: Examines the legal and administrative problems of protecting the quality of the human environment. Federal and state legislation on environmental policy is studied. Public interest litigation as a supplement to the enforcement of environmental law is discussed. Places emphasis on the law as a means of protecting the environment.
Max Credits: 3
Min Credits: 3

41.370 Real Estate Law
Course ID: 4980
Course Details: Examines contracts for the sale of real estate, deeds, title examinations, security for real estate transactions, methods and problems of co-ownership, zoning ordinances, brokerage contracts, leases and landlord and tenant rights and liabilities.
Max Credits: 3
Min Credits: 3

41.372 Sports, Entertainment and Art Law
Course ID: 4981
Course Details: The purpose of this course is to challenge students to engage in analytic reading, critical thinking and problem solving as it relates to the legal issues facing the sports, entertainment and art worlds.
Max Credits: 3
Min Credits: 3

41.376 Family Law
Course ID: 4983
Course Details: Studies the critical family law issues facing society today. Subject matter examined includes the law of marriage, custody, adoption, divorce, child support, juveniles, right to die, fetal tissue transfer to prolong the life of another, reproduction control, and surrogate parenting. This course is taught from a legal and human values perspective.
Max Credits: 3
Min Credits: 3

41.377 Elder Law
Course ID: 36724
Course Details: This course introduces the student to the major architectural components of the legal environment of the elderly, including Medicare, Medicaid, SSI, pensions, nursing homes, assisted living and related issues.
Max Credits: 3
Min Credits: 3

41.379 The Relationship of Law, Logic, and Ethics
Course ID: 4984
Course Details: Examines the impact of ethical viewpoints on the structure of legal doctrines. It stresses the fact that the study of law is a study of ethics as well as logic.
Max Credits: 3
Min Credits: 3

41.381 Women and the Law
Course ID: 4985
Course Details: Presents issues that particularly affect women. Topics include: sex discrimination, sexual harassment, marriage, divorce, reproductive control, surrogate motherhood, and custody.

Max Credits: 3
Min Credits: 3

41.386 Intellectual Property

Course ID: 4988

Course Details: Surveys the law of the protection of ideas, trade secrets, inventions, artistic creations, and reputation. The course will briefly review the bases for patent, trademark, copyright and trade secret protection, the distinction between the various forms of intellectual property, and the statutory and common law methods of enforcing rights.

Max Credits: 3
Min Credits: 3

41.387 Legal Research Methods

Course ID: 4989

Course Details: Designed to introduce the student to the fundamentals of legal research and writing. The student will gain hands-on experience in legal research and in the reporting of such research in written assignments, case briefs and memoranda.

Max Credits: 3
Min Credits: 3

41.388 Directed Study: Law

Course ID: 4990

Course Details:

Max Credits: 3
Min Credits: 3

41.390 Litigation

Course ID: 4992

Course Details: Examines the practices and procedures involved in the litigation process. Topics include: legal research, courts and jurisdictions, evidence and discovery, pleadings, motions, depositions, trials and appeals, and federal rules of procedure.

Max Credits: 3
Min Credits: 3

41.392 Wills, Trusts and Estates

Course ID: 4994

Course Details: Introduction to the law of wills, trusts, and estates. This course covers the fundamental legal concepts and vocabulary necessary to understand, draft, and work with the core estate planning tools. Practical examples and sample legal cases and materials will be provided and discussed. No prior legal knowledge is required, though some familiarity with the United States legal system or case law will be helpful.

Max Credits: 3
Min Credits: 3

41.488 Directed Study in Law

Course ID: 5000

Course Details: Permits superior students to engage in specialized study.

Max Credits: 3
41.489 Seminar in Law

Course ID: 5001

Course Details: Provides opportunity for small groups of advanced students to study selected topics.

Max Credits: 3

Min Credits: 3

41.490 Legal Aspects of Cyberspace

Course ID: 5002

Course Details: The growth of the Internet has created two parallel universes each with its own set of rules and reality: real space and cyber space. Traditional notions about privacy, defamation, contracts, freedom of expression, pornography, stalking, jurisdiction and intellectual property are challenged by the latest cyberspace technology. Much of the debate about control, which leads to questions about rights and responsibilities, centers around who, if anyone, should design the architecture of cyberspace, i.e., the "code". These and other topical subjects serve as the focus on the study of legal issues in cyberspace.

Max Credits: 3

Min Credits: 3

41.497 The Paralegal Practicum

Course ID: 5004

Course Details: Assigned fieldwork under the supervision and with the permission of the coordinator. This course is designed to broaden the educational experience of paralegal students by providing exposure to selected legal environments such as corporate legal departments, financial institutions, law firms, real estate departments, banks, and government agencies. This course is intended to provide a correlation of theoretical knowledge with practical experience in an area of particular interest to students.

Max Credits: 3

Min Credits: 3

42.101 College Writing I

Course ID: 5014

Course Details: A workshop course that thoroughly explores the writing process from pre-writing to revision, with an emphasis on critical thinking, sound essay structure, mechanics, and academic integrity. Students will read, conduct rhetorical analyses, and practice the skills required for participation in academic discourse. Students will write expository essays throughout the semester, producing a minimum of four formal essays.

Max Credits: 3

Min Credits: 3

42.101SI Intensive Writing Lab - Supplemental Instruction

Course ID: 36232

Course Details: Taken simultaneously with College Writing I, the two-credit Intensive Writing Lab offers students supplemental instruction to complement their work in that course. Students who place into the Writing Lab will receive extensive training in grammar, mechanics, and the use of Standard English. The once-per-week lab encourages students' success in College Writing I and in their other classes. The course credit cannot be used to satisfy the credits required for graduation, but may be used to satisfy credits required for full time student status.

Max Credits: 2

Min Credits: 2

42.102 College Writing II

Course ID: 5015
Course Details: A workshop course that thoroughly explores the academic research writing process with an emphasis on entering into academic conversation. Building on the skills acquired in College Writing I, students will learn to write extensively with source material. Key skills addressed include finding, assessing, and integrating primary and secondary sources, and using proper documentation to ensure academic integrity. Students will produce analytical writing throughout the semester, including a minimum of four formal, researched essays.

Max Credits: 3
Min Credits: 3

42.110 College Writing A ESL

Course ID: 33851

Course Details: A workshop course that provides a thorough review of the basics of essay writing in preparation for success in College Writing I ESL, with a focus on the particular needs of multilingual students. Students placed into this course will use the writing process to strengthen the fundamental skills necessary for clear academic writing in English, including the basic rules of grammar and principles of rhetoric. Credit for both 42.100 and 42.110 will not be granted.

Max Credits: 3
Min Credits: 3

42.111 College Writing I ESL (formerly 42.103)

Course ID: 33852

Course Details: Satisfies the first half of the first-year writing requirement, equivalent to 42.101 College Writing I, with a focus on the particular needs of multilingual students. Credit for both 42.101 and 42.111 will not be granted, nor credit for both 42.101 and 42.103.

Max Credits: 3
Min Credits: 3

42.112 College Writing II ESL (formerly 42.104)

Course ID: 5018

Course Details: Satisfies the second half of the first-year writing requirement, equivalent to 42.102 College Writing II, with a focus on the particular needs of multilingual students. Credit for both 42.102 and 42.112 will not be granted, nor credit for both 42.102 and 42.104.

Max Credits: 3
Min Credits: 3

42.200 Critical Methods of Literary Inquiry

Course ID: 31885

Course Details: Examination of diverse critical and theoretical approaches to literature in the development of literary analysis.

Max Credits: 3
Min Credits: 3

42.201 Great Books of Antiquity

Course ID: 5019

Course Details: Studies representative literary selections from the Hebrews, the Greeks, the Romans, and other societies of the ancient world.

Max Credits: 3
Min Credits: 3

42.202 Great Books of the Modern Period

Course ID: 5020

Course Details: Much of what we consider "contemporary" was born out of the modernist period, roughly 1900-1950, and was
considered radical, even salacious, in its time. This course provides a sampling of modernist literature. Students will explore this period by examining exemplary texts, numerous historical and social events, and a few films.

Max Credits: 3
Min Credits: 3

42.210 Drama

Course ID: 5027
Course Details: Presents a study of plays from the classical period to the present.

Max Credits: 3
Min Credits: 3

42.211 Poetry

Course ID: 5028
Course Details: Studies selections from the Renaissance through contemporary periods.

Max Credits: 3
Min Credits: 3

42.212 The Short Story

Course ID: 5029
Course Details: Studies the development of the short story from Poe and Chekhov to the present.

Max Credits: 3
Min Credits: 3

42.216 Monsters, Apes & Nightmares

Course ID: 5033
Course Details: This course examines literary responses to science in England and the United States from the early Nineteenth Century to the present. Readings include novels—Frankenstein, The Island of Doctor Moreau, Dr. Jekyll and Mr. Hyde, Jurassic Park—essays, and poems.

Max Credits: 3
Min Credits: 3

42.217 The Horror Story

Course ID: 5034
Course Details: Explores the genre from Poe to the present.

Max Credits: 3
Min Credits: 3

42.218 Comedy

Course ID: 5035
Course Details: Presents the theory and practice of comedy from the Greeks to the present.

Max Credits: 3
Min Credits: 3

42.220 Oral & Written Communication for Computer Science
Course ID: 5036

Course Details: The main goal of this course is to enhance the student's understanding of the elements of effective communication, and to put that knowledge into practice in a supportive, co-operative, workshop environment. Limited to Computer Science majors.

Max Credits: 3
Min Credits: 3

42.222 Oral Communication

Course ID: 5038

Course Details: Develops and applies the basic speaking skills that can be adapted to a variety of personal and professional contexts. Emphasis is placed on selection, analysis, organization and presentation of speech materials. Practice skills include listening, interviewing and the delivery and critique of extemporaneous speeches.

Max Credits: 3
Min Credits: 3

42.224 Business Writing

Course ID: 5040

Course Details: Studies the theory and practice of writing letters, memoranda and reports on specific business and technical problems. Registration preference for students enrolled in Business programs.

Max Credits: 3
Min Credits: 3

42.226 Technical and Scientific Communication

Course ID: 5042

Course Details: Studies the theory and practice of letters, memoranda, reports and oral presentations on specific scientific and technical problems.

Max Credits: 3
Min Credits: 3

42.227 Essay Writing for English Majors

Course ID: 5043

Course Details:Analyzes and discusses the techniques and styles of selected professional essayists as well as the preparation of student essays. Emphasis will be placed on the writing process from prewriting through drafting and revising. English majors and minors only.

Max Credits: 3
Min Credits: 3

42.229 Essay Writing for Non-English Majors

Course ID: 5045

Course Details:Analyzes and discusses the techniques and styles of selected professional essayists as well as the preparation of student essays. Emphasis will be placed on the writing process from prewriting through drafting and revising. Non-English majors only.

Max Credits: 3
Min Credits: 3

42.232 Turning Fiction into Film

Course ID: 5048

Course Details: Often when we encounter narratives (in the movies or in books) we tend to practice a "suspension of disbelief" letting
the story unfold, following the conventions of film and fiction without question. This course will direct our critical focus on the mechanisms through which writers and filmmakers convey meaning to their audiences.

Max Credits: 3
Min Credits: 3

**42.233 Play Analysis**

Course ID: 36436

Course Details: An introduction to the principles of play construction and the vocabulary and methods of interpreting play texts for theatrical production. Required of all theatre arts concentrators.

Max Credits: 3
Min Credits: 3

**42.236 Science Fiction and Fantasy**

Course ID: 5051

Course Details: Designed to introduce students to understand science fiction and fantasy within the broader context of literature and literary theory. It attempts to develop and hone student’s skills of critical analysis as it supplies them with the tools to contextualize their reading experience - i.e., to understand the origins and politics of the books that they read.

Max Credits: 3
Min Credits: 3

**42.238 Introduction to Creative Writing**

Course ID: 36923

Course Details: A course for aspiring creative writers among freshman and sophomores which offers an introduction to the craft of creative writing in its primary genres: poetry, fiction, drama, creative non-fiction (emphases will vary depending upon instructor). The focus of this course will be on learning the fundamentals of craft techniques and peer review.

Max Credits: 3
Min Credits: 3

**42.240 Literature and Women**

Course ID: 5053

Course Details: A survey of literary attitudes toward women from the Judaic and Hellenic periods through the present.

Max Credits: 3
Min Credits: 3

**42.242 The Heroine in Modern Fiction**

Course ID: 5055

Course Details: Provides a study of selected short stories and novels which deal sympathetically with the changing roles of women.

Max Credits: 3
Min Credits: 3

**42.243 Contemporary Women Writers**

Course ID: 5056

Course Details: Contemporary Women Writers introduces students to American women writers of the last fifty years. We examine the historical, socio-cultural, political, and personal influences on these writers’ work by studying trends and events in recent American history and themes reflected in the works. By studying contemporary women's writing in this contextualized fashion, students can appreciate larger trends in our society, the role writing plays in examining such trends, and the value of literature as an exploration of human growth and struggle. Through discussion, group collaboration, critical analysis, and by designing their own graphic organizers, students gain a
breadth of knowledge in the following areas: the themes and stylistic concerns of contemporary American women writers; the key historical events that influence contemporary American women’s writing; the critical reading of literary texts.

Max Credits: 3
Min Credits: 3

42.246 Gay & Lesbian Literature

Course ID: 5059

Course Details: Explores the treatment of homoeroticism and homosexual love in literature from Antiquity to the present. Emphasis is given to texts reflecting the construction of a homosexual identity and recurring motifs among gay, lesbian, and bisexual writers.

Max Credits: 3
Min Credits: 3

42.248 Values in American Culture

Course ID: 1248

Course Details: Deals with the development and interrelationship of American views on individualism, nature, science, technology, democracy, ethnicity, and the American dream. Readings begin with the Puritans and end with contemporary essayists. Deals with the development and interrelationship of American views on individualism, nature, science, technology, democracy, ethnicity, and the American dream. Readings begin with the Puritans and end with contemporary essayists.

Max Credits: 3
Min Credits: 3

42.249 Literature on Technology and Human Values

Course ID: 5060

Course Details: A study of the relationship between works of fiction, cultural attitudes toward technology, and social values.

Max Credits: 3
Min Credits: 3

42.250 The Bible as Literature

Course ID: 5061

Course Details: Presents a literary and historical analysis of selected Old and New Testament books.

Max Credits: 3
Min Credits: 3

42.251 War in Literature

Course ID: 5062

Course Details: In "War in Literature" we will study conflict and human values in times of war, focusing on the literature of World War I, World War II, Vietnam, and the Gulf War. Content covered includes a selection of representative (and divergent) literary texts written throughout the 20th century in a variety of genres (poetry, essays, memoir, short story, novel, and hybrid forms like the "graphic novel").

Max Credits: 3
Min Credits: 3

42.253 The Culture of American Sport

Course ID: 5063

Course Details: An examination of the history, literature, sociology, and aesthetics of sport. Attention to corollary issues and values including racism, sexism, and violence.

Max Credits: 3
42.257 The Family in American Literature

Course ID: 5065
Course Details: A study of literary selections dealing with traditions of family life, the individual, and social change.
Max Credits: 3
Min Credits: 3

42.258 Disability in Literature

Course ID: 34574
Course Details: The course will focus on historical and contemporary portrayals of disability and disabled people in literature.
Max Credits: 3
Min Credits: 3

42.267 Introduction to Shakespeare

Course ID: 5074
Course Details: A study of selected histories, comedies, and tragedies. Not for English majors.
Max Credits: 3
Min Credits: 3

42.274 The Literature of the Beat Movement

Course ID: 5078
Course Details: Explores both the writings and the personal lives of a loose confederation of poets, novelists, and essayist who emerged onto the American literary and cultural scene following World War II and who came to be known as the -Beat Generation.+ The primary focus will be on the life and writings of Lowell native Jack Kerouac (1922-1969) with others of the -beat circle+ included as well, i.e., Allen Ginsberg, William Burroughs, Diana DiPrima, etc.
Max Credits: 3
Min Credits: 3

42.281 British Literary Traditions

Course ID: 36426
Course Details: A survey of British Literary history from the medieval through the modernist periods.
Max Credits: 3
Min Credits: 3

42.282 American Literary Traditions

Course ID: 5081
Course Details: A survey of American Literary history from early contact between Native American populations and European colonists through contemporary American writing.
Max Credits: 3
Min Credits: 3

42.285 Crime in Literature

Course ID: 5082
Course Details: A study of how various authors use crime as a plotting device to study character, reveal social order, and critique social institutions.

Max Credits: 3
Min Credits: 3

42.286 The Graphic Narrative: Comics in Context

Course ID: 33659

Course Details: While picture-images date as far back as the Egyptian tombs, or the caves of Lascaux, this course will consider the development of the modern comic in twentieth- and twenty-first century America. Readings will include not just comics, but also the history of comics, art and literary theory, a novel about comics, and articles that consider the legal, political, and social issues surrounding comics. We will also look at traditional and contemporary comic strips and graphic novels to explore what we can learn from them about American popular culture. Comics are on the cutting edge of contemporary literature, and there are many avenues to pursue in the study of this narrative form. This course will include intensive reading and writing, and will ask students to engage with demanding theoretical works, in addition to incorporating a considerable amount of research. While the subject matter can be lighthearted the course takes these texts seriously, and asks for intellectual engagement with the issues and concerns of culture depicted in these words and pictures. (Full proposal and supplemental material available).

Max Credits: 3
Min Credits: 3

42.291 History of English Literature I

Course ID: 5083

Course Details: A survey of representative writers and works from the Anglo-Saxon period to the mid-seventeenth century.

Max Credits: 3
Min Credits: 3

42.292 History of English Literature II

Course ID: 5084

Course Details: A survey of representative writers and works from Milton into the twentieth century.

Max Credits: 3
Min Credits: 3

42.294 History of American Literature I

Course ID: 5086

Course Details: Studies the historical development of American literature from the Colonial period to the Civil War. Selected works by representative authors from each period are studied.

Max Credits: 3
Min Credits: 3

42.295 History of American Literature II

Course ID: 5087

Course Details: Studies the historical development of American literature from the Civil War to World War I.

Max Credits: 3
Min Credits: 3

42.298 Children's Literature

Course ID: 32364

Course Details: A survey course covering traditional and contemporary children's literature. Texts are selected to represent different
historical periods and a diversity of authorial perspectives. Attention is given to changing views of children and childhood as reflected in selected texts.

Max Credits: 3
Min Credits: 3

**42.300 Intro to Journalism**

Course ID: 5090

Course Details: An introduction to techniques of writing for the news media.

Max Credits: 3
Min Credits: 3

**42.302 Creative Writing: Fiction**

Course ID: 5092

Course Details: Studies the theory and practice of fiction. Conducted as a workshop with close analysis of student work.

Max Credits: 3
Min Credits: 3

**42.303 Creative Writing: Poetry**

Course ID: 5093

Course Details: Discusses the theory and practice of poetry. Conducted as a workshop with close analysis of student work.

Max Credits: 3
Min Credits: 3

**42.304 Creative Writing: Playwriting**

Course ID: 5094

Course Details: Studies the theory and practice of playwriting. Conducted as a workshop with close analysis of student work.

Max Credits: 3
Min Credits: 3

**42.305 Reviewing the Arts**

Course ID: 5095

Course Details: Theory and practice of writing short, critical essays in a journalistic mode on the visual and performing arts. Special attention to theater, movie, and television criticism. Conducted as a workshop with close analysis of student work.

Max Credits: 3
Min Credits: 3

**42.307 History of the English Language**

Course ID: 5097

Course Details: Examines the phonetic, lexical, syntactical, and semantic shifts in the English language from its beginnings to the present.

Max Credits: 3
Min Credits: 3

**42.308 Analysis of Modern English**
42.310 Writing Popular Fiction

Course Details: This course is designed for students who are interested in writing in one or more of the popular forms of genre fiction: the mystery, the horror story, science fiction, fantasy, romance, and the thriller. Class time will be spent discussing and work-shopping student writing. Some time will also be devoted each week to brief lectures on practical matters like choosing between the short story and the novel, finding ideas, constructing plots, building characters, pacing, generating suspense, and marketing one's work. In addition, there will be assigned readings to illustrate the above.

Max Credits: 3
Min Credits: 3

42.311 The South in American Literature

Course Details: A study of the writers, movements, and social culture of the South, from both the nineteenth- and twentieth-centuries.

Max Credits: 3
Min Credits: 3

42.313 Realism and Naturalism American Fiction

Course Details: A study of realism and naturalism in fiction from the end of the Civil War to World War I.

Max Credits: 3
Min Credits: 3

42.315 Old English Language and Literature

Course Details: Students will acquire reading knowledge of the Old English language, spending half the semester mastering grammar and vocabulary, and the second half translating texts such as The Wanderer, Dream of the Rood, and Beowulf. Attention will also be given to Anglo-Saxon culture.

Max Credits: 3
Min Credits: 3

42.317 British Literature of the Twentieth Century

Course Details: A study of twentieth-century British short stories, poetry, and drama.

Max Credits: 3
Min Credits: 3

42.320 Personal and Reflective Writing

Course Details: A workshop format encourages peer criticism of individual writings and discussion of models from various texts.
Max Credits: 3
Min Credits: 3

42.321 Community Writing I

Course ID: 5108

Course Details: Students work on various writing projects the professor brings into the classroom on behalf of local non-profit organizations. This service learning course provides opportunities for students to learn through thoughtful engagement with the community, applying knowledge of writing gained in the classroom to real world problems. The course will be held in a workshop format with strong emphasis on revision.

Max Credits: 3
Min Credits: 3

42.323 Writing About People

Course ID: 5110

Course Details: A creative non-fiction course run in a workshop format. Writing assignments are equally divided between reflective, personal pieces about people you know and more journalistic, biographical writing about people you don't know. Readings cover both categories.

Max Credits: 3
Min Credits: 3

42.324 Writing About Place

Course ID: 5111

Course Details: Writers throughout time have been thoroughly grounded in place. Students in this course will read and write on a variety of topics: travel, cities, suburbs, dwelling places, nature, environmental issues, etc., in a variety of genres: creative non-fiction, essays, journalism, short stories, poetry, journals. This course will be held in a workshop format with strong emphasis on revision.

Max Credits: 3
Min Credits: 3

42.325 The Rise of the Novel

Course ID: 5112

Course Details: A study of the British novel in the eighteenth and early nineteenth centuries from DeFoe through Austen.

Max Credits: 3
Min Credits: 3

42.327 Victorian Fiction

Course ID: 5114

Course Details: A study of fiction from 1837 through 1901. May include reading and writing about texts by Dickens, Collins, Gaskell, Bronte, eliot, thackeray, Trollope, Hardy, wilde, and others.

Max Credits: 3
Min Credits: 3

42.330 Twentieth Century British Novel

Course ID: 5115

Course Details: A study of the novel from Conrad through Greene and others.

Max Credits: 3
Min Credits: 3
42.331 American Novels to 1900
Course ID: 5116
Course Details: A study of the American novel from colonial beginnings to 1900.
Max Credits: 3
Min Credits: 3

42.333 American Autobiography
Course ID: 5118
Course Details: A Study of autobiographical writing from Colonial America to the present. Works from the 17th to the 21st century will allow students to explore the genre of autobiography and related sub-genres, including the captivity narrative, the slave narrative, and the immigration narrative. Readings will also explore literary and political autobiographies.
Max Credits: 3
Min Credits: 3

42.337 The Gothic Tradition in Literature
Course ID: 33662
Course Details: This course will consider works that fall under the very broad genre known as "The Gothic." As this genre is one of highly contested boundaries, we will consider how to define the Gothic, and what exactly constitutes this form. We will look at texts from both England and America, and spanning from the late 18th century to our own times. Our study will focus on the form of the novel, and the development and emergence of the gothic novel from its beginnings in England to its contemporary manifestations in the United States.
Max Credits: 3
Min Credits: 3

42.341 Studies in Film
Course ID: 31938
Course Details: A rigorous examination of a topic of current interests in film studies organized by particular themes, genres or filmmakers.
Max Credits: 3
Min Credits: 3

42.342 Women Writers and the Past
Course ID: 30861
Course Details: Women Writers and the Past
Max Credits: 3
Min Credits: 3

42.345 British Women Novelists
Course ID: 5121
Course Details: Selected novels by writers such as Austen, the Brontes, Eliot, Woolf, Bowen, and Drabble.
Max Credits: 3
Min Credits: 3

42.348 Modern American Drama
Course ID: 5123
Course Details: A study of such playwrights as O'Neill, Odets, Wilder, Williams, and Miller.

Max Credits: 3
Min Credits: 3

42.349 Arthurian Literature

Course ID: 5124
Course Details: Will examine works in modern English translation from a variety of genres (romance, history, tragedy, epic) that tell stories of the mythical King Arthur and the knights and ladies of his courtly world. The course will focus primarily on texts of the medieval and renaissance periods, but will include attention to nineteenth- and twentieth-century versions in poetry, prose, art, music and film.

Max Credits: 3
Min Credits: 3

42.351 Literature of the Middle Ages

Course ID: 5126
Course Details: A study of the prose, poetry, and drama of England from 1200-1500 set against cultural and historical backgrounds.

Max Credits: 3
Min Credits: 3

42.353 Literature of the Seventeenth Century

Course ID: 5128
Course Details: A study of English prose and poetry of the period excluding Milton.

Max Credits: 3
Min Credits: 3

42.354 Literature of the Eighteenth Century

Course ID: 5129
Course Details: A study of the prose and poetry of the period.

Max Credits: 3
Min Credits: 3

42.356 Literature of the Victorian Period

Course ID: 5131
Course Details: A study of British fiction, poetry, and prose from 1837 to 1901.

Max Credits: 3
Min Credits: 3

42.361 Restoration Comedy

Course ID: 5134
Course Details: A study of comic plays from 1660 to the mid-eighteenth century. Focus on the works of Ethridge, Wycherley, Congreve, and Sheridan.

Max Credits: 3
Min Credits: 3

42.362 Modern Drama
Course ID: 5135
Course Details: A study of selected Continental, British and American plays of the late nineteenth century to the present.
Max Credits: 3
Min Credits: 3

42.363 English Renaissance Drama

Course ID: 5136
Course Details: A study of major dramatists of the Age of Shakespeare including Marlowe, Dekker, Webster, Jonson, Beaumont and Fletcher, Massinger, Ford and others
Max Credits: 3
Min Credits: 3

42.364 African American Drama

Course ID: 38101
Course Details: A study of the history and development of African American drama, with emphasis on major aesthetic, political, and social movements in African American culture.
Max Credits: 3
Min Credits: 3

42.366 Creative Writing: Poetry II

Course ID: 5138
Course Details: Combines discussion and critique of student poems with readings in contemporary poetry and poetics. The focus is on enabling students to develop their individual voices, forms, and subjects.
Max Credits: 3
Min Credits: 3

42.368 Feature Writing

Course ID: 36427
Course Details: This writing-oriented course will focus on learning how to write feature stories for newspapers, magazines, and the Internet.
Max Credits: 3
Min Credits: 3

42.369 Reading and Writing New Media

Course ID: 36428
Course Details: This course will focus on learning how to write for electronic media and understanding the changing world of journalism.
Max Credits: 3
Min Credits: 3

42.370 Contemporary American Fiction

Course ID: 5140
Course Details: Discusses novels and short fiction from World War II to the present.
Max Credits: 3
Min Credits: 3
42.373 Modern Poetry
Course ID: 5143
Course Details: A study of the development of British and American poetry from 1900 through World War II.
Max Credits: 3
Min Credits: 3

42.374 Contemporary Poetry
Course ID: 5144
Course Details: A study of selected British and American Poets since World War II.
Max Credits: 3
Min Credits: 3

42.375 Modern Irish Literature
Course ID: 5145
Course Details: Poetry, drama, and prose fiction from the Irish literary renaissance to the present. Writers will include Yeats, Joyce, O'Casey, Friel and Heaney.
Max Credits: 3
Min Credits: 3

42.376 African-American Literature
Course ID: 5146
Course Details: A study of selected works by black American writers, such as Toomer, Wright, Ellison, Walker, and Morrison.
Max Credits: 3
Min Credits: 3

42.377 Asian American Literature
Course ID: 36696
Course Details: Asian Americans hold an intriguing place in the cultural imagination: as perpetual foreigners, as so-called 'model minorities' that serve to maintain hegemonic power relations, and as living embodiments of America's memory of its involvement in recent wars. As artists, however, Asian Americans have contributed and impressed body of literary work, and we'll examine some of the most enduring and provocative of these texts. We'll explore themes such as trauma and the immigrant experience, issues of exile and dislocation, Asian Americans' embattled place in our country's history, and the intersections of race and ethnicity with gender and sexuality.
Max Credits: 3
Min Credits: 3

42.378 Post Colonial Literature
Course ID: 36924
Course Details: When the peoples of Africa, India, the Caribbean, Ireland, and Canada finally gained, to a greater and lesser extent, independence from the British during the 20th century, they found that their national, cultural, and individual identities had been radically altered by the experience of colonization. In this course, we will examine how authors have related this postcolonial condition. We will examine a diverse body of texts--poetry which eloquently describe the heroic journey out of colonialism, drama which lays bare the conflicts of assimilation, and novels which fantastically present political struggle--as we determine how postcolonial theory and literature affects and possibly redefines all literature.
Max Credits: 3
Min Credits: 3
42.382 Theatre History I: Ancient Greece through the 18th Century

Course ID: 33541

Course Details: A survey of ancient to early modern theatre in its historical and social contexts, tracing changes and developments in acting styles, theatre architecture, scenic practices, dramatic literature, and the audience. The course examines how theatre both reflects and shapes the changing beliefs and priorities of a culture.

Max Credits: 3
Min Credits: 3

42.383 Theatre History II: Nineteenth Century to the Present

Course ID: 33542

Course Details: A survey of theatre in its historical and social contexts from the 19th century to the present, focusing on innovations in design and technology, the advent of the director, the emergence of modern schools of acting, and the creation of new forms of theatre to suit the changing needs of a modern world.

Max Credits: 3
Min Credits: 3

42.387 Introduction to Editing and Publishing

Course ID: 5153

Course Details: Designed for students considering a career in book publishing, this course provides an overview of the publishing industry. You will examine the stages of the book publishing process from acquisition to bound book or e-book, using assignments and examples from school, college, and trade book publishing. You will also consider the specific responsibilities of an editor. The course includes class visits by authors, editors, or publishing executives, as well as a trip to a local printing company.

Max Credits: 3
Min Credits: 3

42.388 Undergraduate Seminar on the Teaching of Writing

Course ID: 5154

Course Details: Training in writing theory for direct application in peer tutoring. Discussion supplemented by experimental exercises, class presentations, reading, and writing. Meets two hours each week. Students tutor four hours each week.

Max Credits: 3
Min Credits: 3

42.391 Writing on the Job

Course ID: 5157

Course Details: A study of special problems of writing in business from memos and press releases through reports and proposals, including strategies for correspondence, presentation of complex information, and writing for diverse audiences. For English majors and minors.

Max Credits: 3
Min Credits: 3

42.395 Special Topics in English

Course ID: 38096

Course Details: This course focuses on the exploration of thematic or issue-oriented or timely topics of interest. The precise topics and methods of each section will vary. Barring duplication of topic, the course may be repeated for credit.

Max Credits: 3
Min Credits: 3
42.401 Selected Authors

Course ID: 31986
Course Details: A study of selected works. Authors to be announced each semester.
Max Credits: 3
Min Credits: 3

42.402 Topics in Writing

Course ID: 5160
Course Details: A study of issues and the practice of skills needed in specific areas of professional writing. Topics to be announced each semester.
Max Credits: 3
Min Credits: 3

42.406 Community Writing II

Course ID: 5164
Course Details: Students work for a local non-profit for the semester completing a variety of writing tasks, depending on the placement. In class students apply the principles of rhetoric and use the tools of research and revision to write effectively for their community partner; to articulate in a public presentation a thoughtful, intelligent position on relevant social policy; and to become more active, engaged citizens.
Max Credits: 3
Min Credits: 3

42.407 Creative Writing Fiction II

Course ID: 30856
Course Details: Creative Writing Fiction II
Max Credits: 3
Min Credits: 3

42.412 Software Writing

Course ID: 32148
Course Details: Focuses on the document preparation process from start to finish, focusing on each stage of the process. Includes documents design, document organization, using examples and illustrations, style, creating an index and the review process.
Max Credits: 3
Min Credits: 3

42.413 Advanced Software Writing

Course ID: 32149
Course Details: Introduces a range of advanced topics in software writing. Topics may include electronic publishing, hyper text, advanced graphics, document set components, and working in project teams. In this course, the student selects some aspect of the computer industry that interests him/her and documents it.
Max Credits: 3
Min Credits: 3

42.415 Young Adult Literature-Critical Methods

Course ID: 5167
Course Details: Using young adult literature as a vehicle, this course considers traditional methods of interpretation and evaluation. Particular attention is given to the analytical, psychological and sociological approaches.

Max Credits: 3
Min Credits: 3

**42.423 Shakespeare I**

Course ID: 5170

Course Details: A study of selected histories, comedies, and tragedies.

Max Credits: 3
Min Credits: 3

**42.424 Shakespeare II**

Course ID: 5171

Course Details: A study of selected histories, comedies, and tragedies not covered in 42.243. Shakespeare I is not a prerequisite.

Max Credits: 3
Min Credits: 3

**42.429 Introduction to Literary Theory**

Course ID: 5173

Course Details: A solid introduction to major trends in contemporary critical theory. Emphasis on producing a sample critical paper treating one or more current critical approaches to reading a literary text.

Max Credits: 3
Min Credits: 3

**42.450 Writing Workshop**

Course ID: 5176

Course Details: A capstone level creative writing class: a substantial writing project is developed through the collaborative environment of an advanced workshop. May be repeated for credit when workshop topic is different.

Max Credits: 3
Min Credits: 3

**42.479 Senior Seminar**

Course ID: 5178

Course Details:

Max Credits: 3
Min Credits: 3

**42.490 Directed Studies in Writing**

Course ID: 32037

Course Details: The student develops a plan for a sustained writing project or portfolio and submits preliminary and final versions for critique and evaluation.

Max Credits: 3
Min Credits: 3
42.491 Directed Study in Literature

Course ID: 5179

Course Details: The student develops a plan of directed reading, defines a problem for individual research, and prepares a paper or papers.

Max Credits: 3
Min Credits: 3

42.492 Directed Study in Language Analysis

Course ID: 5180

Course Details: The student develops a plan of directed readings in linguistics, semantics, or stylistics and defines a topic for individual research.

Max Credits: 3
Min Credits: 3

42.493 Directed Study in Creative Writing

Course ID: 5181

Course Details: The student develops a series of projects in creative writing and composes poetry, fiction, or drama.

Max Credits: 3
Min Credits: 3

42.495 Practicum in Theater

Course ID: 5183

Course Details: A part-time full-semester internship at an approved off-campus theater. To be arranged through the Program Coordinator during pre-registration period.

Max Credits: 3
Min Credits: 3

42.496 Practicum

Course ID: 5184

Course Details: An off-campus writing experience for English Majors. Practicum experience is intended to provide students with the opportunity of applying their writing skills in actual business, technical, or professional situations.

Max Credits: 3
Min Credits: 3

42.498 Practicum-English Study

Course ID: 5186

Course Details: A short-term, intensive project related to English study and/or writing.

Max Credits: 1
Min Credits: 1

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.
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 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

43.101 Classical Civilization

Course ID: 5189

Course Details: This course provides an introduction to the Ancient Near East, Greece and Rome. The class first examines the formation of urban centers and the evolution of civilization as the late Bronze Age world transforms into the Iron Age with the creation of the vast empires such as Assyria and Achaemenid Persia. The course then focuses on the development of Greek city-states and the ideological differences between Athens and Sparta with a brief exploration of Classical Greek culture. Finally the class looks at the conquests of Alexander and his successors in the East, and the development of Rome as it shaped and was shaped by the cultures it conquered. The course requires short analytical papers, exams, and historical analysis of primary sources.

Max Credits: 3
Min Credits: 3

43.105 Western Civilization I

Course ID: 5191

Course Details: This course surveys some important issues and tendencies in the history of Western Civilization from its origins through the early modern period, including ancient Mesopotamia, classical Greece and Rome, the Middle Ages, and the Renaissance. These include "civilization" and the rise of cities, different imaginings of god(s) and humanity, evolving forms of political organization, continuity and change in social organization and everyday life, and the ongoing dialogue of faith and reason.

Max Credits: 3
Min Credits: 3

43.106 The Modern World

Course ID: 5192

Course Details: In a period of intensifying globalization a basic understanding of our world is increasingly important. The main purpose of this course is to expose students to the global processes that have shaped our modern world since roughly the year 1500. Taking on a global and comparative perspective, this course will help students to develop a topical, chronological, and geographical understanding of global history and cultures.

Max Credits: 3
Min Credits: 3
43.107 World Civilization I

Course ID: 5193

Course Details: This class examines societies and cultures from ancient until early modern times with the underlying assumption that world history is an important conceptual tool for understanding our interdependent world. Course topics analyze the nature of the earliest human communities, the development of the first civilizations and the subsequent emergence of cultures in selected areas of Eurasia, Africa, and the Americas. This course also offers a consideration of issues related to the connections and relationships that shaped civilizations as a result of migration, war, commerce, and the various cultural expressions of self, society, and the cosmos before 1500.

Max Credits: 3
Min Credits: 3

43.108 World Civilization II

Course ID: 5194

Course Details: This course will introduce you to the study of world history, its relevance for living in the present, and the challenge to think critically about the emergence and subsequent development of the modern world since 1500. Participants in this course will examine experiences that transcend societal and cultural regions, focus on processes of cross-cultural interaction, and investigate patterns that influenced historical development and continue to impact societies on a global scale.

Max Credits: 3
Min Credits: 3

43.111 United States History to 1877

Course ID: 5195

Course Details: This course surveys United States history from the early settlement of North America through the Civil War and Reconstruction. It considers the role of the political and economic leadership in the building of the nation as well as actions of ordinary people whose energies and aspirations constitute the fabric of United States society.

Max Credits: 3
Min Credits: 3

43.112 United States History since 1877

Course ID: 5196

Course Details: This course surveys the history of the United States from the end of Reconstruction to the present. It covers significant developments in the politics, economy, culture, and other aspects of American life during that period.

Max Credits: 3
Min Credits: 3

43.204 China & the Modern World

Course ID: 5201

Course Details: This course introduces China's interactions with the world since the 1840s. With the Opium War as the starting point, students are ushered into a traditional China whose political system, cultural values, and an economic structure stood in sharp contrast to those of the outside world. The main focus of the course is to explore the process in which China fought for its survival as a sovereign nation and searched for its road to modernization.

Max Credits: 3
Min Credits: 3

43.207 Women in China

Course ID: 5204

Course Details: From Confucian texts to current conditions, the course examines the evolution of Chinese women's status throughout the centuries. The course will ask questions such as whether Confucianism dictated oppression against women, what factors influenced the changes of status for women, how Western feminism is connected with Chinese women, what roles women played in transforming
China, and how ordinary women lived and are still living in China.

Max Credits: 3
Min Credits: 3

43.209 Colonial Latin America

Course ID: 5206

Course Details: This class examines the history of Latin America from 1492 until the early nineteenth century. After considering the rise of the Aztec and Inca empires, we will consider how the Spanish and Portuguese were able to acquire and maintain control in the region. Topics include indigenous-European relations, slavery, economic developments, the challenges of maintaining a colonial government, and Latin American independence.

Max Credits: 3
Min Credits: 3

43.211 Historical Dimensions of Globalization

Course ID: 33660

Course Details: This course explores the impact of globalization on the development of world societies in the late 20th-early 21st century. Using historical analysis of contemporary realities, it develops an appropriate frame of reference to address questions about the nature and cause of globalization.

Max Credits: 3
Min Credits: 3

43.212 Modern Latin America

Course ID: 33661

Course Details: Modern Latin America, a 200-level course, surveys Latin America from independence in the early nineteenth century to the present using primary sources, a textbook, and scholarly works. It begins with an understanding of the political, social, and economic context from which ideas of independence emerged and considers the wars for independence. We will spend a significant part of the course studying nation-building: how did the leaders of new nations define their nations and the values that would guide them? Who was included and who was excluded in the process of nation-building? The next part of the course examines the demands of groups originally excluded: the indigenous population, women, and the poor. The portion of the course covering the twentieth century emphasizes Latin America's international connections, focusing on influence from the United States and the effects of world wars on the region. Mass politics also emerge, and are expressed in the Mexican Revolution and in Peronism. We also will consider the Cuban Revolution and its wider effects in the region. We will conclude our survey of the region by considering how historical trends continue to affect politics today. For example, the Bolivian political scene continues to be affected by the events and outcome of the War of the Pacific (1879-1883) and by a strong indigenist movement.

Max Credits: 3
Min Credits: 3

43.213 History of the Ancient Near East

Course ID: 37455

Course Details: This broad survey investigates the development of the so-called "Cradles of civilization," Ancient Mesopotamia, Egypt, Anatolia, the Levant and Persia. At times the class will dip deeply into these cultures, using primary texts as well as archaeological and artistic evidence to better understand the political, religious, economic, military, social and artistic evolution of these closely associated cultures. We will focus on themes such as the development of kingship as a secular and sacred ruler, the ideology of Empire, the environment, and the fragility of the inter-connected network of resources that developed. The ultimate goal is to understand the inter-cultural milieu of the Ancient Near East and demonstrate how much Western civilization owes to these historical developments.

Max Credits: 3
Min Credits: 3

43.223 England to 1660

Course ID: 35872

Course Details: A survey of English History to 1660 with emphasis on the Institutional, Economic and cultural developments. In addition
to providing general knowledge of the topic, the course is designed to enhance the learning experience of both History and English majors.

Max Credits: 3
Min Credits: 3

**43.224 England Since 1660**

Course ID: 35704

Course Details: A survey of English History since 1660 with emphasis on the Institutional, Economic and cultural developments. In addition to providing general knowledge of the topic, the course is designed to enhance the learning experience of both History and English majors.

Max Credits: 3
Min Credits: 3

**43.225 Ancient Greek History**

Course ID: 5213

Course Details: A study of Greek history, institutions and culture from Minoan times through the Hellenistic period.

Max Credits: 3
Min Credits: 3

**43.226 Roman History and Civilization**

Course ID: 5214

Course Details: This course examines one thousand years of Roman history (ca. 500 BC-500AD) with equal emphasis upon social, political, military, and cultural aspects of the Republic and Empire.

Max Credits: 3
Min Credits: 3

**43.227 Europe in the Middle Ages**

Course ID: 1244

Course Details: A survey of the Latin West during the formative period from the Roman Empire to the creation and development of the first European civilization.

Max Credits: 3
Min Credits: 3

**43.228 Women in European History**

Course ID: 5215

Course Details: This course examines the history of women in late medieval, early modern, and modern Western Europe (ca. 1300-1900). From medieval saints and Renaissance queens to Enlightenment Salonieres and ordinary wives and mothers, women have played an astonishing variety of roles. We will utilize primary and secondary sources, historical films, and works of art to understand the contributions and challenges of women in the past.

Max Credits: 3
Min Credits: 3

**43.231 Renaissance and Reformation**

Course ID: 5217

Course Details: The history of Europe in the time of transition between the late Middle Ages and the Early Modern Period. Two principle topics are the intensification of cultural change which began in Italy around 1300 and spread slowly northward and the disruption of the unity of the Western Christian Church.
43.237 Europe in the Twentieth Century

Course ID: 5221

Course Details: This course will survey the continent’s history over its ‘age of extremes’ in the twentieth century, moving broadly from the apogee of European global power at the turn of the century to its decline in the trauma of two world wars and decolonization, through the Cold War and post-1945 recovery and the challenges and possibilities that have arisen for Europe in the aftermath of 1989 and the fall of the Berlin Wall.

43.239 The Nonwestern World Since 1945

Course ID: 5223

Course Details: The recent history of Africa, the Middle East, Asia and Latin America and the comparative global processes and trends that have influenced the world since 1945.

43.240 World War I

Course ID: 5224

Course Details: The course will cover the wide range of causes of this major conflict, the difficulties and changing dynamics of waging this massive war and the effects of all this on both the internal political and social conditions and external consequences for the combatants with the peace settlement.

43.241 Colonial Survival: Case Studies in Early American Legal and Political History

Course ID: 37709

Course Details: This class contrasts the dominant monoculture colonies of Massachusetts Bay and Virginia with the lesser known multicultural colonies of Maine, Plymouth, New Amsterdam, Maryland and Rhode Island. While some of the multicultural colonies foundered, others flourished by utilizing a wide range of political and legal methods which allowed for their survival alongside much larger rival colonies. The class finishes by examining similar political and legal methods employed by Native American tribes for their own survival, in particular the Cherokee, whose carefully negotiated accommodations to Anglo-American culture allowed them to live side by side with the growing United States until the 1830’s. Close analysis of both primary and secondary source material will provide students with an intensive look at rarely examined issues in early American history.

43.242 World War II

Course ID: 5225

Course Details: The Second World War transformed states and people from East Asia to the United States to Europe. We examine diplomatic and military aspects of the war and how it affected the lives of people in the countries involved. Topics include the prelude to the war, military campaigns in Europe and the Pacific, collaboration and resistance, the home front, the Holocaust, science and the atom bomb, and the consequences of the war.
43.258 Russia to 1796
Course ID: 5233
Course Details: The growth of the Russian state: Varangian origins, the Kievan state, conversion to Christianity, Mongol domination, the rise of Muscovy, Europeanization and expansion under Peter the Great and Catherine the Great.
Max Credits: 3
Min Credits: 3

43.270 Women in American History
Course ID: 5238
Course Details: This course surveys the history of women in the British North American colonies and United States with a special focus on social and economic change. It examines women as a distinct group but also attends to divisions among them, particularly those based on class, ethnicity/race, and regional diversity. Course themes include concepts of womanhood, the development and transgression of gender roles, unpaid work and wage labor, social reform and women's rights activism, as well as changing ideas and practices with respect to the female body.
Max Credits: 3
Min Credits: 3

43.274 Native American History
Course ID: 5242
Course Details: A comprehensive study of the Native Americans through historical and first-hand accounts of their lives. Designed to enlighten students and to represent fairly the Native Americans, dispelling some of the existing myths about them.
Max Credits: 3
Min Credits: 3

43.275 African-American History
Course ID: 5243
Course Details: This course surveys African American history in the United States from colonization to the present. It begins with a study of life in West Africa and traces the forced migration of Africans to the Americas. It explores West African transmissions, the freedom struggle, the great migrations from the South, the Harlem Renaissance, the modern Civil Rights movement, and the continuing impact of African Americans on life in the 21st century.
Max Credits: 3
Min Credits: 3

43.281 Sub-Saharan Africa
Course ID: 30354
Course Details: This course provides a basic introduction to the history of the African continent. It will expose students to the processes and patterns that have shaped modern African history. The course examines the historical roots of the many challenges that the continent faces today. But, at the same time, it will also provide students with the knowledge to shatter the myths and stereotypes about Africa.
Max Credits: 3
Min Credits: 3

43.295 Japan Since 1600
Course ID: 5252
Course Details: A study of the traditional Japanese institutions and the transformation of Japan into a modern state after 1868: the Tokugawa Shogunate, Meiji Restoration, Russo-Japanese War, world power status, militarism, World War II, and present day Japan.
Max Credits: 3
Min Credits: 3
43.296 United States Diplomatic History

Course ID: 5253

Course Details: Although the course takes the entire United States diplomatic history as its field of historical study, its focus is on the American foreign policy in the twentieth century. The course first explores domestic and international factors that made the United States a world power by 1898. It will then consider the goals, the practices, and the results of the twentieth century American foreign policy. The course challenges students to view American diplomacy in a global context.

Max Credits: 3
Min Credits: 3

43.298 Introduction to Historical Methods

Course ID: 5255

Course Details: An introduction for the undergraduate student to the nature and principles of history. The course takes up methodology, historiography, research methods, electronic resources, bibliography, and the technical and stylistic problems involved in the presentation of research in scholarly form. Required of all history majors in the sophomore year.

Max Credits: 3
Min Credits: 3

43.301 The World of Things: Consumer Cultures in the Modern West

Course ID: 5257

Course Details: This course will examine the emergence and historical impact of consumer cultures in the modern West, from the eighteenth century through the present. Topics to be covered will include the emergence of spaces of consumption (the home, the commercial/spectacular metropolis, the department store, the shopping mall, the tourist site), changing attitudes toward shopping and spending, the construction of modern social identities of class, gender, generation and race through consumption, and political struggles over consumption.

Max Credits: 3
Min Credits: 3

43.302 Byzantine History & Civilization

Course ID: 5258

Course Details: A study of the important political, social, and cultural changes in the East Roman Empire from the founding of Constantinople to the fall of the Empire in 1453 with emphasis on the role of Byzantium as the custodian of the classical past.

Max Credits: 3
Min Credits: 3

43.304 European Economic & Social History

Course ID: 5260

Course Details: Europe has been transformed in the last 250 years from an agricultural society to a post-industrial one. We study the processes by which this happened, from the Industrial Revolution of the 18th and early 19th century to the wars and depressions of the early 20th century and the collapse of the communist system and European unification in the late 20th century. Students learn basic concepts and methods of history and economics.

Max Credits: 3
Min Credits: 3

43.308 History of Crime and Social Control

Course ID: 5264

Course Details: Analyzes the causes and development of attempts to control crime, ethnic conflict, radical protest movements, urban disorders, and attitude and role conflicts.
43.310 History of New England

Course ID: 5266

Course Details: Explores the evolution of New England society from pre-Columbian to the Post-Industrial, emphasizing the ways succeeding generations of New Englanders have confronted social and economic change. Topics include: white-Indian relations, ecological change, Puritanism, the New England town, the industrial revolution, the rise of cities, immigration, ethnic and class conflict, and the distinctiveness of the region.

Max Credits: 3
Min Credits: 3

43.314 American Social History II

Course ID: 5270

Course Details: This course explores various aspects of common peoples' lives in the United States since 1880. Primary areas of investigation include work and leisure, family and community, as well as culture and values.

Max Credits: 3
Min Credits: 3

43.316 American Environmental History

Course ID: 5272

Course Details: This course explores the environmental history of early America and the United States from the end of the last ice age (c. 12,500 years ago) to the present. It examines the role played by nature as an historical agent as well as the relationship between human communities and the physical and organic environment. Course themes include evolving land use, the environmental significance of industrial capitalism, urban public health, resource conservation and wilderness protection, the impact of ecology on public consciousness, as well as environmentalism.

Max Credits: 3
Min Credits: 3

43.320 American East Asian Relations

Course ID: 5276

Course Details: The course examines relations between the United States on one hand and Japan, Korea, China, Vietnam, and the Philippines on the other in the 19th and 20th centuries. Besides political, trade, and cultural relations, there is also emphasis on American laws and practices regarding immigrants from these East Asian countries. The aim of the course is for students to gain a basic knowledge of American relations with East Asia and to develop analytical skills for sophisticated inter-national relations.

Max Credits: 3
Min Credits: 3

43.321 The Holocaust

Course ID: 5277

Course Details: In a world in which genocide is real, the murder of six-to-eight million Jews between 1939 and 1945 remains a critical topic of inquiry. When were factories of death first conceived? What perverse rationale motivated the collaborators who built and operated the gas chambers and crematoria? This course will answer questions of this kind by examining the most respected scholars who have written on and primary sources that speak directly to the Holocaust.

Max Credits: 3
Min Credits: 3

43.322 Chinese Foreign Policy
Course ID: 5278

Course Details: Chinese foreign policy since 1949 with a strong emphasis on tracing the links between historical, ideological, and cultural influences, on the one hand, and pragmatic and nationalistic considerations on the other. While tracing these links, the course explores the intricate process of policymaking in the People's Republic of China.

Max Credits: 3
Min Credits: 3

43.323 World of the Atlantic

Course ID: 34780

Course Details: The concept of the Atlantic world arose to describe the interactions of the peoples of the Americas, Europe, and Africa through trade, conquest, colonialism, independence and beyond. In this class, we will consider the cultural, economic, and political relationships that are formed and change over time between these groups. We will pay special attention to historical approaches to studying and writing about the Atlantic World.

Max Credits: 3
Min Credits: 3

43.329 Childhood in Premodern Europe

Course ID: 30355

Course Details: This course examines the concept of childhood in medieval and Renaissance Europe (ca. 1100-1600), with particular attention to England and Italy. There are no specific prerequisites, although some knowledge of European history (i.e., Medieval Institutions, Western Civilization, Renaissance-Reformation) will be useful. Among the topics we will consider are the following: the different stages of childhood; children's education and apprenticeship; dress, diet, and demeanor of children; orphans; royal children; Protestant and Catholic views of children; adolescent sexuality; depiction of children in art; child labor; literature for children.

Max Credits: 3
Min Credits: 3

43.330 Tudor and Stuart England, 1485-1714

Course ID: 5283

Course Details: Traces the transformation of England from a small island kingdom to the hub of an overseas empire. During this period the English people underwent religious upheaval and civil war, saw the rise and partial decline of the monarchy, built and rebuilt London, and enjoyed the plays of Shakespeare. Although England provides the focus for this course, the rest of the Tudor and Stuart world is included.

Max Credits: 3
Min Credits: 3

43.332 Warfare in the Ancient World

Course ID: 37440

Course Details: Warfare in the Ancient World is a practical introduction to the study of warfare in the ancient world and traces the advances made in empire building, ideology and military technology. The chronological structure of the class starts with the Egyptians and continues through the Dark Age, Classical and Hellenistic Greeks, to the rise and fall of Rome. This course will trace certain themes through the centuries: how different civilizations waged war; who served in various armies and why soldiers decided to fight. While major battles and important individuals are discussed, military tactics and strategies are only tools to help understand the underlying causes for armed conflict.

Max Credits: 3
Min Credits: 3

43.334 The French Revolution and Napoleon

Course ID: 5286

Course Details: This course will involve students directly in critical consideration of the central events and issues of the Revolutionary and Napoleonic periods, with an eye to their longer-term historical resonances in France, Europe and beyond. The core problems we
will be discussing are ones which have remained vital in modern and even contemporary political history: the nature of liberty, the nation and national identity, equality and inequalities, violence and terror in politics, the cult of the leader, war and empire.

Max Credits: 3
Min Credits: 3

**43.336 Problems of Modern Ireland**

Course ID: 5288

Course Details: This course focuses on a discussion of the problems in Modern Irish History, how they became problems and what people have tried to do to resolve them. You will also learn about the nature of both history and human beings who have made history, and you will learn how to analyze historical issues, and come to some logical and defensible conclusion about the nature of those events and people. In this course, particularly, you will learn how to analyze events in terms of the challenges of economic, political and social claims by different groups with their competing values.

Max Credits: 3
Min Credits: 3

**43.337 Germany Since 1871**

Course ID: 5289

Course Details:

Max Credits: 3
Min Credits: 3

**43.338 War and Memory in Twentieth Century France**

Course ID: 37041

Course Details: This course will address the individual and collective trauma of modern warfare, as that was experienced in France both during and after the country's three main wars in the twentieth century. It focuses on how the experience of modern war was negotiated in culture—in personal and official memory, in gender relations, and in a great variety of written and visual texts. Individual units will be dedicated to World War I, the Occupation and Vichy Regime during World War II, and the Algerian War, and to the long and conflicted afterlife of those conflicts.

Max Credits: 3
Min Credits: 3

**43.342 Inquisition: Myth and Reality**

Course ID: 5292

Course Details: Following a brief introduction and an overview of the medieval Inquisition, the first few weeks of the course will be devoted to a study of the Inquisition in Spain and Italy from 1450-1650. We will also discuss the way in which the history of the Inquisition has been analyzed during the past five hundred years (what historians call "historiography"). The second half of the course will focus on student research and selected topics in Inquisition studies.

Max Credits: 3
Min Credits: 3

**43.343 Fascism and the Radical Right in Twentieth Century Europe**

Course ID: 34573

Course Details: This course will offer a comparative exploration of the deep and enduring appeal of fascism and far rightist politics in twentieth century Europe. Beginning with the nationalist revival and cultural crisis of the late nineteenth century and the cataclysm of World War I, we will trace the rise of the radical right to political prominence in Europe in the 1920's and 1930's. While retaining a Europe-wide perspective throughout, we will analyze in particular detail the Fascist and National Socialist seizures of power in Italy and Germany, and examine their efforts of political, social, economic and cultural mobilization. Issues covered will include fascist political communication and governance, terror and "normality" in everyday life, labor and youth policy, racism and racial purification, and gender and reproductive politics, among others. In the final section of the course, we will contemplate the historical legacy of fascism after 1945, focusing on the politics of memory and representation in post-war Germany, Italy and Europe more generally, and assessing the recent resurgence of fascist and quasi-fascist political tendencies in the 1980's and 1990's.
Max Credits: 3
Min Credits: 3

43.345 Slavery and Abolition

Course ID: 5293

Course Details: This course takes a comparative approach to the study of plantation slavery in the Americas with special attention to developments in Virginia and Cuba. It surveys the structure of slavery in the nineteenth century United States South; slavery's legacy in the United States; and its twenty-first century reincarnation in human trafficking and forced labor around the world.

Max Credits: 3
Min Credits: 3

43.348 Making an Historical Documentary

Course ID: 34782

Course Details: This course provides students with the basic conceptual and technical skills for developing and completing an historical documentary, including instruction about subject choice, narrative structure, camera work, and editing.

Max Credits: 3
Min Credits: 3

43.349 The Cuban Revolution

Course ID: 34715

Course Details: The Cuban Revolution has been surrounded by controversy since it took power in 1959. Through readings, films, and discussions, we will examine not only the events that have occurred in Cuba over the last four decades but also the ways that they have been presented to audiences in Cuba, the United States, and elsewhere. We will carefully consider the role of perspective in academic writing and the media and how it has shaped understandings of the Castro era.

Max Credits: 3
Min Credits: 3

43.350 Colonial America: History and Culture

Course ID: 5295

Course Details: Emphasis is on the British North American and Caribbean colonies of the 17th and early 18th centuries. Topics include: the impact of European pandemic diseases on the native American populations, new European technologies and the transformation of the environment; contrasts between religious, social, and economic developments in New England and those in the settlements to the south; a comparative analysis of slavery; and the beginnings of modernism.

Max Credits: 3
Min Credits: 3

43.351 Colonial Society and the Captivity Narrative

Course ID: 37722

Course Details: The long sequence of military conflicts in New England at the turn of the eighteenth century led to an equally long sequence of accounts describing the experiences of English colonists taken captive by French of Native American military forces. While these narratives are often portrayed as a uniquely American literary genre, this course will open by exploring the wider European tradition of captivity narratives from the medieval and early modern periods. Readings for the course will consist of narratives written by Britians taken captive by Barbary pirates, the traditional New England captivity narratives as well as the "anti-captivity" narratives written by colonists who chose to remain with their Native American captors, all of which will be examined against the backdrop of cultural changes on both sides of the Atlantic ocean.

Max Credits: 3
Min Credits: 3

43.352 The Coming of the American Revolution
Course ID: 5296
Course Details: A study of 18th-century British America with emphasis on the paradoxes of unity and diversity, Anglophilia and Anglophobia, slavery and freedom, and enlightenment rationalism and evangelical religion. The course also deals with the major causes, events, and interpretations relating to the coming of the American Revolution. Offered on a rotating basis.
Max Credits: 3
Min Credits: 3

43.353 The French and Indian and Revolutionary Wars

Course ID: 5297
Course Details: The years between 1754 and 1784 saw drastic change on the North American continent and around the world for Britain and its colonies. Colonists in North America went from being devout British subjects during the French and Indian War to rebelling and founding their own new country during the American Revolution. In turn, the British Empire went from spending millions of pounds on North America in the 1750’s to barely committing the resources necessary for fighting the Revolution. This class examines these cultural and political transitions in context with discussions on the varied populations of North America who experienced them.
Max Credits: 3
Min Credits: 3

43.355 Jacksonian America

Course ID: 5299
Course Details: An investigation of the social, political, and economic developments in the United States from 1815 to 1848. Special emphasis is placed on the spread of capitalism, the growth of reform movements, the development of cities, and the conflict over slavery.
Max Credits: 3
Min Credits: 3

43.356 Civil War and Reconstruction

Course ID: 5300
Course Details: This course surveys the increasing political, social, and economic tensions between the North and the South during the first half of the nineteenth century; the explosion of those tensions into secession and conflict; the four years of war; and the postwar struggle to reconstruct the South and forge a new union.
Max Credits: 3
Min Credits: 3

43.357 American Civil War in Memory

Course ID: 5301
Course Details: Students analyze how Americans have remembered the American Civil War in the years after the war ended in 1865. By looking at novels, memoir films, National Park Service Battlefields, and monuments, students discover how remembrances are influenced by views of race, gender, patriotism, regionalism, and economic forces.
Max Credits: 3
Min Credits: 3

43.359 Early United States Political Culture

Course ID: 5303
Course Details: The course examines what is often referred to as the Golden Age of American Democracy. How much power did ordinary Americans have in the political system? What motivated people to participate in politics? What roles did women and racial minorities play in American politics despite not being able to vote?
Max Credits: 3
43.362 The Twenties and the Thirties
Course ID: 5306
Course Details: An examination of the emergence of the corporate and governmental institutions of modern America set in two turbulent decades of cultural and political ferment that involved both booming prosperity and the economic collapse of the Great Depression.
Max Credits: 3
Min Credits: 3

43.365 United States History since 1960
Course ID: 5309
Course Details: Discusses Cold War politics and civil rights upheavals during the 1960's and 1970's, the decline of American economic and political power, and the resurgence of conservative politics in the 1980's.
Max Credits: 3
Min Credits: 3

43.369 Russia in the Nineteenth and Twentieth Centuries
Course ID: 5313
Course Details: Addresses selected topics in modern Russian history: political and social reforms of the nineteenth century, international policies in Europe and Asia, the 1917 revolutions, development of the new regime under Lenin, Stalinist policies, World War II, and Russian expansion. A comparative study of these topics will underscore patterns of continuity in both Tsarist and Communist Russia.
Max Credits: 3
Min Credits: 3

43.373 Nazi Germany
Course ID: 5317
Course Details: This course looks at the period 1933-1945 (the period of the "Third Reich") in Germany from the perspectives of economics, politics, society, and the arts. In the course, we will read preeminent historians who have written on each of these themes in order to gain a firm understanding of the historical debates that surround the period. Specific subjects include the Nazi consolidation of power, the increasingly brutal nature of anti-Semitic policies, the power struggles among chief Nazi officials, the ideologies and personae of figures like Hitler, Rosenberg, and Goebbels, the nature of "Nazi art" and cultural policies, and the path to war.
Max Credits: 3
Min Credits: 3

43.374 Stalin's Russia
Course ID: 5318
Course Details: Spanning the period from the "October Revolution" of 1917 to Stalin's death in 1953, this course considers "Stalinist Russia" from the perspectives of economics, society, the arts, politics and war. In the course, we will read the preeminent historians who have written on these topics.
Max Credits: 3
Min Credits: 3

43.379 United States Industry Twentieth Century
Course ID: 5322
Course Details: An exploration of the rapid growth of the American economy in the 20th century, including the evolution of the large corporation and the mass production assembly line. Particular attention is devoted to the ways in which immigrants, women, and the African Americans were affected by the rise of big business. The course also traces the decline of the traditional U.S. manufacturing base following the Second World War and the impact this had on the working class and their unions.
Max Credits: 3
Min Credits: 3

43.380 Work and Society
Course ID: 5323
Course Details: Provides a survey of labor history from the colonial period to the present focusing on the interrelationship between culture and work in American society and on the dynamics of technical and economic changes on the organization of work processes.
Max Credits: 3
Min Credits: 3

43.381 United States in the 1960s
Course ID: 5324
Course Details: This course examines the United States during the 1960s. General themes include the stifling and freeing of dissent, the rights revolution, liberal social and economic policy, foreign policy in a bipolar world, redefinition of values and morals, changing relations between women and men, increasing concern with environmental pollution, the growing credibility gap between citizens and their government, and rise of the New Right.
Max Credits: 3
Min Credits: 3

43.382 The American West
Course ID: 5325
Course Details: Involves readings and discussions of the history of the American frontier and the place of the frontier in American society and thought.
Max Credits: 3
Min Credits: 3

43.384 Radicalism in American History
Course ID: 5327
Course Details: A biographical approach to the influence of radicalism on American history with emphasis on significant and representative personalities and their contributions.
Max Credits: 3
Min Credits: 3

43.386 History of College, 1100-1900
Course ID: 35078
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

43.389 Ancient History in Film
Course ID: 37439
Course Details: Ancient History in Film seeks to understand the interconnection between ancient texts, social history and pop culture in American cinema. This course is more than an excuse to watch fun films and gain academic credit. It will engage the primary texts that are the foundation for these cinematic creations while investigating the social and cultural influences that shaped the making of these movies. Ultimately, this course will provide a clearer view of our own world through the lens of moviemakers mimicking the Greco-Roman world. We will read primary texts in translation, modern analyses of these movies and you are responsible to watch an entire film between class sessions. All films are on reserve in the Media Center of the O'Leary Library.

Max Credits: 3
Min Credits: 3

43.390 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

43.391 America and the World

Course ID: 35559

Course Details: In an age of increasing globalization, historians realize the need for putting the American national narrative in a wider historical context. This course will help students locate the study of the United States in a global, comparative and transnational perspective. This course will be used as one of the courses needed by History majors in the global, comparative and under-represented areas of the major.

Max Credits: 3
Min Credits: 3

43.393 History of the Middle East and Islamic World

Course ID: 5331

Course Details: This course examines the history of the Middle East and the Islamic World from the time of Muhammad to the present. It provides an introduction to the history of this often turbulent region. It exposes students to the processes and patterns that have shaped the history of the Islamic World. The course examines the historical roots of the many challenges that the region faces today.

Max Credits: 3
Min Credits: 3

43.410 Olympic Games and World's Fairs

Course ID: 37042

Course Details: The course studies Olympic Games and World's Fairs from the mid-nineteenth century to the present. We examine how these international festivals participate in and contribute to six themes in the history of that period: nationalism and internationalism, mechanization of industry, modern architecture and urban planning, consumer culture, racial politics, and the Cold War. Students write brief papers connecting these themes and one or more game or fair and a research paper on a relevant topic. Special attention is given to certain icons, like the Crystal Palace, the Eiffel Tower, the Nazi Olympics, and the Mexico City games.

Max Credits: 3
Min Credits: 3

43.432 Research Seminar

Course ID: 5337

Course Details: Systematic research in primary and secondary sources culminating in the writing of an original research paper using proper methodological and stylistic techniques. Weekly meetings and written and oral progress reports. Students must be acquainted with word-processing techniques. Required of all History majors.

Max Credits: 3
43.496 Practicum

Course ID: 5343

Course Details: A program of on-campus and off-campus experiences for history majors only. Specific requirements vary depending upon the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a community, social, cultural, or artistic area and for applying techniques of problem solving and/or skills that are appropriate to the student's major discipline. May be repeated for a maximum of nine credits. Students are graded 'satisfactory' or 'unsatisfactory.' The practicum experience may not be substituted for a required course in the major.

Max Credits: 3
Min Credits: 3

43.497 Tsongas Center Field Practice

Course ID: 35077

Course Details: This 3-credit hour course will be an addition to the History Department's other 400-level courses. Currently, students enrolled in the "Research Seminar" conduct primary original research and present that research in one or another format. Those in the "Directed Study" work with assigned faculty on the historiographic breadth of a particular topic, reading selected books, writing response papers, and meeting for weekly discussions. Additionally, the existing "Practicum" allows students to earn course credit for hands-on classroom and history museum projects. The "Tsongas Center Practicum" will combine elements of all three, and make it possible to identify the specific Tsongas Center focus as such on student transcripts.

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
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

44.101 The Criminal Justice System

Course ID: 5347

Course Details: This course presents a brief history of the Criminal Justice System and an analysis of its structure and function. This course required of all CJ majors and is a prerequisite for all other courses in criminal justice.

Max Credits: 3
Min Credits: 3

44.111 Introduction to Industrial Security

Course ID: 5349

Course Details: An introduction to the planning, organization, and management of industrial, business, and government security resources. The focuses are on the protection of assets via the integration of physical, personal, and information security. Relations between security organizations and government agencies are also explored.

Max Credits: 3
Min Credits: 3

44.115 Introduction to Homeland Security

Course ID: 30826

Course Details: This course will encompass the study and relationship between those entities and institutions necessary for the protection of the United States. Course instructional material will examine the components of Federal, State and Local Police Agencies, as well as the role of Private Security and Emergency Responders needed to facilitate the implementation of the Homeland Security Act. Particular attention will be focused on Policy, Plans and Procedures at governmental and community levels. Credits: 3

Max Credits: 3
Min Credits: 3

44.151 Introduction to Corrections

Course ID: 5351

Course Details: This course provides an overview of the American correction system including the history of corrections, probation, incarceration, community corrections, the prison experience and release.

Max Credits: 3
Min Credits: 3

44.203 Technology and the Criminal Justice System
Course ID: 30356

Course Details: This course is designed to introduce students to the latest innovations in the applications of new technological advances in the criminal justice system. Topic areas include an examination of 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

44.212 Weapons of Mass Destruction

Course ID: 30825

Course Details: This course will center on Weapons of Mass Destruction (WMD) and their potential use by terrorists to obtain their goals. We will explore the origins, development and weaponization of Chemical, Biological, Nuclear and Radiological Systems and Devices. The course content is designed particularly for the First Responder to such incidents of WMD. The class will focus on the preparation and execution of plans and policies to counter this threat. Credits: 3

Max Credits: 3
Min Credits: 3

44.213 Emergency Management

Course ID: 36270

Course Details: The purpose of this course is to introduce the student to the various ways in which a corporation and local municipality can plan for a disaster before it occurs. Topics covered include risk identification and assessment of multi-hazards whether natural and man-made, violence in the workplace, development of crisis and disaster incident management programs, and business/agency continuation planning.

Max Credits: 3
Min Credits: 3

44.221 Criminology I

Course ID: 5356

Course Details: The definition and nature of crime, criminal statistics, and theories of crime causation are included. Required of all CJ majors.

Max Credits: 3
Min Credits: 3

44.223 Crime and the Media

Course ID: 5357

Course Details: This course provides an overview about how the media portrays crime and its impact on the general public, crime, and victims and offenders.

Max Credits: 3
Min Credits: 3

44.233 Criminal Procedure

Course ID: 5358

Course Details: Examines the rules that govern the everyday operation of the criminal justice system from investigation to sentencing and appeal. Topics include: Investigation, arrest, search and seizure, interrogation, pretrial detention and hearings, plea bargaining, trial procedures, sentencing, and appeals.

Max Credits: 3
**44.234 Criminal Law**

Course ID: 5359

Course Details: The historical origins and development of criminal law from the early common law to contemporary decisions and statutes. Constitutional and statutory factors as they pertain to criminal responsibility, capacity, crimes against persons and property, defenses to criminal charges and sentences. Sections of the Massachusetts Criminal Code and other statutes will be covered where applicable.

Max Credits: 3

**44.235 Introduction to the Law and Politics of Constitutional Development**

Course ID: 5360

Course Details: A course examining American constitutional doctrine as it has developed historically through the process of constitutional adjudication.

Max Credits: 3

**44.237 Introduction to the Law and Politics of Civil Liberties**

Course ID: 5361

Course Details:

Max Credits: 3

**44.241 Physical Security**

Course ID: 5362

Course Details: The basic principles of physical security with emphasis on tailoring these principles to the protection of specific operations and facilities. Proper planning, appropriate design, and use of modern techniques and devices to enhance security while reducing costs are discussed.

Max Credits: 3

**44.243 Criminalistics I**

Course ID: 5363

Course Details: This laboratory course will cover basic procedures in arrest, search and seizure, and the gathering and evaluation of evidence as to admissibility, weight, and competence.

Max Credits: 3

**44.244 Criminalistics II**

Course ID: 5364

Course Details: This course is a continuation of Criminalistics I. It is intended to familiarize the student with various types of physical evidence that can be found at the more violent crime scenes. Methods of identification, preservation, collection and analysis of physical evidence relating to specific criminal activities shall be stressed. Topics shall include Bloodstain Pattern Analysis, DNA Typing, Crime Scene Reconstruction, Point of Origin Determination and evidence associated with Death Investigations, Sexual Assaults, Bombings, Arsons, Motor Vehicle Homicides, Robberies and Burglaries.

Max Credits: 3
44.248 Terrorism (international and domestic)

Course ID: 5368

Course Details: This course acquaints the Criminal Justice student with the concept of terrorism at both the international and domestic levels. Topics include the history of terrorism, terrorism today and terrorism in the future. Counter measures taken to respond to terrorist threats are also examined.

Max Credits: 3
Min Credits: 3

44.251 Institutional Corrections

Course ID: 5369

Course Details: Detailed examination of the U.S. prison and jail systems, highlighting such topics as classification of offenders, crowding, treatment programs, prison violence, and privatization.

Max Credits: 3
Min Credits: 3

44.261 Juvenile Delinquency

Course ID: 5370

Course Details: An examination of causative factors in the development of youthful offenders and the development and philosophy behind treatment and rehabilitative practices.

Max Credits: 3
Min Credits: 3

44.280 Criminal Justice Ethics

Course ID: 5371

Max Credits: 3
Min Credits: 3

44.312 Security Management

Course ID: 5375

Course Details: Addresses the basic interdisciplinary principles of security management including planning, budgeting, organizing, staffing, directing, and controlling. This course will also cover marketing security services to management, risk management, civil and criminal liability, and labor relations. Each aspect of the course is designed to prepare security managers to face the new challenges as broader and more cost-effective protection is required with fewer resources. The course will also bring about greater awareness and understanding of the various options available in security and loss control. It will identify a number of risk areas and outline various deterrent and preventative methods.

Max Credits: 3
Min Credits: 3

44.318 American Courts and Judicial Process

Course ID: 33792

Course Details: This course will study the organization of and the processes employed by American Courts in an intensive participation format. Traditional text lessons on the U.S. Court system will be supplemented by simulations and mock trial problems. Using this two track approach, students will learn about the courts and simultaneously develop the analytical, critical reasoning and public speaking skills used in the Judicial system.

Max Credits: 3
44.323 White Collar and Elite Deviance

Course ID: 5378

Course Details: This course will provide an overview of white collar crime including white collar, corporate, occupational, workplace, and organized crime.

Max Credits: 3
Min Credits: 3

44.326 Hate Crime

Course ID: 5379

Course Details: This course examines prejudice as a motivation for criminal behavior. The criminological theory for hate crime is reviewed, as well as historical perspectives of this crime category.

Max Credits: 3
Min Credits: 3

44.327 Violence in America

Course ID: 30803

Course Details: This course provides students with an in-depth analysis of the courses, context, and control of a wide range of violent crimes.

Max Credits: 3
Min Credits: 3

44.342 Criminal Profiling

Course ID: 5383

Course Details: This course provides an overview of the development and character of the many types of offenders who become criminal psychopaths. The course explores the various methods used in classifying and predicting criminal behavior derived form the field of Criminology, Psychology and Forensic Science.

Max Credits: 3
Min Credits: 3

44.343 Forensic Psychology

Course ID: 30368

Course Details: This course examines the application of psychological theories, principles, and research to issues of concern to the criminal justice system.

Max Credits: 3
Min Credits: 3

44.347 Police Innovations

Course ID: 5385

Course Details: This course is concerned with contemporary efforts to change police agencies, particularly in the United States. Contemporary reform revolves mainly around what we now know as "community policing" and this course will dwell at some length on these initiatives. Other innovations, some of which may complement community policing, and all of which are narrower in scope, are also considered.

Max Credits: 3
Min Credits: 3
44.348 Advanced Seminar on Weapons of Mass Destruction and Terrorism

Course ID: 37471

Course Details: This course will examine the scientific and technological details of chemical, biological, radiological and nuclear (CBRN) weapons; the proliferation of these weapons and international CBRN prevention efforts (like the Nuclear Nonproliferation Treaty, the Chemical Weapons Convention, and the Biological Weapons Convention); and the threat of terrorist groups seeking to acquire and use CBRN weapons, and explore ways to improve our response to this complex threat.

Max Credits: 3
Min Credits: 3

44.350 Institutional Correction

Course ID: 5386

Course Details: This course provides an in-depth examination of the history, function, structure, and operation of American adult and juvenile correctional institutions.

Max Credits: 3
Min Credits: 3

44.351 Community-Based Corrections

Course ID: 5387

Course Details: A comprehensive review of community-based sanctions and community-based, early-release mechanisms. In addition to traditional probation and parole reviews, "new" intermediate sanctions such as electronic monitoring, intensive supervision, boot camps, day fines, day reporting centers, and community service sentences.

Max Credits: 3
Min Credits: 3

44.360 Gender, Race, and Crime

Course ID: 5390

Course Details: This course examines gender and racial implications of criminal laws, criminal justice practices and programs will be examined. The position of women and racial/ethnic minorities will be assessed from the different perspectives of victims, offenders, and criminal justice practitioners.

Max Credits: 3
Min Credits: 3

44.361 Philosophy of Law

Course ID: 5391

Course Details:

Max Credits: 3
Min Credits: 3

44.365 Hate Crimes

Course ID: 5392

Course Details: Hate crimes illustrate bigotry plus criminal acts. This course examines prejudice as a motivation for criminal behavior. The criminological theory for hate crime is reviewed, as well as historical perspectives of this crime category. This is a rich and comprehensive exploration that begins with understanding the psychology of prejudice and ends with reviewing genocide as a mass hate crime.

Max Credits: 3
Min Credits: 3
44.370 Criminal Justice Management

Course ID: 5393

Course Details: This course provides an introduction to the principles of administration, including planning, budgeting, grantsmanship, and evaluation as they relate to the criminal justice manager.

Max Credits: 3
Min Credits: 3

44.373 Issues in Police Administration

Course ID: 5396

Course Details: Specific analysis of the management of contemporary police forces, including staffing, scheduling, training, collective bargaining, community relations, and other related issues.

Max Credits: 3
Min Credits: 3

44.380 Selected Topics in Criminal Justice

Course ID: 5397

Course Details: An advanced course of study and examination of a variety of current issues and topics in criminal justice. Students without a sufficient background in criminal justice courses should not attempt this course. Subject matter to be announced in advance. Visit the current semester schedule on the Continuing Studies website for more details.

Max Credits: 3
Min Credits: 3

44.385 Crime and Mental Illness

Course ID: 5401

Course Details: This course examines the realities and myths surrounding the involvement of individuals with mental illness in the criminal justice system. Material from criminal justice and psychology will be examined, with emphasis on service models that foster collaboration between mental health professionals, law enforcement, the courts, and corrections.

Max Credits: 3
Min Credits: 3

44.387 Criminal Mind and Behavior

Course ID: 5402

Course Details: This course will explore the psychological dimensions of criminal thinking and behavior. The course will cover the psychological origins and types of crime, the multidimensional influences on criminal behavior, developmental criminal pathways, diagnoses, assessment and treatment approaches and a description of the continuum of psychopathic behavior.

Max Credits: 3
Min Credits: 3

44.388 Forensic Psychopathology

Course ID: 5403

Course Details: This course addresses psychopathology in forensic settings, providing students with an integrative approach to understanding the multiple causes of psychological problems and disorders of adult and juvenile offenders as well as crime victims including biological, social, emotional, cognitive, and behavioral influences.

Max Credits: 3
Min Credits: 3
44.390 Criminal Justice Research Methods

Course ID: 5404

Course Details: An introduction to research methods for the criminal justice professional including terminology, standard methodologies, and elementary statistics.

Max Credits: 3
Min Credits: 3

44.395 Statistics in Criminal Justice

Course ID: 5406

Course Details: This course is an extension of concepts learned in 44.390 (Introduction to Criminal Justice Research Methods). Statistics will be utilized as a mathematical language for interpreting the interrelation of social forces impacting criminality and deviance. The course will focus on how various statistics are calculated, but more importantly, the meaning of these figures for criminal justice scholars and practitioners will be discussed.

Max Credits: 3
Min Credits: 3

44.397 Crime Mapping

Course ID: 5407

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

44.398 Criminal Justice Data Analysis

Course ID: 5408

Course Details: The student is introduced to computer software packages (i.e. SPSS) used to analyze large quantitative data sets common in criminal justice/criminology. This course is seen as the capstone to the research methods/technology component of the major, and is intended for upper level students, especially those preparing for graduate study.

Max Credits: 3
Min Credits: 3

44.401 Substance Abuse and Crime

Course ID: 5409

Course Details: Covers the problems posed by substance use/abuse and examines the role and impact of the legal, criminal justice, and public health systems, as well as current treatment/intervention approaches.

Max Credits: 3
Min Credits: 3

44.422 Victimology

Course ID: 5413

Course Details: This course examines the patterns of victimization, the characteristics and lifestyles of crime victims, and the impact of their victimizations. The treatment of victims by the criminal justice system will be examined along with possible reforms in these approaches.

Max Credits: 3
Min Credits: 3
44.477 Intimate Partner Violence

Course ID: 5417

Course Details: This course examines the causes and consequences of domestic violence and the latest research regarding the responses of the criminal justice system.

Max Credits: 3
Min Credits: 3

44.478 Child Maltreatment

Course ID: 5418

Course Details: This course introduces students to empirical findings and theoretical perspectives concerned with the maltreatment of children and youth. One of the major course goals is to balance the view of children and youth in the criminal justice system by focusing on their victimization instead of exclusively on their offending behavior.

Max Credits: 3
Min Credits: 3

44.491 Directed Study - Criminal Justice

Course ID: 5420

Course Details:

Max Credits: 3
Min Credits: 3

44.492 Short Directed Study

Course ID: 32152

Course Details: This course is designed as an independent study of a subject with Chair's permission.

Max Credits: 1
Min Credits: 1

44.493 Issues in Technology and Security

Course ID: 5421

Course Details: An examination of the causes and consequences of computer crime as well as the criminal justice system's response to the problem.

Max Credits: 3
Min Credits: 3

44.495 Criminal Justice Field Studies

Course ID: 5423

Course Details: This is an intense internship program for Criminal Justice majors which requires approval by the Department Chair.

Max Credits: 6
Min Credits: 6

44.496 Criminal Justice Internship

Course ID: 5424

Course Details: Assigned fieldwork under the supervision and with the permission of the instructor assigned to the course. The purpose is to broaden the educational experience of pre-service students in law enforcement, probation, and correctional agencies within this
area. This course is designed to provide a correlation of theoretical knowledge with practical experience in an area of particular interest

Max Credits: 3

Min Credits: 3

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

44.554 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
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

44.570 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.
44.575 Criminal Homicide

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

44.580 Descriptive & Inferential Statistics

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

44.590 Research Design

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 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 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

44.646 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

44.680 Selected Topics

Course ID: 5473

Course Details: A comprehensive examination of a current issue in criminal justice.

Max Credits: 3
Min Credits: 3
**44.691 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

**44.741 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

**45.201 Introduction to Philosophy**

Course ID: 5497

Course Details: Examines some of the typical approaches to philosophical questioning and the issues raised in such inquiry: what is true knowledge, what is reality, what is the good, what is the right political order, what is the nature of religious faith?

Max Credits: 3
Min Credits: 3

**45.202 Introduction to Logic and Critical Reasoning**

Course ID: 5498

Course Details: Studies the methods used to distinguish correct from incorrect reasoning. This course will aim at developing (1) an ability to express one's ideas clearly and concisely; (2) an increased skill in defining one's terms; and (3) a capacity to formulate arguments vigorously and to scrutinize them critically.

Max Credits: 3
Min Credits: 3

**45.203 Introduction to Ethics**

Course ID: 5499

Course Details: Examines the basic issues and problems of ethics and values and a survey of some important alternative answers to the questions raised, on both an individual and a social level, by our necessity to act and to live in a rational and human way.

Max Credits: 3
Min Credits: 3

**45.206 Introduction to Political Philosophy**

Course ID: 5500

Course Details: Political philosophy is concerned with basic questions about community, public life, and social organization. This course will address issues such as the rights of the individual in relation to the power of the state and society, the nature and legitimacy of
political authority and democracy; the significance of power, economics, justice and equality in social life; and the duties and responsibilities of citizens. We will also consider the philosophical meaning of communitarianism, liberalism, and republicanism, individualism, capitalism, and socialism, as well as the role of class, race, and gender in politics.

Max Credits: 3
Min Credits: 3

45.216 Plato and Beginning of Philosophy

Course ID: 5503

Course Details: It is Plato who first uses the words "philosopher" and "philosophy", and who, in his dialogs or dramatic discussions, establishes for all subsequent Western thought just was the enterprise of philosophy will be. In our study of these dialogs we will trace the origins in Plato of philosophy's primary questions concerning what is real and true as opposed to mere appearance (ontology, metaphysics), what is knowledge as opposed to mere opinion (epistemology), what is valid argument (logic), what is beautiful (aesthetics), and what is good, just and fair (ethics, politics). Plato foregrounds speech and language in all these considerations. Hence language, as the medium of thought and communication, will be a fundamental concern throughout our study.

Max Credits: 3
Min Credits: 3

45.285 Ancient Philosophy

Course ID: 5506

Course Details: A survey of the beginnings of philosophy, mainly western, from the Presocratics to Augustine. Studies the emergence of philosophy out of mythical forms of thinking and the development of rational thought in the work of Plato, Aristotle, the Stoics, the Epicureans, and the Neoplatonists.

Max Credits: 3
Min Credits: 3

45.296 Introduction to World Religions

Course ID: 33190

Course Details: A study of religious knowledge and the phenomena of religion from a philosophical standpoint. The course considers explanations for religious behavior, some central issues in religious belief, and the values and goals of religious systems. Various world religions provide specific data for these topics.

Max Credits: 3
Min Credits: 3

45.301 Ways of Knowing

Course ID: 5510

Course Details: Studies and analyzes various forms and expressions of human knowledge (perception, concept-formation and symbolic functioning, myth, aesthetic creation and interpretation, scientific discovery and understanding) and the individual, social, and historical conditions to which they are subject. The goal of the course is a comprehensive view of the structure of the human mind and its operations.

Max Credits: 3
Min Credits: 3

45.304 God and Philosophy

Course ID: 5513

Course Details: Studies, historically and systematically, the following topics: a) the origin and content of the idea of God, b) the possibility of affirming God, philosophically and religiously, c) the complex nature of religious language and imagery, and d) God's relation to the world, history, and the individual.

Max Credits: 3
Min Credits: 3
45.305 Language Signs and Symbols
Course ID: 5514
Course Details: An examination of the various grammars of human expressions from the point of view of a general theory of signs. Among the topics to be treated are: a) the nature of signs, symbols, and meaning; b) the structures and functions of language; c) the relations between language, thought, and reality, especially as manifested in metaphor; d) the social dimensions of signification and symbolization; and e) the relations between the different linguistic, sign, and symbol systems.
Max Credits: 3
Min Credits: 3

45.306 Feminist Theory Politics
Course ID: 5515
Course Details: What is sexist oppression? Is our culture still sexist, or is the need for feminism over? How should we respond to sexism in other cultures? Do men and women have different natures? Are our culture’s sexual representations of women necessarily degrading, and if so, why? We’ll consider these questions, and others, by examining the arguments and methodology of analytic feminism. We’ll start by tracing the historical development of feminism in the 18th, 19th, and 20th centuries, and then turn to several contemporary feminist analyses of sexist oppression. We’ll then use these feminist frameworks to examine more specific issues. Possible topics include: feminist analyses of sexual objectification in pornography, feminist arguments in ethics and social theory, feminist analyses of science, and feminist criticisms of gendered labour.
Max Credits: 3
Min Credits: 3

45.310 Philosophy of Creative Imagination
Course ID: 5518
Course Details: Focuses first on imagination as a function of mind, placing it in relation to other functions such as perception, emotion, and conceptualization. Attention is then given to the difference between the reproductive and the creative imagination, with special emphasis on the psychological and social/political dimensions of creativity. Topics to be considered include poetical metaphor, theatrical performance, painting, architecture, or photography.
Max Credits: 3
Min Credits: 3

45.313 American Philosophy
Course ID: 5521
Course Details:
Max Credits: 3
Min Credits: 3

45.314 Philosophy of the Gothic Imagination
Course ID: 5522
Course Details: A philosophical inquiry into science fiction, fantasy, and horror, with special emphasis on film. This course will attempt to provide interpretations of some classic examples from these genres, as well as to inquire into the philosophical significance of these literary categories and their relation to mythology and religion. Questions to be addressed will include the problem of knowledge and rationality and its limits, the nature of the human being, and the moral problem of the role of violence in the social order. The class will attempt to identify a continuous tradition between these modern genres and ancient Greek tragedy and mythology.
Max Credits: 3
Min Credits: 3

45.315 Philosophical Topics
Course ID: 5523
Course Details: A close study of some of the great texts of philosophical literature. In general, one or two major works are selected and subjected to a thorough reading.

Max Credits: 3
Min Credits: 3

45.316 Philosophy and Film

Course ID: 5524

Course Details: This course examines the political and philosophical values and ideas which constitute cinema. It analyzes film as an historical, cultural, commercial, and artistic endeavor. Students will develop the skills to watch film actively and critically.

Max Credits: 3
Min Credits: 3

45.323 Philosophy Classics: Nietzsche

Course ID: 5531

Course Details: A detailed introduction to Nietzsche’s thought and its reception. This course will examine Nietzsche’s most important works and central concepts such as the Dionysian and Apollonian, the last man, overman, eternal recurrence, genealogy, and will to power.

Max Credits: 3
Min Credits: 3

45.327 Environmental Philosophy

Course ID: 5535

Course Details: An examination of the philosophical foundations of environmentalism. Addresses both the question of ethical duties we owe to animals and to nature, and also the question of man's relation to the natural world.

Max Credits: 3
Min Credits: 3

45.330 Philosophy of Symbolic Logic

Course ID: 5537

Course Details: The first half of this course examines various axiomatic systems, and the student develops both intrasystematic and metasystematic techniques of proof. During the second half of the course, attention is given to certain important philosophical problems which arise from reflection on logical systems, e.g., the cognitive processes of abstraction and instantiation, the general notion of form, and questions of consistency and interpretation.

Max Credits: 3
Min Credits: 3

45.331 Philosophy of the Mind

Course ID: 5538

Course Details: The status of consciousness is the central concern of a philosophy of mind. The course takes as its point of departure a reflection upon the nature and significance of consciousness from the perspective of its advocates (Husserl, Sartre) and its adversaries (Ryle, Skinner). The results of this preliminary inquiry is to provide a foundation for the exploration of other issues: the possibility of an unconscious; the temptation of bad faith; the dynamics of concept formation; and the nature of emotion, imagination, and dreams.

Max Credits: 3
Min Credits: 3

45.334 Engineering and Ethics

Course ID: 5541
Course Details: A philosophical analysis of the ethical dimensions and responsibilities of the engineering profession. Specific case studies and ethical issues are analyzed through the application of some of the basic concepts and principles of traditional and contemporary ethical theories.

Max Credits: 3
Min Credits: 3

**45.336 Early Modern Philosophy**

Course ID: 5543

Course Details: Examines Early Modern European Philosophy and its religious and scientific context, including movements such as the Mechanical Philosophy, Rationalism, Empiricism, and Transcendental Philosophy. Topics include knowledge and scientific understanding, the human mind and personal identity, and the debate between faith and reason.

Max Credits: 3
Min Credits: 3

**45.337 Science & Meaning of Nature**

Course ID: 5544

Course Details: The Scientific Revolution in seventeenth century Europe transformed our relationship to the world. This class analyzes the meaning of this transformation, inquiring into such questions as what defines science as a unique discipline, whether science and religion are intrinsically in conflict, and whether the lesson of science is that the universe is merely the result of impersonal laws and blind chance, or whether there is a place for meaning and purpose in the world.

Max Credits: 3
Min Credits: 3

**45.339 Neoplatonism in Poetry & Philosophy**

Course ID: 30406

Course Details: After defining "Neoplatonism" with reference to Plato's Phaedo, Symposium, and Phaedrus, the course will consider the relationships among Homer's Odyssey, Plotinus's Enneads, Virgil's Aeneid, Augustine's Confessions, and Dante's Divine Comedy. The focus will be on coming home to the "source and origin" after having been away and, as the philosopher Plotinus puts it, having been "a stranger in something strange". Students will be invited to work on other literary and philosophical treatments of this theme in English, Irish or American poetry and writing. A principal concern of the course is language "sung, spoken, and written". Accordingly, the course will applicable to, and count for the Philosophy and Communications track.

Max Credits: 3
Min Credits: 3

**45.342 Critical Theory & Society**

Course ID: 5548

Course Details: The nature and methods of a critique of society that focuses on the conflicts between the various modes of rationality and rationalization.

Max Credits: 3
Min Credits: 3

**45.347 Greek Tragedy & Philosophy**

Course ID: 31937

Course Details:

Max Credits: 3
Min Credits: 3

**45.348 Eastern Philosophy and Religion**
Course ID: 32558
Course Details: A comparative study of the major strand and themes of Eastern thought and philosophies, encompassing principally the Japanese, Chinese, and Indian traditions.
Max Credits: 3
Min Credits: 3

45.351 Problem of Evil
Course ID: 30851
Course Details: Why is there evil and suffering in the world? This course looks at the explanations that have been given in the various religions of the world and considers the strengths and weaknesses of each approach.
Max Credits: 3
Min Credits: 3

45.352 Existence & Anxiety
Course ID: 31936
Course Details: Explores basic questions of human existence in 19th and 20th Century philosophy and literature. Topics include anxiety and alienation; freedom and responsibility; authenticity and bad faith; individuality and mass society; rationality and the absurd; values and nihilism; and God and meaninglessness.
Max Credits: 3
Min Credits: 3

45.354 Philosophy & Rhetoric
Course ID: 5553
Course Details: Recent insights into the limits of traditional logic have confirmed that Aristotle was correct when, in distinguishing between the logical syllogism and the rhetorical enthymeme, he implied that in any field of argument outside the pure mathematical sciences there are no certain starting points and no final conclusions and, accordingly, the more useful model would be public speech and discussion, not inference and deduction. In examining the texts of the ancient masters of rhetoric, Aristotle, Cicero, and Quintilian, this course takes up their reflections on the nature of effective argument forensic, epideictic, and deliberative and thereby attempts to lay bare the foundations of contemporary rhetorical theories.
Max Credits: 3
Min Credits: 3

45.357 Science and Religion
Course ID: 5556
Course Details: A study of the multiple relations between science and religion focussing on the theme of creativity. The problem of the various truth claims of the two systems will be subjected to a close analysis and principles developed to understand how conflicts between the them can be understood and resolved.
Max Credits: 3
Min Credits: 3

45.361 Equality, Justice and the Law
Course ID: 5559
Course Details: This class investigates the American fascination with the "rule of law." Questions to be considered include the following: What do we mean by the rule of law? What is the relation between law and morality? How does the rule of law promote justice, and what is its connection with the ideal of equality? What is the role of a written Constitution in protecting the rule of law? Special emphasis will be given to the Equal Protection clause of the Constitution and its role in prohibiting discrimination against disadvantaged groups, including racial minorities, women, and the handicapped. We will also consider in detail some theories of constitutional interpretation, including the Original Intent theory.
Max Credits: 3
Min Credits: 3

45.362 Democracy and Its Critics

Course ID: 33499

Course Details: Explores the diverse roots of the democratic ideal and the opportunities and dangers associated with democratic politics. The arguments for and against democracy will be analyzed.

Max Credits: 3

Min Credits: 3

45.365 Capitalism and Its Critics

Course ID: 34779

Course Details: This course explores the historical evolution of capitalism, from its early beginnings in the Enlightenment to the most recent debates about the free market and globalization. The focus will be on the debate over the virtues and vices of capitalism as distinct from other modes of economic and political organization. Concepts to be discussed will include freedom, equality and the distribution of wealth. Readings include Adam Smith, Karl Marx, Max Weber, Joseph S, and others.

Max Credits: 3

Min Credits: 3

45.366 Globalization and Its Critics

Course ID: 35076

Course Details: The course explores globalization as the process of transformation of regional and national phenomena into global ones, analyzing its social, economic, political, and cultural aspects. Supporters view it as the progress of liberalization and democratization that develop peaceful international cooperation; critics see globalization as the expansion of the profit-seeking global corporations that abuse the less developed and vulnerable regions. The course readings include the works of Amartya Sen, Samuel Huntington, Joseph Stiglitz, and other leading economists, sociologists, and philosophers.

Max Credits: 3

Min Credits: 3

45.367 Feminism and Liberalism

Course ID: 35286

Course Details: Liberalism stresses the importance of protecting individual people's right to live their lives however they see fit. Feminism strives to show that women are subject to a variety of injustices that prevent them from being able to live lives that are as good as men's. The aim of this course will be to consider whether liberalism and feminism are compatible, or whether the central ideals of liberalism--ideals like equality, autonomy, and individual rights--actually function to entrench not just sexism but also racism, classism, and other kinds of oppression. Readings will include both historical and contemporary writers such as Isaiah Berlin, Thomas Hobbes, John Locke, Catherine MacKinnon, John Stuart Mill, Martha Nussbaum.

Max Credits: 3

Min Credits: 3

45.368 The Politics of Food

Course ID: 35834

Course Details: This class will examine the moral and political implications of the food we eat. Topics we'll cover include genetically modified organisms, factory farming, animal rights and welfare, agricultural pollution, agricultural subsidies, third world hunger, the obesity epidemic, and the industrial food system and its alternatives.

Max Credits: 3

Min Credits: 3

45.369 History of Moral Philosophy

Course ID: 35841
Course Details: This course explores the history of moral philosophy by examining the writings of key thinkers in the Western philosophical canon, including Leibniz, Hume, Kant and Hegel. We will focus on four basic types of moral reasoning: perfectionism, utilitarianism, intuitionism, and Kantian constructivism. Our goal will be to understand how these thinkers from the modern period of moral philosophy have influenced the way contemporary philosophers think about morality.

Max Credits: 3
Min Credits: 3

45.370 Metaphysics

Course ID: 37719

Course Details: This course examines fundamental issues and topics in contemporary metaphysics. Broadly construed, metaphysics refers to the nature of existence and reality, or more basically, being. Topics in the course include: persistence, personal identity, human ontology, free will, possible worlds and modality, causation and paradoxes.

Max Credits: 3
Min Credits: 3

45.371 Buddhist and Zen Philosophy

Course ID: 33509

Course Details: Explores Buddhist and Zen philosophy and practice from ancient India through its developments in China and Japan to contemporary America. Attention is given to significant philosophical movements such as Abhidharmika, Madhyamika, Yogacara, Huayan, and Chan (Zen).

Max Credits: 3
Min Credits: 3

45.372 Chinese Philosophy

Course ID: 35287

Course Details: An introduction to the Chinese philosophical tradition in translation, especially the classical schools of Confucianism, Daoism, Mohism, and Legalism. Later developments in Buddhist and Neo-Confucian thought will also be explored.

Max Credits: 3
Min Credits: 3

45.373 Arabic and Islamic Philosophy

Course ID: 36790

Course Details: An introductory survey of selected philosophical topics and figures in the Arabic-speaking world, focusing on the development of classical Arabic philosophy (falsafa) through its proponents and critics from al-Kindi (9th century) to Averroes (12th century). The course can also include speculative theology (kalam), mystical philosophy (Sufism), later developments, and contemporary issues.

Max Credits: 3
Min Credits: 3

45.374 Myth, Ritual and Festival

Course ID: 36908

Course Details: This course aims to analyze the social, cultural, and religious phenomena of the festival or holiday in its connection with myth and ritual. We focus in particular on the groundbreaking work of the Russian literary theorist Mikhail Bakhtin and his analysis of the cross-cultural features of the idea of the festival, for example the Roman Saturnalia, the British May Day festival, and our modern thanksgiving, Christmas, and New Year festivals. We will also consider other important contributions to the study of ritual and festival, including those of James Frazer, mircea Eliade, and Joseph Campbell. A substantial part of the class will be focused on the sociological and historical aspects of the role of festival in modern society. We will also attempt to place the festival and holiday tradition within a larger framework of the role of myth and ritual in religion.

Max Credits: 3
Min Credits: 3

45.375 Philosophy of Sex and Love

Course ID: 5509

Course Details: The aim of this course is to introduce students to both historical and contemporary discussions surrounding the topics of sex and love.

Max Credits: 3

Min Credits: 3

45.376 The Ethics of War and Peace

Course ID: 37648

Course Details: This course examines theories about why human beings engage in mass killing, the history of moral deliberation about war in major religious traditions, and modern philosophical analyses of the diverse moral principles that those traditions have bequeathed to us. The course comprises three broad ethical questions. First when, if ever, is recourse to arms legitimate (jus ad bellum)? Second, what constraints should apply to military conduct (jus in bellos)? And third, how should wars end (jus post bellum)? These three questions will be systematically discussed by critically examining a selection of writings by historical and modern secular and religious thinkers.

Max Credits: 3

Min Credits: 3

45.383 Philosophy of Death and Dying

Course ID: 37720

Course Details: This course is a philosophical and interdisciplinary examination of prominent issues concerning the meaning of life and death and the ethical concerns involved with life, death and end of life issues. Topics in the course include: definitions of death, metaphysics and death, cultural meanings of death, the ethics of killing vs. letting die, euthanasia and suicide, and rights of the dying.

Max Credits: 3

Min Credits: 3

45.384 Philosophies of Art and Beauty

Course ID: 5560

Course Details: Examines the views of major philosophers on the beautiful and the nature of artistic creativity. An attempt is made to correlate the views of the thinkers with the works of poets, artists, and composers and the statements the latter have made about their work.

Max Credits: 3

Min Credits: 3

45.401 Bioethics and Genetics Research

Course ID: 5561

Course Details:

Max Credits: 3

Min Credits: 3

45.491 Directed Studies

Course ID: 5564

Course Details: The student, through regular and frequent consultation with an instructor, pursues a special problem in philosophy, the results of which are presented in a 25-30 page paper.

Max Credits: 4
Min Credits: 1

45.496 Practicum

Course ID: 5566

Course Details: An introduction to the politics, structure, and behavior of the American National Political Community

Max Credits: 3

Min Credits: 3

46.101 Introduction to American Politics

Course ID: 1243

Course Details: An introduction to the politics, structure, and behavior of the American National Political Community

Max Credits: 3

Min Credits: 3

46.105 Introduction to Public Policy

Course ID: 5570

Course Details: An introductory survey of the major forces and processes involved in the development of public policy; contemporary issues in public policy will also be considered.

Max Credits: 3

Min Credits: 3

46.110 Introduction to Politics

Course ID: 5571

Course Details: An introductory exploration of basic political concepts, ideologies, and themes. Stresses the importance of understanding politics for everyday life.

Max Credits: 3

Min Credits: 3

46.111 Election of 2012

Course ID: 30408

Course Details: An examination of the American election process in this presidential election year. Attention especially is given to candidates, political issues, political parties, and financing, among other factors, within the process and their influence in the election outcome. Strengths and weaknesses of the election process and reform proposals and prospects will also be addressed.

Max Credits: 3

Min Credits: 3

46.112 Introduction to Comparative Political Systems

Course ID: 5572

Course Details: A cross-cultural analysis of various governmental systems; elements common to all forms of government are emphasized and variations among contemporary political systems are discussed. Balance between developed and Third World countries.

Max Credits: 3

Min Credits: 3

46.121 Introduction to International Relations
Course ID: 5573
Course Details: Surveys some recent methods and approaches used in the study of international politics and provides an introduction to current problems of foreign policies of major world powers.
Max Credits: 3
Min Credits: 3

**46.125 Introduction to Peace and Conflict Studies**

Course ID: 36942
Course Details: This course will focus on the causes of conflict, conflict resolution methods, and ways to sustain peace. The course will explain and define each of those areas. A mid-term will be administered to examine the students' grasp of the concepts and key terminology. The second part of the class will emphasize student participation and the application of concepts learned earlier in class. The final is a take home exam that will require the application of theory and praxis in the field of Peace and Conflict Studies.
Max Credits: 3
Min Credits: 3

**46.201 Introduction Political Analysis**

Course ID: 5576
Course Details: Introduces the Political Science major to the scope of politics as a discipline. Highlights value questions through analysis of the political, socio-demographic and constitutional background of selected contemporary public issues and policies.
Max Credits: 3
Min Credits: 3

**46.210 Media & Politics**

Course ID: 5583
Course Details: This course explores the role of the media in American politics and the role of politics in the American media including a survey of general approaches to media analysis and the history of mass communication.
Max Credits: 3
Min Credits: 3

**46.218 Introduction to Politics and Sports**

Course ID: 5586
Course Details: Analyzes the growing importance of sports in American life. Examines the psychological, political and social impact of sports on society. Discusses how sports have been shaped by such monumental events as war, the civil rights movement, and the changing economy.
Max Credits: 3
Min Credits: 3

**46.222 Politics of the Internet**

Course ID: 5588
Course Details: This course will examine the influence social media and web connectivity have had on political campaigns, campaign fundraising, political mobilization, and the recent proliferation of democratic movements.
Max Credits: 3
Min Credits: 3

**46.230 Law and the Legal System**

Course ID: 5590
Course Details: Presents an introduction to the nature of the legal process and the operation of the American legal system. Also discusses considerations of its political and social functions.
Max Credits: 3
Min Credits: 3

46.231 Introduction Political Thought
Course ID: 5591
Course Details: A critical survey of the history of Western political thought from Plato to the present.
Max Credits: 3
Min Credits: 3

46.235 Introduction to the Law and Politics of Constitutional Development
Course ID: 5592
Course Details: An introductory study of constitutional law and politics; analysis of constitutional doctrine and the American constitutional system, with emphasis on contemporary controversies.
Max Credits: 3
Min Credits: 3

46.251 Politics of Identity
Course ID: 30848
Course Details: This interdisciplinary course considers the way we construct self-identity through our affiliation with various cultural and political groups - from the "Red Sox nation" to linguistic, economic, nationalist and ethnic groups. It examines the central role of nationalism; its symbols, traditions and expectations; the role of the media; and the benefits and risks of our allegiance to these groups.
Max Credits: 3
Min Credits: 3

46.253 Introduction to Public Administration and Policy
Course ID: 5597
Course Details: An examination of the little studied fourth branch of government. Bureaucratic power in the American political system is reconsidered.
Max Credits: 3
Min Credits: 3

46.265 State and Local Politics
Course ID: 5600
Course Details: Examination and study of politics and government at the state and local levels, with emphasis on Massachusetts and New England. Practitioners from state and local government will meet with the class.
Max Credits: 3
Min Credits: 3

46.304 Politics of Development
Course ID: 5580
Course Details: This course considers the politics of the global development process, the actors involved and the contexts within which development occurs.
Max Credits: 3
**46.307 American Political Thought**

Course ID: 5608  
Course Details: A survey of the historical development of American political thought from the colonial era to the present.  
Max Credits: 3  
Min Credits: 3

**46.310 'Isms' in American Politics**

Course ID: 5611  
Course Details: An examination of major ideological, philosophical and social currents.  
Max Credits: 3  
Min Credits: 3

**46.313 Electoral Politics**

Course ID: 37643  
Course Details: This course will examine voting behavior in American elections: how voters make decisions, the changing nature of campaigns, the influence of money, media, and polling, and related matters.  
Max Credits: 3  
Min Credits: 3

**46.314 Parties and Interest Groups**

Course ID: 37644  
Course Details: An examination of party systems and coalitions in the US, their changing nature over time, the history of realignment, and the relationship of parties to interest groups.  
Max Credits: 3  
Min Credits: 3

**46.316 Politics and Film**

Course ID: 5615  
Course Details: Analysis of the role of film in creating, expressing, revealing, and responding to social and political ideas and values. Examines a variety of film and film styles and introduces students to elements of film theory, the theory of popular culture and the role of film in forming our ideas about the world.  
Max Credits: 3  
Min Credits: 3

**46.320 Gender Law and Politics**

Course ID: 5617  
Course Details: Explores legal constructions of gender by examining Supreme Court cases, federal legislation, historical documents, news stories, and scholarly essays on sexual inequality in the United States. Topics include the evolution of the family as a legal (and illegal) reality; political regulation of reproduction and sexual activity; feminist critiques of economic inequality; the rise and fall of affirmative action; the changing role of gender in class consolidation; and ongoing debates about the relationships between public and private life.  
Max Credits: 3  
Min Credits: 3
46.321 Soccer and Politics

Course ID: 36431

Course Details: This course analyzes the social, political and business aspects of the World Cup, the most popular sporting event in the world. The course will study the evolution of the World Cup, from the 1930's when fascist regimes used the Cup to buttress their doctrines to the emergence of new soccer powers like the U.S.

Max Credits: 3
Min Credits: 3

46.323 Politics and Baseball

Course ID: 36432

Course Details: Introductory look at the interaction between the world of baseball and the social and political structures which influence the sport.

Max Credits: 3
Min Credits: 3

46.324 Politics of Football

Course ID: 36433

Course Details: How the rise of professional football's popularity reflects changes in American society during the 20th century. An examination of how politics, economics and television created a sport that has become an American obsession, and some argue, a new religion.

Max Credits: 3
Min Credits: 3

46.327 The Dynamics of Sexual Politics

Course ID: 5621

Course Details: Starting with the constructionist approach of analyzing the sexual dynamics of ancient civilizations, we will expose how sex has been used as a political tool to further the cause of unrelated agendas, how attitudes about sex have changed from Greco-Roman times to the 1960's sexual revolution, culminating in the current political debate about Vermont's civil union laws. Join us in this academic endeavor to understand our roles as sexual beings both in history and in politics, as well as an exploration of our own attitudes towards differing sexualities.

Max Credits: 3
Min Credits: 3

46.329 Politics of College Sports

Course ID: 36434

Course Details: Current controversies over the role of college sports within in academic environment with particular attention to Title IX, the pivotal law that altered gender in college sports.

Max Credits: 3
Min Credits: 3

46.331 Animal Rights and Animal Welfare

Course ID: 35839

Course Details: This course examines how the structure of the human/non-human animal relationship affects of determines the nature of public policy formation on issues with impacts on non-human animals, both nationally and internationally.

Max Credits: 3
Min Credits: 3
46.332 The Politics of Food
Course ID: 37038
Course Details: The course will examine current debates in food politics over: regulatory politics and the appropriate reach of the state in food labeling, safety, and oversight; genetically modified food, organic and sustainable agriculture, the effects of economic globalization of the food supply chain and the future of the world food system.
Max Credits: 3
Min Credits: 3

46.334 Islam and Politics
Course ID: 36670
Course Details: The course will explain the nature of the relationship between Islam and Politics by examining the rise of the first modern Islamic movement, and by examining other Islamic movements that spread throughout the Muslim world.
Max Credits: 3
Min Credits: 3

46.335 Constitutional Law and Politics
Course ID: 5624
Course Details: A study of constitutional law focused on the principles and structures of American government. The course will discuss the Constitution, the Bill of Rights, the origins of judicial review, and the principles of federalism, natural law, ordered liberty, limited government, separation of powers, equal protection, and due process.
Max Credits: 3
Min Credits: 3

46.356 Public Policy Analysis
Course ID: 5642
Course Details: This course examine issues in and techniques utilized in public policy analysis.
Max Credits: 3
Min Credits: 3

46.374 Democracy and Development
Course ID: 5660
Course Details: Explores the theories and experiences of countries newly converting to democracy in Asia, Africa, Latin America and the former Eastern Bloc. Also examines the strategies and prospects for development among the same countries.
Max Credits: 3
Min Credits: 3

46.375 Politics of Pacific Rim
Course ID: 5661
Course Details: An examination of the politics, policies and institutions of Japan, the "four tigers" and other countries of the Pacific rim area.
Max Credits: 3
Min Credits: 3

46.378 International Political Economy
Course ID: 5662
Course Details: An examination of the politics of global economic relations stressing the role of international institutions, multinational corporations and other international actors on the policies of the nation-state.

Max Credits: 3
Min Credits: 3

46.380 American Foreign Policy

Course ID: 5663

Course Details: A study of the processes of American foreign policy in the contemporary world.

Max Credits: 3
Min Credits: 3

46.384 International Politics of Human Rights

Course ID: 5666

Course Details: This course will address the history, content, structure, law, and politics of international human rights. Using interactive participatory class format students will learn analytical and critical thinking skills as well as written and oral communication skills.

Max Credits: 3
Min Credits: 3

46.387 Politics of International Organizations

Course ID: 33791

Course Details: This course will address the history, functioning, structure and politics of international organizations in world politics. International Governmental Organizations as well as Non-Governmental Organizations on the global and regional level will be analyzed and discussed. In a participatory and interactive class format students will develop analytical and critical thinking skills.

Max Credits: 3
Min Credits: 3

46.395 International Law and Politics

Course ID: 33793

Course Details: This course will address the history, content, functioning and politics of International Law. It will deal with public law as it has developed throughout history and how it guides the politics of states and other actors in international relations.

Max Credits: 3
Min Credits: 3

46.397 Seminar: Labor Law & Politics

Course ID: 5670

Course Details: Consideration of a variety of political, legal and social issues involving labor relations, unions, employment, and dispute resolution, and their place in American society.

Max Credits: 3
Min Credits: 3

46.401 Research Seminar

Course ID: 5673

Course Details: Requires the writing of a substantial paper (or production of an equivalent project.) Typically, students should select a 300 level seminar course from among Departmental offerings that are of interest, all of which involve the writing of one or several papers, and select one paper or topic to expand upon. The student should then register in the Research Seminar section for the appropriate supervising instructor and expand the paper into a more substantial form.
46.402 Women in Islam

Course ID: 5674

Course Details: Focusing upon one of the most important topics in Islam, this course will go beyond conventional stereotypes and explore woman's many and varied roles within Islamic cultures and societies.

Max Credits: 3
Min Credits: 3

46.411 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

46.418 American Courts and Judicial Process

Course ID: 33792

Course Details: This course will study the organization of and the processes employed by American Courts in an intensive participation format. Traditional text lessons on the U.S. Court system will be supplemented by simulations and mock trial problems. Using this two track approach, students will learn about the courts and simultaneously develop the analytical, critical reasoning and public speaking skills used in the Judicial system.

Max Credits: 3
Min Credits: 3

46.420 Reading and Simulation Experience International Organization

Course ID: 5684

Course Details: Students take part in a simulation of the proceedings of a regional or international organization, e.g., U.N., O.A.S., O.A.U., or the Arab League. They study all aspects of the selected institution but concentrate on key economic, social and security issues discussed in the body's debates. The course aims to give the student a clearer understanding of the forces and constraints which shape the foreign policies of individual states.

Max Credits: 3
Min Credits: 3

46.422 SMR: Political communication and Media Studies

Course ID: 31968

Course Details: Advanced study in contemporary issues in Political Communication and Media Studies.

Max Credits: 3
Min Credits: 3

46.439 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

46.444 Advanced Research Methods
Course ID: 36723
Course Details: Both quantitative and qualitative methods will be examined with a focus on locating and utilizing available data to study social questions.
Max Credits: 3
Min Credits: 3

46.445 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

46.446 The Politics of Discord between the Arab East and The West
Course ID: 35836
Course Details: The course examines the roots of political discord in the Arab East starting with colonialism and progressing to the contemporary state of dissension. Throughout the course the stress on the effect of this discord on comparative domestic politics and international relations in the region will be examined.
Max Credits: 3
Min Credits: 3

46.491 Directed Study
Course ID: 5688
Course Details: Directed study offers 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 problem in an area of special interest and present the results of their investigation through a combination of readings and papers and/or a significant research paper.
Max Credits: 3
Min Credits: 1

46.492 Directed Study In International Organizations
Course ID: 5689
Course Details: Advanced and intensive reading and other activity in connection with the study of selected international organizations.
Max Credits: 3
Min Credits: 3
46.496 Practicum Experience Requirement

Course ID: 5693

Course Details: A program of study and research for political science majors only stressing involvement in and first-hand knowledge and observation of the political life and relationships of national, state and local institutions. The purpose is to acquaint the student in a directed way with political institutions and political behavior. Specific requirements vary depending upon the nature of the program undertaken by the student. The course will be graded S (satisfactory) or U (unsatisfactory).

Max Credits: 3
Min Credits: 3

46.497 Practicum in the Law Requirement.

Course ID: 5694

Course Details: A program of study and research which includes involvement in and first-hand knowledge and observation of the legal system and legal practice. Open only to political science majors and, with certain restrictions, legal studies minors. The course will be graded S (satisfactory) or U (unsatisfactory).

Max Credits: 3
Min Credits: 3

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

47.101 General Psychology

Course ID: 5697

Course Details: Intended as an introductory course both for non-concentrators and for concentrators, this course surveys the major areas of psychology: the nature of psychology as a science, principles of learning, the relationship between physiological and psychological processes in humans and animals; sensation and perception, cognitive processes, motivation and emotion, personality and development, adjustment and behavior disorders, and social behavior.

Max Credits: 3
Min Credits: 3

47.209 Social Psychology

Course ID: 5701

Course Details: Presents an introduction to the study of social behavior in interpersonal relationships, groups, organizations, and the community. Diversity in regard to groups of peoples, cultures, and views is emphasized. Topics include non-verbal communication, social attraction, attitudes and attitude change, group dynamics, prejudice, labeling, stereotyping, interpersonal influence, and applications to social problems.

Max Credits: 3
Min Credits: 3

47.232 Psychology of Personality

Course ID: 5703

Course Details: Presents an introduction to the study of social behavior in interpersonal relationships, groups, organizations, and the community. Diversity in regard to groups of peoples, cultures, and views is emphasized. Topics include non-verbal communication, social attraction, attitudes and attitude change, group dynamics, prejudice, labeling, stereotyping, interpersonal influence, and applications to social problems.
Course Details: Serves as an introduction to the study of human personality including such topics as self-concept, anxiety and adjustment, and achievement motivation. Psychoanalytic, humanistic, cognitive, and behavioral theories of personality are stressed with consideration of the interplay between theory and research.

Max Credits: 3
Min Credits: 3

47.255 Community Psychology

Course ID: 5705

Course Details: Surveys the nature and practice of community psychology, including principles of community organization and change as seen in such areas as education, mental health, the workplace, health care, justice system, corrections and social services. Students may participate in field research or practice under the direction of an assigned agency, and classroom work will include discussion of the field experiences of the participants.

Max Credits: 3
Min Credits: 3

47.260 Child and Adolescent Development

Course ID: 5706

Course Details: The study of childhood and adolescence. The course begins with an overview of major theoretical perspectives, research methods, and ethical issues in human development. Based on a chronological approach, the course covers prenatal development and birth, infancy, childhood and adolescence, and the transition to adulthood.

Max Credits: 3
Min Credits: 3

47.272 Abnormal Psychology

Course ID: 5711

Course Details: Presents an introduction to the study of various patterns of mental, behavioral, and personality disorders with consideration of issues of diagnosis, etiology, and treatment in terms of contemporary theory, research, and practice.

Max Credits: 3
Min Credits: 3

47.273 Brain, Mind & Behavior

Course ID: 5712

Course Details: Surveys issues and topics dealing with the physiological and evolutionary bases of behavior. Biological systems and processes that influence behavior are considered, with particular emphasis on brain mechanisms. Recent discoveries in the neurosciences will be presented. Methods of research are reviewed.

Max Credits: 3
Min Credits: 3

47.276 Theories of Learning

Course ID: 5714

Course Details: Traces the development of theories of learning from earlier global theories to more recent and more specific ones. Behavioral, cognitive, and physiological approaches are compared. Current issues of importance in the study of learning also are stressed.

Max Credits: 3
Min Credits: 3

47.277 Sensation and Perception
Course ID: 5715

Course Details: The course focuses on human sensations and perceptions. Students will examine how people know the objects and events of the world through hearing, seeing, smelling, tasting, moving, and touching. Students will also examine the foundations of experiences which correspond to independent measures of the world (veridical) and those which do not (illusory).

Max Credits: 3
Min Credits: 3

47.278 Cognitive Psychology

Course ID: 5716

Course Details: Examines the psychological bases of verbal and visual reasoning, logical and creative thought-processes, and linguistic and conceptual behaviors. The nature and limits of knowledge and creative expression are discussed.

Max Credits: 3
Min Credits: 3

47.305 Psychology and Law

Course ID: 38082

Course Details: this course is an introduction to many topics representing major fields of study within psychology and law. Topics may include: eyewitness testimony, lie detection, jury selection, child protection, forensic interviews, and the death penalty. In this course, students will be exposed to the diversity of interests among legal psychologists as well as innovative and important ideas, theories, and scientific research findings. Through readings, the study of actual cases, and presentations from guest speakers, students will gain more understanding of how psychologists study and contribute to the legal system.

Max Credits: 3
Min Credits: 3

47.312 Learning and Behavior

Course ID: 5718

Course Details: Examines various methods and techniques suitable for the modification of human behavior, based on the principles and findings of experimental studies of animal and human behavior. Considers how such methods can be used in education, mental health and corrections, and self-directed personal change.

Max Credits: 3
Min Credits: 3

47.328 Dynamics of Interpersonal Relations

Course ID: 5720

Course Details: Presents an analysis of psychological dynamics in interpersonal behavior, emphasizing such topics as interpersonal communication, self-disclosure, personal styles of interaction and techniques of change. The primary focus is on the behavior of the students themselves.

Max Credits: 3
Min Credits: 3

47.332 History of Psychology

Course ID: 5721

Course Details: Examines the historical roots of psychology from the pre-scientific psychologies of the ancient Greeks to the twentieth century schools of the introspectionists, the Gestalt psychologists, and psychoanalysts. Historical resolutions of recurring issues are contrasted with modern resolutions.

Max Credits: 3
Min Credits: 3
47.335 Psychology and Women

Course ID: 5723

Course Details: Considers such topics as: the psychology of sex differences; biological bases of psychological sex differences; the nature of female sexuality; clinical theory and practice concerning women; women as mental patients and mental health consumers; implications for psychology and for women's status.

Max Credits: 3
Min Credits: 3

47.336 Culture and Psychology

Course ID: 37477

Course Details: Provides an analysis to the impact of culture, socio-historical, and social influences on psychological processes and outcomes. Students will also learn about techniques for studying the influence of culture including cross-cultural methods and population-specific methods. Through careful analysis of research literature, this class will examine a variety of contexts within the U.S. and internationally. Topics will include identity development, immigration, acculturation, socialization, and social interactions among groups.

Max Credits: 3
Min Credits: 3

47.345 Health Psychology

Course ID: 5724

Course Details: An examination of psychological aspects of human health, both physical and mental, and the processes of adjustment and growth. Consideration is given to the interplay of health and illness with emphasis on psychological methods of overcoming and preventing illness and of enhancing physical and emotional well-being.

Max Credits: 3
Min Credits: 3

47.351 Human Sexuality

Course ID: 5725

Course Details: Addresses the biological, psychosocial, and attitudinal aspects of human sexuality through lectures, discussions, films from a variety of perspectives.

Max Credits: 3
Min Credits: 3

47.352 Psychological Testing

Course ID: 5726

Course Details: A survey of major tests and techniques used to assess cognitive abilities, personality and vocational interests; an introduction to the various professional settings in which testing and assessment methods are used (e.g. school/education, mental health, rehabilitation, employment and personnel selection, criminal justice). Students learn to administer, score, and interpret specific tests and learn how to develop a case study or report based on test data and related information.

Max Credits: 3
Min Credits: 3

47.355 Sport and Exercise Psychology

Course ID: 5727

Course Details: The course will cover topics such as motivation, arousal and anxiety in performance, performance enhancement, youth sport and family interactions, leadership, cooperation and competition, team cohesion, gender issues, exercise and mental health, and psychological factors in injury prevention and rehabilitation.

Max Credits: 3
47.360 Adult Development and Aging

Course Details: Begins with an overview of recent theoretical perspectives on adult development and aging. In chronological sequence, it presents the stages of adulthood and concludes with death and dying. Topics covered include personal, family, and vocational development through adulthood, gender pattern differences, and the impact of changing demographics, including the lengthening of the life span.

Max Credits: 3
Min Credits: 3

47.361 Developmental Psychopathology

Course Details: Examines behavior problems of childhood and adolescence across developmental transitions with a focus on the interaction of risk and protective factors in the child and his or her social context (e.g., family, school, friendships). Problems such as depression, anxiety, conduct disorder, ADHD, learning disabilities, and the consequences of trauma and maltreatment are addressed.

Max Credits: 3
Min Credits: 3

47.362 Psychology of Developmental Disabilities

Course Details: This course examines a range of developmental disabilities, their etiology, consideration of underlying brain function, assessment procedures, and current diagnostic, treatment and educational approaches. In addition, the impact of disability on individuals and the families of those affected, cultural and social aspects of disability, and current practices in service provision will be considered.

Max Credits: 3
Min Credits: 3

47.363 Introduction to Disability Studies

Course Details: This course provides students with a wide range of interests and backgrounds with the opportunity to examine their own mental model (attitudes/values/assumptions) of disability. It includes an overview of the nature of mental retardation and other disabilities and it provides opportunities to explore and understand the historical social response to disability. Students will look at a range of strategies for providing support and intervention and they will learn about how to effect change through a variety of strategies, including advocacy.

Max Credits: 3
Min Credits: 3

47.369 Research II: Statistics

Course Details: An intermediate level course building on competence in quantitative reasoning skills and the fundamentals of research methods, and focusing on descriptive and inferential statistics and their application and interpretation. The course will include basic computational approaches; the primary goal is for students to develop the ability to articulate and apply statistical concepts, and communicate statistical results. The course includes topics in basic inferential statistics from z-scores up to and including chi-square and factorial ANOVA. Students will learn to use a database and conduct statistical analyses using standard software packages.

Max Credits: 3
Min Credits: 3

47.472 Seminar: Personality
Course ID: 30882

Course Details: Focuses on a variety of theoretical conceptualizations of the productive personality, psychodiagnostic tools and techniques and case histories. Students develop and enhance their professional skills with respect to presentation of self, writing, and psychological diagnostic techniques.

Max Credits: 3
Min Credits: 3

47.473 Seminar in Social Psychology

Course ID: 5748

Course Details: Presents an intensive study of one or more of the following special topics in social psychology: small group interaction; social aspects of health and illness; conformity; attitude formation and prejudice; patterns of communication, including nonverbal communication; psychology of sex roles; methods of social action and social change in the community.

Max Credits: 3
Min Credits: 3

47.474 Seminar in Developmental Psychology

Course ID: 5749

Course Details: Presents a careful consideration of selected topics in the area of human development, including the following: psychology of the family and parent-child relations; infant development; adjustment during adulthood; and death and dying, etc.

Max Credits: 3
Min Credits: 3

47.475 Seminar in Clinical Psychology

Course ID: 5750

Course Details: Focuses on such topics as: the nature of psychotherapy and clinical practice; analysis of specific clinical theories of psychopathology and psychotherapy (family systems, transactional analysis, Gestalt, behavioral, psychoanalysis); the nature and causes of specific psychological disorders (schizophrenia, affective disorders, etc.); the nature of mental hospitals; the community mental health movement; clinical methods of assessment; and current topics in personality theory and research; etc.

Max Credits: 3
Min Credits: 3

47.477 Seminar: Contemporary Trends

Course ID: 1242

Course Details: Deals with issues in contemporary areas of psychological practice and/or research; implications for future developments in the field will be covered.

Max Credits: 3
Min Credits: 3

47.480 Integrative Fieldwork in Developmental Disabilities I

Course ID: 5752

Course Details: This fieldwork based course examines standards for services to people with developmental disabilities, exploring the forces that support or interfere with realizing current best practice. In this course, students will develop an understanding of the life of an individual with a disability that includes hopes and dreams, vision, the societal context of his/her life, and the services and personal relationships that influence growth and change. Students will learn to implement person centered planning, community membership mapping, and become familiar with professional skills and standards. Fieldwork opportunities include all ages and service delivery models.

Max Credits: 3
Min Credits: 3
47.481 Integrative Fieldwork in Developmental Disabilities II

Course ID: 5753

Course Details: This seminar accompanies a human service/education-based field placement and provides a critical examination of organizations and personal leadership in the lives of people with disabilities. Students will explore how formal services, advocacy, and informal community systems impact one another and impact the lives of people with disabilities. Students will examine their own field placements from a variety of theoretical frameworks, using this knowledge to understand personal leadership change opportunities. Students who are considering a career in a human service profession will have the opportunity to learn how vision, mission, community partnerships, funding, human resources, regulations, and families/individuals themselves impact service delivery.

Max Credits: 3
Min Credits: 3

47.486 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

47.488 Research Service Learning

Course ID: 36769

Course Details: Students will take an applied role in faculty supervised research where they will provide a meaningful contribution to a research program or particular study. Students will meet regularly with a designated faculty member to discuss the research process and rationale for relevant components of the project including literature review, research design, procedures, data collection, entry, and analysis. In some instances the commitment to research 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

47.491 Directed Study: Psychology

Course ID: 5757

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, but no more than 9 credits from any combination of 47.486, 47.488, and 47.491 may be counted toward the degree.

Max Credits: 3
Min Credits: 3

47.496 Practicum in Psychology

Course ID: 5759

Course Details: A program of practical experience for Psychology majors only. Specific requirements vary, but the Practicum experience enables Junior and Senior level students to work and study in a variety of areas related to psychological practice and research (mental health agencies, community agencies and groups, work settings, schools, prisons, group homes, etc.). 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 psychologists practice and the challenges that psychologists confront. Practicum may be repeated for a maximum of nine credits. Graded Satisfactory or Unsatisfactory. (Field Placement Required)

Max Credits: 3
Min Credits: 3
47.500 Introduction to Community Social Psychology

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 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 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 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 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 Approaches to Child Maltreatment

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 workplace; examines psychological consequences, social structural influences, and options for change. Topics include: housework and childcare; violence against women; workplace 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

**47.545 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

47.574 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-quisite: 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

47.691 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

47.733 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

48.101 Introduction to Sociology

Course ID: 5812

Course Details: Serves as the basic course in sociology. Emphasis is directed at the ways in which social institutions such as government, schools, the economy, social class, and the family develop and influence our lives. It is concerned not only with presenting various ways to understand our relationship to society but also with ways to change it.
Max Credits: 3
Min Credits: 3

48.102 Social Anthropology

Course ID: 5813

Course Details: Using the comparative approach to society, this course examines several distinct cultures as a means of understanding both the universal constants and the variations in human societies.
Max Credits: 3
Min Credits: 3

48.112 Sociology Goes to the Movies

Course ID: 33538

Course Details: This course is designed to give students the opportunity to survey primary sociological texts and view films, offer commentary on and analysis of social behavior.
Max Credits: 3
Min Credits: 3

48.212 Cultures of the World

Course ID: 5819

Course Details: Focuses on a different country or region each time it is given. Students examine the traditional culture, recent history, economic development, class structure, and international relations of the area covered.
Max Credits: 3
Min Credits: 3

48.215 Peacemaking Alternatives
Course ID: 5821

Course Details: Examines various positive alternatives to war and violence, including disarmament, nonviolence, conflict resolution, and the United Nations. Students do volunteer work with an activist agency or interview an activist. The course stresses the historical and contemporary role of peace movements and allied social-change movements such as feminism, civil rights and environmentalism.

Max Credits: 3
Min Credits: 3

48.216 Sociology of War and Peace

Course ID: 30413

Course Details: The purpose of this course is to examine critically the social forces that contribute to war, war's social consequences, and the possibilities for creating a more peaceful world.

Max Credits: 3
Min Credits: 3

48.220 Self-Assessment and Career Development

Course ID: 5822

Course Details: Studies the meaning of work in our society. Class participants will assess their own life experiences and develop plans to integrate interests, values, and abilities into meaningful and realistic life/work options.

Max Credits: 3
Min Credits: 3

48.225 Sociology of Disability

Course ID: 33256

Course Details: This course is organized around several key questions that are used to study the concepts of disability and ability from a variety of sociological and interdisciplinary perspectives. Specifically, the course explores representations of disability in popular culture and medical discourses to discuss disability and ability as social constructs. By looking at various literary and cultural representations, this course investigates constructions of the disabled and abled body, how this becomes politicized, and the implications of these constructions.

Max Credits: 3
Min Credits: 3

48.231 Sociology of the Family

Course ID: 5824

Course Details: Studies the nature of the family in contemporary society, with particular emphasis on the family in America. What functions does the family perform in modern society? How is it changing? How do these changes affect our lives?

Max Credits: 3
Min Credits: 3

48.234 The Study of Minorities

Course ID: 5825

Course Details: Examines the process of immigration and majority-minority relations in the United States over the last century with particular emphasis on the process of adaptation in a pluralistic society. The treatment of minority groups in other societies is examined as well.

Max Credits: 3
Min Credits: 3

48.236 Sociological Approaches to the Environment
Course ID: 33284

Course Details: Focusing on case studies of recent and pending environmental disasters, this course will trace how political, social, economic and cultural arrangements and choices contribute to environmental catastrophes and their resolution. In order to identify possibilities for agency, students will play several environmental games in which they will assume roles in the global economy, governmental and civil society to identify possibilities for agency. As a final project, students will describe a recent disaster identifying both structures that create environmental stresses and the options that might exist for structural changes. The project is intended to develop both critical thinking and communication skills.

Max Credits: 3
Min Credits: 3

48.240 Sociology of Gender

Course ID: 5827

Course Details: This course is an interdisciplinary introduction to the field of gender studies. A variety of topics are presented, such as gender stratification, work and family, sexual identities, media representations of women and men, women's movement, and violence against women. Feminist theories and methods are also introduced.

Max Credits: 3
Min Credits: 3

48.245 Work, Labor & Society

Course ID: 37377

Course Details: This foundational course has two overarching learning objectives: (1) to give students basic empirical knowledge and analytical tools to understand the context of work in the United States at the dawn of the twenty-first century and (2) to give students an understanding of how labor unions work, what has been their impact historically, and what their role is in contemporary society. Lowell and the Merrimack Valley will be used as a lens through which to examine these larger work and labor issues. The course will be explicitly interdisciplinary, drawing on readings from history, sociology, economics, political science, and psychology to offer an introduction to understanding work and labor through and analytic lens. In addition, the course will include a service-learning component in collaboration with the UML Labor Extension Program.

Max Credits: 3
Min Credits: 3

48.251 Community Service

Course ID: 5830

Course Details: Course uses fieldwork approach to understand social problems and to discipline study and career pursuit in the area of public service.

Max Credits: 3
Min Credits: 3

48.255 Sociology of Deviance

Course ID: 5831

Course Details: Analysis of how social institutions define and respond to various forms of social deviance, from individual mental illness to gang violence to illegal acts by governments and corporations. Attention will be paid to the construction and management of deviant identities, the role played by social status, and the social importance of institutions of social control.

Max Credits: 3
Min Credits: 3

48.256 Political Sociology

Course ID: 5832

Course Details: Focuses on the development and use of power in modern society. Emphasis is placed on the relationship of American political institutions to economic institutions, to social class, and to supporting ideologies.
Max Credits: 3
Min Credits: 3

48.276 Sociology of the Gun

Course ID: 5837

Course Details: This course examines the social impact of guns on the American psyche, from deer hunters and intergenerational family bonds to street gangs and broken families, from collectors and recreational users to hospital trauma. Self-defense issues are discussed within the context of the Second Amendment. The conflict between pro-gun and anti-gun special interest groups and the evolution of an American gun culture will be studied.

Max Credits: 3
Min Credits: 3

48.280 Drugs and Society

Course ID: 30844

Course Details: This course is designed to introduce students to the cultural and political qualities of drugs in society. The course provides a historical and cross-cultural overview of the use of organic and simple processed substances, as well as a history of drug policy in the United States.

Max Credits: 3
Min Credits: 3

48.303 Sociology of American Education

Course ID: 5840

Course Details: Course introduces students to ongoing debates in the field of Sociology regarding the American educational system, its structures and functions and how it relates to issues of inequality by race, class and gender. Students are expected to explore, examine and evaluate the current issues relating to the system of education in the United States.

Max Credits: 3
Min Credits: 3

48.305 Sociology of Family Law

Course ID: 5841

Course Details: Examines some social issues in family law, the changes therein, and the social climate and consequences accompanying these. By using the sociological method of inquiry to examine family law cases, the relationship between law and society as instruments of order and change are exemplified.

Max Credits: 3
Min Credits: 3

48.307 Sociology of Immigration

Course ID: 37721

Course Details: The United States is frequently described as a country with a proud history of immigration. As a result, citizens and residents of the U.S. often identify their home as a nation of people who make up a melting pot country. While useful and insightful, the melting pot metaphor requires comparison with additional explanations of immigration and immigrant experiences. In order to provide deeper comprehension of the topic matter, this course offers sociological examination of immigration processes, laws, and debates. Three areas compose the main portion of class content: historical accounts and theories, legislation, and the social, economical, and political experiences of immigrants.

Max Credits: 3
Min Credits: 3

48.310 Ethnicity in Massachusetts
Course ID: 5844

Course Details: This is an interdisciplinary, distance learning course devoted to understanding specific ethnic groups in Massachusetts, their histories and cultures, and the economic and political realities of their lives as defined by themselves and others. Different groups are studies each year. Groups such as African American, Puerto Rican, Cambodian, Vietnamese, Wampanoag and Mi'kmaq will be examined in relation to the topics listed above.

Max Credits: 3
Min Credits: 3

48.315 Public Sociology

Course ID: 33259

Course Details: Public sociology includes sociological initiatives targeting non-university audiences and serving the public good. This course will 1) introduce and critique the various conceptualizations of public sociology linking them to broad schools of sociological theory; 2) explore alternative field models and methods, preparing students for field projects in future semesters; and 3) expose students to sociological practitioners and practices compatible with the mission of the university and department. From a liberal arts perspective, the course stresses critical thinking and communication skills.

Max Credits: 3
Min Credits: 3

48.317 Sociology of Genocide

Course ID: 5846

Course Details: The deliberate destruction of an ethnic group is an historical event and a social process. This course addresses such questions as: Why do genocides occur? Why do people become genocide perpetrators? How do genocides affect survivors and their offspring? How can genocide be prevented? Focus is on Native American, Armenian and Jewish experiences and recent cases of ethnic cleansing.

Max Credits: 3
Min Credits: 3

48.321 Social Theory I

Course ID: 5848

Course Details: This course offers a critical examination of major classical sociological theories. It emphasizes the relationship between the individual and society and the competing pressures for social order and social conflict.

Max Credits: 3
Min Credits: 3

48.322 Social Theory II

Course ID: 5849

Course Details: This course offers a critical examination of major contemporary sociological theories, including critical theory, neo-Marxism, critical race theory, feminist theory, and postmodernism.

Max Credits: 3
Min Credits: 3

48.340 Sociology of Sports

Course ID: 5854

Course Details: Examines the history of modern sports at the amateur and professional levels and international competition. The impact of race, sex, economics, and politics on the institution of sports will also be examined.

Max Credits: 3
Min Credits: 3
48.341 Wealth, Status and Power
Course ID: 5855
Course Details: Focuses on the phenomenon of social class distinctions with particular emphasis on social class in America. The approach is both historical and sociological.
Max Credits: 3
Min Credits: 3

48.345 Urban Sociology
Course ID: 5856
Course Details: Deals with issues related to the quality of life in American cities. Students taking this course may engage in research projects on the city of Lowell and the role of the University of Massachusetts Lowell within that city.
Max Credits: 3
Min Credits: 3

48.351 The Sociology of Health and Health Care
Course ID: 5860
Course Details: With the passage of the Affordable Care Act, the U.S. Health Care system is undergoing a radical change as profound as any in U.S. history including those for minority and woman's rights. A large segment of the population has struggled to obtain even basic health care coverage. The changes taking place are analyzed in a historical and comparative context by examining health care in other countries. Special attention is given to understanding the professions in medicine and the role medical professions have had in shaping medical care. At the micro level, the course examines evolving health care provider/patient relationships to better understand the level of control patients can exert over their health care decisions.
Max Credits: 3
Min Credits: 3

48.355 Black Experience in American Life
Course ID: 5862
Course Details:
Max Credits: 3
Min Credits: 3

48.357 The Sociology of Religion
Course ID: 5863
Course Details: An investigation of religious institutions and experiences. Emphasis is placed on the influence of religion on social change.
Max Credits: 3
Min Credits: 3

48.360 Sociology of Non-Violence
Course ID: 5864
Course Details: An analysis of non-violent efforts to achieve social change through demonstrations, civil disobedience, etc. Movements led by Mahatma Gandhi, Martin Luther King, Jr., and others are examined.
Max Credits: 3
Min Credits: 3

48.361 Sociology of Law
Course ID: 5865
Course Details: The course examines the role of social forces in defining the law. Topics include the legal profession, white-collar crime, and the importance of race, class and gender in the criminal justice system.
Max Credits: 3
Min Credits: 3

48.362 Social Welfare Policy
Course ID: 30414
Course Details: The course examines the development of social welfare policy in the United States as well as alternative strategies for social welfare provision. Particular attention is paid to the role of race/ethnicity, class, and gender in the formation of social welfare policy.
Max Credits: 3
Min Credits: 3

48.371 Sociology of Work
Course ID: 5867
Course Details:
Max Credits: 3
Min Credits: 3

48.380 Sociology of Mass Media
Course ID: 33539
Course Details: Examines ownership and control patterns of electronic and print media and their impact on media content and censorship.
Max Credits: 3
Min Credits: 3

48.382 Social Movements
Course ID: 5868
Course Details: Considers organized action undertaken to alter the social position of a group. Organization, techniques of action, motivation of participants, and group ideologies are studied. Materials from historical, social, psychological, and sociological sources are used.
Max Credits: 3
Min Credits: 3

48.402 Research I Quan. Methods
Course ID: 5873
Course Details: An introduction to methods of social research, with emphasis on quantitative research methods. Presents basic statistical techniques used in social research as well as the computer software used for analyzing social science data. For majors only.
Max Credits: 3
Min Credits: 3

48.403 Research II Qual. Methods
Course ID: 5874
Course Details: Qualitative research methods. Discusses various strategies employed by qualitative researchers with special emphasis
on field research. For majors only.

Max Credits: 3
Min Credits: 3

48.404 Learning from the Field

Course ID: 5875

Course Details: Provides students with the opportunity to directly observe and participate in the operation of a social service organization.

Max Credits: 3
Min Credits: 3

48.405 Feminist Methodologies

Course ID: 34784

Course Details: Despite the recent growth of feminist methodologies, there is no one way of doing feminist methodologies. The growing body of literature in this area addresses the distinctive challenges and strengths of doing this research. Gender Studies scholars especially seek to question the framing of a study, managing of emotions, and ethical dilemmas. We will explore feminist strategies for creating, implementing, and analyzing a project that is grounded in the everyday lives of people while situating them in a social, political, and economic context. We will explore the interdisciplinary intersections where these challenges push at the boundaries of the disciplines of your major field of study. We will also investigate how to use a variety of qualitative approaches while doing a feminist project and the ways in which feminism can enlighten understandings of "traditional" qualitative methods.

Max Credits: 3
Min Credits: 3

48.421 Seminar on the Family

Course ID: 5877

Course Details: Study of the family structures and gender roles in various human societies. Prerequisites: 48.101 plus either 48.231 or 48.241.

Max Credits: 3
Min Credits: 3

48.469 Seminar on Global Society

Course ID: 5882

Course Details: Considers the spread of industrial society globally. Emphasizes economic, political and cultural changes in various parts of the world and in the USA.

Max Credits: 3
Min Credits: 3

48.484 Industry Internship I

Course ID: 5890

Course Details:

Max Credits: 3
Min Credits: 1

48.491 Directed Studies in Sociology

Course ID: 5892

Course Details: The student, through regular and frequent consultation with an instructor, develops a course of directed reading in sociology and defines a problem for individual research. Prerequisite: permission of instructor.
Max Credits: 3
Min Credits: 3

48.492 Directed Studies: Sociology

Course ID: 5893

Course Details: A one-credit, short course available only to qualified seniors. Prerequisite: Permission of Department Chairperson.

Max Credits: 1
Min Credits: 1

48.495 Thesis in Sociology

Course ID: 5894

Course Details: A program of study which affords the advanced student with an additional opportunity to pursue a previously explored problem in greater depth or to initiate a new study. The purpose is to sharpen and refine techniques for scholarly research and presentation in the student's major discipline. Prerequisites: demonstrated proficiency in an area selected for directed study and permission of instructor.

Max Credits: 3
Min Credits: 3

48.496 Practicum Experience

Course ID: 5895

Course Details: A program of on-campus and/or off-campus experience for sociology majors and minors only. Specific requirements vary depending upon department policies and the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a community, social, cultural, or artistic area and for applying techniques of problem solving and/or skills that are appropriate to the student's major discipline. May be repeated to a maximum of six credits. Students are graded satisfactory and unsatisfactory. The practicum experiences may not be substituted for a required course in the major. Prerequisite: permission of Chairperson.

Max Credits: 3
Min Credits: 3

49.201 Economics I (Microeconomics)

Course ID: 5897

Course Details: Studies the principles of production and exchange. An introduction to demand, supply, pricing, and output under alternative market structures. Derived demand and resource markets are introduced.

Max Credits: 3
Min Credits: 3

49.202 Economics II (Macroeconomics)

Course ID: 5898

Course Details: Studies the principles governing the level of national income and employment. Also examines the commercial banking system, monetary and fiscal policy, the international economy, and alternative economic systems.

Max Credits: 3
Min Credits: 3

49.211 Statistics for Business and Economics I

Course ID: 5901

Course Details: Presents descriptive statistics, sophisticated counting techniques and other components of probability, simple random variables and their distribution, bivariate functions, sampling theory properties of estimators.
49.212 Statistics for Business and Economics II

Course Details: Discusses interval estimation, hypothesis testing, analysis of variance, applied regression theory, correlation analysis, and other selected topics.

Max Credits: 3
Min Credits: 3

49.302 Labor Economics

Course Details: An introduction to the economic analysis of behaviors and institutions in the labor market: labor supply and participation, labor demand by firms, wage determination under different institutional settings, and gender, race or ethnicity as determinants of different labor market outcomes. The course presents microeconomic models, empirical findings and their public policy implications on topics such as minimum wage, affirmative action, social insurance programs, workplace safety, and subsidized day care. Prerequisites: 49.201 or instructor's approval.

Max Credits: 3
Min Credits: 3

49.303 Microeconomic Theory

Course Details: Provides an advanced examination of price and production theory and the theory of the consumer and the firm.

Max Credits: 3
Min Credits: 3

49.304 Macroeconomic Theory

Course Details: An analysis of Keynesian and post-Keynesian theory. National income accounts, monetary and fiscal policy, and econometric models.

Max Credits: 3
Min Credits: 3

49.312 Managerial Economics

Course Details: Applies the economic theory and statistical methods to business decision making. Estimation of demand, production, cost functions and accompanying elasticity estimates, pricing and output decisions, value maximization problems, and capital budgeting.

Max Credits: 3
Min Credits: 3

49.315 Introduction to Environmental Economics

Course Details: This is a renumbering of an existing course, 49.315. The renumbering to the 400 level is to allow Masters students in programs with environmental content to take this course for credit with their advisor's approval. This course introduces students to the economic and policy aspects of environmental quality and natural resource 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 or efficiency criteria will be applied to a wide variety of environmental issues.

Max Credits: 3
Min Credits: 3

49.316 Investments: Instruments and Strategies

Course ID: 36846

Course Details: In this course we will look at different types of investments, from stocks, bonds and real estate to mutual funds, hedge funds and derivatives exploring how and when to use them. Students will create a diversified investment portfolio using an online trading program that incorporates products covered in class. In addition we will look at how different exchanges operate and the role of financial investments in real capital accumulation and rising living standards.

Max Credits: 3
Min Credits: 3

49.317 Capital Markets

Course ID: 5914


Max Credits: 3
Min Credits: 3

49.318 Financial Markets and Monetary Policy

Course ID: 5915

Course Details: The economics of financial intermediation and central bank monetary policy. Evaluation of global financial markets, financial deregulation, bank failures and financial stability, determinants of the level and term structure of interest rates, and the impacts of monetary policy changes on overall levels of output, employment and prices are topics analyzed in this course.

Max Credits: 3
Min Credits: 3

49.319 Public Finance

Course ID: 5916

Course Details: The economics of the public sector. Principles of public expenditure, taxation, and the public debt applied to federal, state, and local governments.

Max Credits: 3
Min Credits: 3

49.325 United States Economic History

Course ID: 5921

Course Details: The evolution of institutions and their functions, and sources of economic development. The contributions of railroads, agricultural population growth, immigration, capital formation and technological progress to economic development. Other areas addressed: rapid industrialization and antitrust laws; evolution of financial institutions, the creation of the Federal Reserve System, crash of 1929, the depression of the 1930s, the New Deal and various banking acts, the labor movement, the growth of international trade.

Max Credits: 3
Min Credits: 3

49.345 Health Economics

Course ID: 5926
Course Details: An introduction to the economic analysis of health care market. The course presents microeconomic models, empirical findings and public policies referring to the following topics: the production and demand for health (the investment/consumption aspects of health and the relationship between socio-economic status and health status), the issues of moral hazard and adverse selection in the insurance market, the role of information in the physician-patient relationship, the different regulation and payment systems for providers, the Medicare and Medicaid programs, and the comparisons between the US system and the health systems of other western economies and developing countries. This class aims to help students becoming more informed future citizens and consumers or producers of healthcare. Prerequisites: 49.201 or instructor's approval.

Max Credits: 3
Min Credits: 3

49.401 Special Topics in Economics

Course ID: 33036

Course Details: Special Topics in Economics is a course for advanced undergraduates in Economics. The content will vary from semester to semester depending on the research interests of the Faculty member teaching the course.

Max Credits: 3
Min Credits: 3

49.403 International Trade Theory

Course ID: 5928

Course Details: The classical and modern theories. International payments, exchange and trade controls, and international trade policy determinants. Prerequisites: 49.201, 49.202.

Max Credits: 3
Min Credits: 3

49.407 Econometrics

Course ID: 5931

Course Details:
Max Credits: 3
Min Credits: 3

49.410 Economic Growth and Development

Course ID: 33657

Course Details: In this course, we try to solve the puzzles of why some countries are so rich and some are so poor and why some countries grow so quickly and some grow so slowly. After introducing the basic analytical framework, we will investigate various possible reasons in explaining the observed country differences. Those possible explanations include differences in countries’ investment rates, population growth rates, human capital accumulation rates, production technologies, openness to international trade, and government policies. Issues of income inequality and their effect on economic growth will also be addressed. This course is designed for Economics majors or minors who have fulfilled the following prerequisites, and master level students from other departments, such as the Regional Economic and Social Development Department. Pre-req: 49.201 Economics I (Microeconomics) 49.202 Economics II (Macroeconomics)

Max Credits: 3
Min Credits: 3

49.485 Internship in Economics

Course ID: 5938

Course Details:
Max Credits: 3
Min Credits: 3
**49.499 Independent Studies**

Course ID: 5940

Course Details: A course to permit the advanced student to do research in topics of special interest in economics under faculty supervision. This course also may be utilized to offer topics to individual students where there are insufficient number of registrants for a regular class. Restricted to Economics majors.

Max Credits: 3

Min Credits: 3

**50.101 French 1 and Culture**

Course ID: 5949

Course Details: Develops French speaking, listening, reading and writing skills through the discovery of French and Francophone culture in a communicative approach (instruction occurs in French with clarification in English). This class is the 1st of the 4-course French language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3

Min Credits: 3

**50.102 French 2 and Culture**

Course ID: 5950

Course Details: Continuation of French 1 and Culture (or equivalent), which is a pre-requisite. Strengthens French speaking, listening, reading and writing skills acquired in French 1 and Culture through the discovery of French and Francophone culture in a communicative approach (instruction occurs in French with some clarification in English). This class is the 2nd of the 4-course French language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3

Min Credits: 3

**50.211 French 3 and Culture**

Course ID: 5952

Course Details: Enhances the four skills acquired in French 2 and Culture (or equivalent), which is a pre-requisite: speaking, listening, reading and writing through the discovery of French and Francophone culture in a communicative approach (instruction occurs in French with minimal use of English). This class is the 3rd of the 4-course French language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3

Min Credits: 3

**50.212 French 4 and Culture**

Course ID: 5953

Course Details: This course has French 3 and Culture (or equivalent) as a pre-requisite and is the 4th and last of the 4-course French language program offered at UML. The course strengthens the four skill acquired in prior levels. It emphasizes increased accuracy and depth of students’ abilities and knowledge of French and Francophone culture and language in a communicative approach (instruction occurs in French with almost no use of English). Students express themselves orally and in writing at the national standards level of high-intermediate and understand key-concepts when spoken clearly at native speed.

Max Credits: 3

Min Credits: 3

**50.301 Survey of French Literature**

Course ID: 5962

Course Details: A panoramic survey of French Literature based on the history and civilization of France from the Middle Ages to the XXth (20th) Century, through readings in the original French language of excerpts from milestone novels, theater and poetry. Class conducted
**50.302 Survey of Francophone Literature**

Course ID: 5963

Course Details: A survey of contemporary Francophone Literature of African, European, and North American French speaking countries since 1960 until today.

Max Credits: 3
Min Credits: 3

**50.310 French Speaking World**

Course ID: 5964

Course Details: Designed for prospective majors and minors in French as well as for those who have completed four years of high school or two years of college French. The course examines similarities and differences in the ethos of nations of the French-speaking world and in the life-styles of the individuals and groups that make them up. Conducted in French.

Max Credits: 3
Min Credits: 3

**50.315 Francophone Community in North America**

Course ID: 5965

Course Details: This course introduces the concept of "Francophonie" and describes the origins of the main francophone communities left in North America: Quebec, Acadia and New-Foundland in Canada, and Louisiana and New England (including Lowell) in the U.S. The primary focus of this class is Culture, history and language (different varieties of French spoken by those communities). Class conducted in French.

Max Credits: 3
Min Credits: 3

**50.320 Contemporary French Civilization and Culture**

Course ID: 5966

Course Details: In this course we look closely at some fundamental issues reflecting the rapidly changing parameters of French culture and society today: the question of national identity and cultural hybridité, the relationship between the evolving types of family relations and new forms of social and political contracts; the crucial personal problems faced by the young, the poor, the immigrant and the elderly in an increasingly multicultural Hexagone attempting to define its place, role and function within the recently defined Europe unit and the new global world order; the current status of women; the relationship between cities and ghettos, violence and crime; the nature of emerging forms of cultural production within new trends and styles of modernité.

Max Credits: 3
Min Credits: 3

**50.340 Contemporary French Cinema**

Course ID: 5968

Course Details: Provides a critical appreciation of contemporary French cinema (1985-today) aiming at sorting out its eclecticism and focusing on the following aspects: 1) French cultural exception in the European Union: cultural integration and national identity; 2) Representation of the ongoing social and moral changes in contemporary France; 3) The new generation of French filmmakers. Class taught in French.

Max Credits: 3
Min Credits: 3

**50.346 Advanced French Conversation**
Course ID: 5969
Course Details: Advanced oral practice in rapid and idiomatic speech. Topics of contemporary significance are selected from contemporary prose.
Max Credits: 3
Min Credits: 3

50.348 Advanced French Conversation and Composition
Course ID: 5970
Course Details: Designed to improve and reinforce proficiency in spoken and written French through regular exercises of oral communication and free composition, through the analysis of literary texts and authentic written and oral materials. Taught in French.
Max Credits: 3
Min Credits: 3

50.376 French Cinema & Society
Course ID: 5973
Course Details: Covers the dramatic presentation French society gives of itself during the period of profound social and economic change, from the New Wave and the May 68 events to today's younger generation facing an uncertain tomorrow. Each screening (in French with subtitles) is preceded by an introduction placing the film in its historical context. In English.
Max Credits: 3
Min Credits: 3

50.380 Francophone Identity through Cinema
Course ID: 5975
Course Details: Provides a critical appreciation of the notion of Francophone identity through modern and contemporary (1970-today) Francophone cinema from diverse places such as but not limited to North Africa, West Africa (especially Senegal), Canada (especially Quebec) the Caribbean, Belgium, and Switzerland. The course is aiming at showing the evolution of the Francophone identity in the postcolonial period until now and is focusing on the following aspects: 1) The emergence and importance of postcolonial Francophone cinema in the 1970s as a "cinema engage" (especially Sembene Ousmane in Senegal); 2) Contemporary issues of the postcolonial Francophone societies through films; 3) Representations of the cultural diversity in Francophone films; 4) Identity, race and immigration, women's status issues.
Max Credits: 3
Min Credits: 3

50.491 Directed Studies in French Literature
Course ID: 5983
Course Details: Individual research projects in French literature. Students, through regular and frequent consultation with their instructor, develop a course of directed study in French literature and define a problem for individual research. The student's findings are presented in a paper of significant proportions.
Max Credits: 3
Min Credits: 3

50.492 Directed Studies French Composition
Course ID: 5984
Course Details: Students, through regular and frequent consultation with their instructor, pursue a special program of composition or creative expression.
Max Credits: 3
Min Credits: 3
**50.495 Advanced French Tutorial**

Course ID: 5985

Course Details: A program of directed study which affords the advanced student with an additional opportunity to pursue a previously explored problem in greater depth or to initiate a new problem. The purpose of the course is to sharpen and refine techniques for scholarly research, presentation and creative expression.

Max Credits: 3  
Min Credits: 3

**50.496 French Practicum Experience**

Course ID: 5986

Course Details: A program of on-campus and/or off-campus experiences (for French and Modern Language Majors only). Specific requirements vary depending upon faculty policies and the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a community, social, cultural, or artistic area and for applying techniques of problem solving and/or skills which are appropriate to the student's major discipline. May be repeated for a maximum of nine credits. Students are graded "satisfactory" or "unsatisfactory". The practicum experience may not be substituted for a required course in the major.

Max Credits: 3  
Min Credits: 3

**51.101 German 1 and Culture**

Course ID: 5988

Course Details: Develops German speaking, listening, reading and writing skills through the discovery of the culture of German speaking countries in a communicative approach (instruction occurs in German with clarification in English). This class is the 1st of the 4-course German language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3  
Min Credits: 3

**51.102 German 2 and Culture**

Course ID: 5989

Course Details: Continuation of German 1 and Culture (or equivalent), which is a pre-requisite. Strengthens German speaking, listening, reading and writing skills acquired in German 1 and Culture through the discovery of the culture of German speaking countries in a communicative approach (instruction occurs in German with some clarification in English). This class is the 2nd of the 4-course German language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3  
Min Credits: 3

**51.211 German 3 and Culture**

Course ID: 5992

Course Details: Enhances the four skills acquired in German 2 and Culture (or equivalent), which is a pre-requisite: speaking, listening, reading and writing through the discovery of the culture of German speaking countries in a communicative approach (instruction occurs in German with minimal use of English). This class is the 3rd of the 4-course German language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3  
Min Credits: 3

**51.212 German 4 and Culture**

Course ID: 5993

Course Details: This course has German 3 and Culture (or equivalent) as a pre-requisite and is the 4th and last of the 4-course German
language program offered at UML. The course strengthens the four skill acquired in prior levels. It emphasizes increased accuracy and depth of students’ abilities and knowledge of the culture of German speaking countries in a communicative approach (instruction occurs in German with almost no use of English). Students express themselves orally and in writing at the national standards level of high-intermediate and understand key-concepts when spoken clearly at native speed.

Max Credits: 3  
Min Credits: 3

**51.492 Direct ed Study in German Composition**

Course ID: 6002

Course Details: Individual research projects for modern language majors. Students, through regular and frequent consultation with their instructor, develop a course of directed study in literature and culture and define a subject for individual research. The student's findings are represented in a paper of significant proportion.

Max Credits: 3  
Min Credits: 3

**51.495 Advanced German Tutorial**

Course ID: 6003

Course Details: A program of directed study which affords Modern Language majors an additional opportunity to pursue a previously explored topic in greater depth or to initiate an additional topic. The purpose of this tutorial is to sharpen and refine techniques of scholarly research, presentation and creative expression.

Max Credits: 3  
Min Credits: 3

**52.101 Italian 1 and Culture**

Course ID: 6005

Course Details: Develops Italian speaking, listening, reading and writing skills through the discovery of the culture of Italian speaking countries in a communicative approach (instruction occurs in Italian with clarification in English). This class is the 1st of the 4-course Italian language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3  
Min Credits: 3

**52.102 Italian 2 and Culture**

Course ID: 6006

Course Details: Continuation of Italian 1 and Culture (or equivalent), which is a pre-requisite. Strengthens Italian speaking, listening, reading and writing skills acquired in Italian 1 and Culture through the discovery of the culture of Italian speaking countries in a communicative approach (instruction occurs in Italian with some clarification in English). This class is the 2nd of the 4-course Italian language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3  
Min Credits: 3

**52.211 Italian 3 and Culture**

Course ID: 6010

Course Details: Enhances the four skills acquired in Italian 2 and Culture (or equivalent), which is a pre-requisite: speaking, listening, reading and writing through the discovery of the culture of Italian speaking countries in a communicative approach (instruction occurs in Italian with minimal use of English). This class is the 3rd of the 4-course Italian language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3  
Min Credits: 3
52.212 Italian 4 and Culture

Course Details: This course has Italian 3 and Culture (or equivalent) as a pre-requisite and is the 4th and last of the 4-course Italian language program offered at UML. The course strengthens the four skill acquired in prior levels. It emphasizes increased accuracy and depth of students' abilities and knowledge of the culture of Italian speaking countries in a communicative approach (instruction occurs in Italian with almost no use of English). Students express themselves orally and in writing at the national standards level of high-intermediate and understand key-concepts when spoken clearly at native speed.

Max Credits: 3
Min Credits: 3

52.315 Islam and Medieval Europe

Course Details:

Max Credits: 3
Min Credits: 3

52.325 Italian American Literature and Culture

Course Details: Discusses the most prominent authors and works of Italian-American Literature as they, by using the ethnic setting, are able to convey universal human concerns and themes. The discussion on Italian-American ethnic issues will include such films as The Godfather, Moonstruck, The Sicilian, Goodfellas, and The Untouchables. Conducted in English.

Max Credits: 3
Min Credits: 3

52.330 Italian Women Writers

Course Details: Studies women writers of Italy by giving attention to the genres of narrative, poetry, theater and autobiography. Authors are selected according to their impact on issues affecting women, gender studies, feminism, avant-garde, modernism, social relations and psychological discourse. Conducted in English.

Max Credits: 3
Min Credits: 3

52.373 Italian Humanism

Course Details: A study of the waning of the Middle Ages and the dawning of the Renaissance as seen through the work of Petrarch and Boccaccio. Emphasis is on the study of sources and the influence of Petrarch and Boccaccio upon the literatures of western Europe. Conducted in English.

Max Credits: 3
Min Credits: 3

52.378 Italian Cinema and Culture

Course Details: A guide to contemporary Italian studies through literary and cultural approaches. The works of central figures in contemporary Italian letters are examined in view of their impact on Italian life. Emphasis is given to poets, novelists, the new cinema, the influences of existentialism, and the impact of America on Italian literature. Conducted in Italian/English.

Max Credits: 3
Min Credits: 3
52.491 Directed Study in Italian Literature

Course ID: 6027

Course Details: Individual research projects for modern language majors. Students, through regular and frequent consultation with their instructor, develop a course of directed study in Italian literature and define a subject for individual research. The student's findings are presented in a paper of significant proportions.

Max Credits: 3
Min Credits: 3

52.492 Directed Studies Italian Composition

Course ID: 6028

Course Details: Individual research projects for modern language majors. Students, through regular and frequent consultation with their instructor, pursue a special topic of composition or creative expression.

Max Credits: 3
Min Credits: 3

52.495 Advanced Italian Tutorial

Course ID: 6029

Course Details: 

Max Credits: 3
Min Credits: 3

52.496 Italian Practicum Experience

Course ID: 6030

Course Details: 

Max Credits: 3
Min Credits: 3

53.105 Chinese 1 and Culture

Course ID: 6035

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 105, 106 and 205, 206 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.106 Chinese 2 and Culture

Course ID: 6036

Course Details: Continuation of 53.105 Chinese 1 and Culture. Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 103, 104 and 205, 206 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.108 Business Chinese I and Culture
Course Details: This introductory language and culture course prepares non-Chinese speakers for potential future business engagements either in China or with Chinese speakers in the United States. Effective communication and cultural competency in standard/Mandarin Chinese are emphasized. Students will be exposed to various aspects of Chinese culture appropriate for informal as well as business social settings. Topics include, but are not limited to, self-introduction, traveling, lodging, dining, shopping, banking, seeing a doctor, making friends, and doing business. Authentic language materials (vocabulary, Pinyin, sentence structures, conversations) are presented and taught in a second language acquisition environment with interactive activities that are relevant to proper social etiquette.

Max Credits: 3
Min Credits: 3

53.109 Business Chinese II

Course Details: This language and culture course is a continuation of Business Chinese I. The course prepares non-Chinese speakers for potential future business engagements either in China or with Chinese speakers in the United States. Effective communication and cultural competency in standard/Mandarin Chinese are emphasized. Students will be exposed to various aspects of Chinese culture appropriate for informal as well as business social settings. Topics include, but are not limited to, self-introduction, traveling, lodging, dining, shopping, banking, seeing a doctor, making friends, and doing business. Authentic language materials (vocabulary, Pinyin, sentence structures, conversations) are presented and taught in a second language acquisition environment with interactive activities that are relevant to proper social etiquette.

Max Credits: 3
Min Credits: 3

53.115 Arabic 1 and Culture

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 115, 116 and 215, 216 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.116 Arabic 2 and Culture

Course Details: This course is for students who have completed 53.115 Arabic 1 and Culture. Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 115, 116 and 215, 216 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.135 Cambodian 1 and Culture

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 135, 136 and 235, 236 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.136 Cambodian 2 and Culture

Course Details: This course continues the oral practice, reading, writing, grammar and cultural studies begun in 53.135. Development of
fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 135, 136 and 235, 236 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.205 Chinese 3 and Culture

Course ID: 6049

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 105, 106 and 205, 206 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.215 Arabic 3 and Culture

Course ID: 6057

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 117, 118 and 215, 217 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.216 Arabic 4 and Culture

Course ID: 32067

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 115, 116 and 215, 216 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.235 Cambodian 3 and Culture

Course ID: 32059

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 135, 136 and 235, 236 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.236 Cambodian 4 and Culture

Course ID: 32060

Course Details: This course is a continuation of 53.235 Cambodian 3 and Culture, which is a pre-requisite. Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 135, 136 and 235, 236 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.300 Modern Chinese Literature and Culture

Course ID: 37524

Course Details: This course offers an insight into Chinese culture and society by examining different genres of modern and
contemporary Chinese Literature -- the novel, poetry, essay, and drama -- since the early Twentieth Century. Readings in English
translations of representative works by major writers/essayists/poets/playwrights will be complemented by selected feature films and
documentaries. The survey of Chinese literature will be put in the context of a series of sociopolitical changes in China that informed the
production of these works.

Max Credits: 3
Min Credits: 3

**53.490 Directed Study in Chinese Culture**

Course ID: 37627

Course Details: Students through regular consultation with the Instructor develop a course of directed study or independent study in
Chinese Culture. Students findings are presented in a paper of significant proportion.

Max Credits: 3
Min Credits: 3

**53.495 Advanced Tutorial in Chinese Culture**

Course ID: 37628

Course Details: A program of directed study to give an opportunity to a student to explore problems in Chinese Culture in greater dept or
to initiate additional problems in Chinese Culture.

Max Credits: 3
Min Credits: 3

**54.101 Spanish 1 and Culture**

Course ID: 6061

Course Details: Develops Spanish speaking, listening, reading and writing skills through the discovery of the culture of Spanish
speaking countries in a communicative approach (instruction occurs in Spanish with clarification in English). This class is the 1st of the
4-course Spanish language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3
Min Credits: 3

**54.102 Spanish 2 and Culture**

Course ID: 6062

Course Details: Continuation of Spanish 1 and Culture (or equivalent), which is a pre-requisite. Strengthens Spanish speaking, listening,
reading and writing skills acquired in Spanish 1 and Culture through the discovery of the culture of Spanish speaking countries in a
communicative approach (instruction occurs in Spanish with some clarification in English). This class is the 2nd of the 4-course Spanish
language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3
Min Credits: 3

**54.103 Medical Spanish**

Course ID: 36649

Course Details: This course is designed to develop basic conversational skills necessary to communicate with patients in a health care
setting. Students will acquire a basic linguistic and cultural foundation enabling them to interview and manage patients in clinical settings
using Spanish; to take a history and perform a physical exam using Spanish, and to interpret health concerns of Spanish-speaking
populations. The course is designed for health care professionals.

Max Credits: 3
Min Credits: 3

**54.211 Spanish 3 and Culture**
Course Details: Enhances the four skills acquired in Spanish 2 and Culture (or equivalent), which is a pre-requisite: speaking, listening, reading and writing through the discovery of the culture of Spanish speaking countries in a communicative approach (instruction occurs in Spanish with minimal use of English). This class is the 3rd of the 4-course Spanish language program offered at UML. Language courses are sequential and must be taken accordingly.

Max Credits: 3
Min Credits: 3

54.212 Spanish 4 and Culture

Course Details: This course has Spanish 3 and Culture (or equivalent) as a pre-requisite and is the 4th and last of the 4-course Spanish language program offered at UML. The course strengthens the four skill acquired in prior levels. It emphasizes increased accuracy and depth of students' abilities and knowledge of the culture of Spanish speaking countries in a communicative approach (instruction occurs in Spanish with almost no use of English). Students express themselves orally and in writing at the national standards level of high-intermediate and understand key-concepts when spoken clearly at native speed.

Max Credits: 3
Min Credits: 3

54.301 Introduction to Spanish Literature

Course Details: Studies the history of Spain's literature in its general trends and through its major writers revealing the complicated series of interactions, conflict, and influences which have molded the unique character of the nation. Conducted in Spanish.

Max Credits: 3
Min Credits: 3

54.303 Introduction to Latin American Literature and Culture II

Course Details: A continuation of 53.302, Latin American Literature and Culture I. Conducted in Spanish

Max Credits: 3
Min Credits: 3

54.310 Spanish Civilization and Culture

Course Details: Considers Spanish culture and civilization up to the present. Through audiovisual aids, current newspapers and selected readings, the student will explore the Spanish way of being, thinking, and living. Emphasis is placed on the main contributions of Spain to the Western world.

Max Credits: 3
Min Credits: 3

54.313 Fieldwork in the Spanish Community

Course Details: Involves individual assignments under the sponsorship of local service agencies servicing the Spanish-speaking community involving individual family and group contact. Written and oral reports will be in Spanish.

Max Credits: 3
Min Credits: 3

54.315 Latin American Civilization and Culture
Course ID: 6080
Course Details: Considers significant intellectual, artistic, historical, and sociopolitical aspects of Latin America from the beginning of its history. Through audiovisual aids and selected readings, the student will explore the Latin American way of being and expressing.

Max Credits: 3
Min Credits: 3

54.320 Special Topics in Spanish Studies

Course ID: 6081
Course Details: Focuses on a limited topic of special interest in culture, civilization, or literature. May be taught in English or in Spanish. Course content and approach will vary depending on instructor.

Max Credits: 3
Min Credits: 3

54.330 Spanish and Latin-American Women Writers

Course ID: 6082
Course Details: Studies women writers of the Spanish speaking world. Emphasis is given to their contribution to the development of Spanish literature and culture as well as their vision of the world and their concerns for the rights of women and humanity. Conducted in Spanish only.

Max Credits: 3
Min Credits: 3

54.347 Advanced Spanish Conversation

Course ID: 6087
Course Details: The course aims at developing advanced oral proficiency in rapid idiomatic speech. Topics of contemporary significance are selected for discussions. Required for Spanish Majors.

Max Credits: 3
Min Credits: 3

54.351 Latin American Theater

Course ID: 6089
Course Details: Examines Latin American theatrical works as forms of socially accepted resistance and politically charged art forms. The course will consider plays and performances that challenge governments, inequities, and the status quo. In this course, students will study a variety of Latin American plays, as well as performances an political acts that explore these issues.

Max Credits: 3
Min Credits: 3

54.371 Hispanic Literature & Film

Course ID: 6090
Course Details:

Max Credits: 3
Min Credits: 3

54.401 Spanish Selected Authors

Course ID: 6093
Course Details: Presents an intensive study of the works by a few Spanish and/or Latin American authors.
54.409 Twentieth Century Spanish Literature

Course ID: 6098
Course Details: Studies the famous generation of 1927 and the major literary trends during and after the Spanish Civil War.

54.410 Realism and the Nineteenth Century Spanish Novel

Course ID: 6099
Course Details: Offers a study of fundamental aspects of life, thought, land itself and its sense of history as reflected in the literary masterpieces of Valera, Galdos, Alarcon, Pereda, and others. An analysis of the literary techniques and fiction of the Realism will be included.

54.416 The Latin American Novel

Course ID: 6102
Course Details: A study of the development of the Latin American novel. Three major works of Latin American short story writers such as Borges, Cortazar, Marquez, Rulfo.

54.491 Directed Studies in Spanish Literature

Course ID: 6105
Course Details: 
Max Credits: 3
Min Credits: 3

54.492 Directed Study in Latin America

Course ID: 6106
Course Details: 
Max Credits: 3
Min Credits: 3

54.493 Directed Studies in Spanish Composition

Course ID: 6107
Course Details: Students, through regular and frequent consultation with their instructor, pursue a special program of composition or creative expression.
Max Credits: 3
Min Credits: 3

54.496 Spanish Practicum Experience
Course ID: 6109

Course Details: A program of on-campus and/or off-campus experiences for Spanish or Modern Language majors only. Specific requirements vary depending upon faculty policies and the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a community, social, cultural, or artistic area and for applying techniques of problem solving and/or skills which are appropriate to the student's major discipline. May be repeated for a maximum of nine credits. Students are graded satisfactory, or unsatisfactory. The practicum experience may not be substituted for a required course in the major.

Max Credits: 3
Min Credits: 3

56.320 Special Topics in Latin Study

Course ID: 6128

Course Details: Depends on faculty and student interests associated with Latin literature, composition and culture.

Max Credits: 3
Min Credits: 3

57.201 Regions: Merrimack Valley

Course ID: 6132

Course Details: The ways people produce, distribute, and consume the world's resources profoundly influence the problems we experience in this and other regions of the world. Problems occur most particularly in the areas of work, community, and environment. The goal of this interdisciplinary course is to explore such regional problems and possible solutions within national and global contexts, as well as historical. In the area of work, we will discuss what is necessary to create good jobs, characterized by decent pay and benefits, worker involvement in decision making, and healthy workplaces free from discrimination. In the area of community, we will address such things as patterns of immigration and the interactions between community stability and institutions such as education, family, political leadership, and religion. In the area of environment, we will explore issues surrounding the reduction of pollution that infects our communities and living spaces (e.g., the tradeoff between environmental improvement and economic growth). The course will stress experiential learning (via field trips and small group activities) and will include films as well as readings and presentations from various disciplines. (General Education Course (BS))

Max Credits: 3
Min Credits: 3

57.211 Sustainable Development

Course ID: 6134

Course Details: This course examines workplace and regional factors that shape the prospects for sustainable prosperity and worker and community empowerment. The course begins by reviewing recent trends in the distribution of income and wealth and the industrial structure of the New England economy. The historical dynamics shaping work organization and regional development are examined. Several industry case studies are selected because of their importance to the regional and national economy. The case studies provide focus for studying the strategic choices made by firms in mature industries and newly emerging regions; the basis of competitive advantage for Japanese firms and the response of American rivals; and the influence of the product cycle and regional institutions on capture or retention of emerging and mature industries. The final section of the course focuses on the prospects for sustainability of the organization of production and its environmental impact, incentives for skill development and technological innovation, and shared prosperity. A central course objective is to foster an understanding of the links between the workplace and region in the pursuit of sustainable development and shared prosperity.

Max Credits: 3
Min Credits: 3

57.220 Designing the Future World

Course ID: 33440

Course Details: All purposeful human activity involves design. Every day we are surrounded by the products of design processes--buildings, cars, entertainment, corporations, schools, even laws and regulations. They make our lives easier in many ways, but they may also create significant social and environmental problems. In the past, designers often did not consider the impact of their designs on society, or ignored the negative consequences. Our culture and legal system usually permitted, or even encouraged, this irresponsibility. Today, a small group of scholars, businessmen and women, and activists are rethinking how we design the things around us, with the goal of addressing the most pressing social and environmental issues. This class will introduce students to some of these issues, the people who are confronting them, and the ways in which all of us can contribute to designing a better Future World. With a series of
hands on projects, coupled with readings and other resources, students will work to design aspects of the future. In the process you will learn about possible solutions to complex, important problems, but also learn valuable life skills such as problem framing, problem solving, critical thinking, active learning, communication, and simple construction methods. No previous experience is required—only curiosity and eagerness to learn.

Max Credits: 3
Min Credits: 3

57.408 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

57.420 Gender, Work and Public Policy

Course ID: 33616

Course Details: This seminar course, “Gender, Work and Public Policy” will explore the relationship between human rights, gender and work issues in the 21st century. We will examine how current and future reality can be shaped by related public policies. 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. We will especially look at public policies that can either impede or advance better overall equality of work-life and family life.

Max Credits: 3
Min Credits: 3

57.475 Community Conflict Resolution

Course ID: 6173

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

57.491 Directed Studies: Regional Economic and Social Development

Course ID: 6174

Course Details: Directed Studies: Regional Economic and Social Development

Max Credits: 3
Min Credits: 3

57.496 Practicum In Regional Economic and Social Development

Course ID: 6179

Course Details: Practicum In Regional Economic and Social Development
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
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

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

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

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.
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.

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.

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.

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.
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 form 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

57.598 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

**57.691 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
58.101 Art Appreciation

Course ID: 6218

Course Details: The course introduces the student to the technical, aesthetic and historical aspects of architecture, sculpture, and painting. An analysis of the visual elements used in fine arts such as color, line, shape, texture, and principles of design are developed through slide lectures, museum visits and assigned readings. In addition, students investigate the purposes of art and visual communication and develop a heightened sense of critical thinking that allows them to investigate successfully different modes of representation, styles and media in a multicultural society.

Max Credits: 3
Min Credits: 3

58.105 Comparative Arts

Course ID: 6219

Course Details: This course studies the aesthetic, artistic and intellectual similarities between art history and music history. Discussion of the arts focuses on the development in examining the human creativity and expression through the arts: from ancient times as art and morality followed in the Renaissance as art and sciences continued in the Enlightenment as art and society contrasted in the nineteenth century as art and entertainment. Furthermore, this course surveys some of the fundamental aspects of music and art, such as the nature of aesthetic judgment, the task of art and music criticism, including formalist, representational, and contemporary theories on viewing, analyzing, and interpreting the arts. In addition, with a comparative analysis between the modes of visual and aural representation, visual and aural perception, this course analyzes the principal forms and genres of the visual and aural elements of art history and music history, providing an understanding for human creativity and expression. Spring, alternate years.

Max Credits: 3
Min Credits: 3

58.203 History of Art I: Prehistoric to Medieval Art

Course ID: 6221

Course Details: A survey of the origins and development of painting, sculpture and architecture from prehistoric times to the Medieval period. Emphasis is placed on representative works of art from Ancient Egypt and Near East, Antiquity, Byzantine and Medieval, and Early Renaissance Europe. Methodological problems of interpretation, formal analysis and aesthetic principles are studies in these art works.

Max Credits: 3
Min Credits: 3

58.204 History of Art II: Renaissance to Modern Art

Course ID: 6222

Course Details: A survey of the origins and development of painting, sculpture, and architecture from Renaissance times to the Modern period. Emphasis is placed on representative works of art from the Renaissance, Baroque, Rococo, Nineteenth Century Movements-Neoclassicism, Romanticism, Impressionism, Cubism, Dadaism, Surrealism and Abstract Art. The aim of the course is to introduce the student to basic critical and art historical methods as well as the analysis of style and content within sequential cultural contexts.

Max Credits: 3
Min Credits: 3

58.206 History of Architecture

Course ID: 6224

Course Details: A survey of the major technical and stylistic developments in ecclesiastical and secular architecture from Prehistory to the present day studied with an emphasis on the major monuments (Parthenon, Pantheon, Gothic Cathedrals, St. Peter’s, Versailles Palace, Eiffel Tower, Guggenheim Museum). Spring, alternate years.

Max Credits: 3
Min Credits: 3

58.211 Nineteenth Century Art
Course ID: 6225

Course Details: A study of the nineteenth century European painting, sculpture, and architecture are analyzed, including the art of Neoclassicism, Romanticism, Realism, Impressionism, Post-Impressionism, Symbolism and Art Nouveau.

Max Credits: 3
Min Credits: 3

58.221 Twentieth Century Art

Course ID: 6226

Course Details: A study of American and European movements in painting, sculpture, and architecture from 1900 to the present. Emphasis is placed on Fauvism, Cubism, Expressionism, Surrealism, International Style, Pop, Op Art, Minimal Art, Photorealism, and Post-Modernism.

Max Credits: 3
Min Credits: 3

58.225 History of Picturing

Course ID: 6227

Course Details: This course surveys the major trends and functions of imaging and picturing, as well as its societal impact as it becomes a pervasive cultural and aesthetic entity since the invention of photograph, film and video. Lectures trace the chronological development of the medium; analyze images, culture and integrate discussions pertaining to the role of imaging as it affects the process of visual information as well as how imaging and picturing can affirm existing cultural structures or shape the course of new aesthetic images and ideas.

Max Credits: 3
Min Credits: 3

58.231 Greek and Roman Art

Course ID: 6228

Course Details: A study of Greek painting, sculpture, and architecture from the Cycladic to the Hellenistic period, and an examination of Roman Art from the Etruscan age to the beginning of Christian art. Emphasis is placed on the Greek Classical period and the Roman Empire.

Max Credits: 3
Min Credits: 3

58.313 American Art

Course ID: 6234

Course Details: The study of American painting, sculpture, and architecture from the Colonial period to the end of the nineteenth century seen in relation to European developments and American social and technological changes. Emphasis is placed on New England architecture.

Max Credits: 3
Min Credits: 3

58.314 American Architecture

Course ID: 32950

Course Details: This course begins with a discussion of native American building traditions and proceeds chronologically from the 17th through the 20th centuries. Students will gain a familiarity with the major movements in American architecture (such as Colonial, Greek Revival, Victorian, Arts and Crafts, City Beautiful, International Style, Postmodern) as well as the leading architects such as Frank Lloyd Wright and Frank Gehry. The architecture is discussed in its historical context with attention to the inventions, materials and aesthetic assumptions that made it possible.

Max Credits: 3
58.315 Modern Architecture

Course ID: 37141

Course Details: This course will examine global architecture from the 19th century to the present. It addresses the major movements, "isms", architects, publications, schools, and technological innovations that contributed to varied (and often conflicting) notions of "Modern architecture." Growing nationalism and polities, travel and colonial occupation, the effects of war, and changing conceptions of nature and science, all transformed the built environment. This course will provide a better understanding not only of individual works but also of the ways architecture manifests important themes such as nationalism, regionalism, functionalism, rationalism, and the most current theme, happiness.

Max Credits: 3
Min Credits: 3

58.321 Italian Renaissance Art

Course ID: 6235

Course Details: A study of painting, sculpture, and architecture in Florence, Rome and Venice during the fifteenth and sixteenth centuries. Special emphasis on the formation of the High Renaissance style and the role of representative artists of the period, such as Leonardo, Michelangelo and Raphael in Central Italy; Giorgione and Titian in Venice.

Max Credits: 3
Min Credits: 3

58.330 Italian Mannerism

Course ID: 6237

Course Details: A study on the impact of the High Renaissance in the sixteenth century, the subsequent development of early Mannerism in central Italy and the formation of the Proto-Baroque style in Venice and Northern Italy, the establishment of the courtly Mannerist style. The role of representative artists such as Anguissola, Pontormo, Rosso, Parmigianino, Bronzino, Beccafumi, Fontana, Vasari, Veronese, Bandinelli, Cellini, Palladio, Peruzzi and Ammanati is emphasized.

Max Credits: 3
Min Credits: 3

58.331 Asian Art

Course ID: 6238

Course Details: The purpose of this course is to provide a general overview of the art of the traditional cultures of Asia, China, India and Japan. This survey provides a critical and historical examination of these cultures.

Max Credits: 3
Min Credits: 3

58.332 Baroque Art in Italy

Course ID: 6239

Course Details: The development of painting, sculpture and architecture in Italy during the seventeenth century with special emphasis on Rome and Venice. The role of representative artists (Caravaggio, Bernini, Borromini, Pietro da Cortona, Artemisia Gentileschi, Elisabetta Sirani and Longhena) is emphasized.

Max Credits: 3
Min Credits: 3

58.340 Women and Art

Course ID: 6241

Course Details: Investigation of the various ways women have been portrayed in the visual arts from antiquity to the present. A
chronological examination of selected female artists and their milieu from the Middle Ages to the twentieth century.

Max Credits: 3
Min Credits: 3

58.345 Pre-Raphaelite Art

Course ID: 6242


Max Credits: 3
Min Credits: 3

58.353 History of Public Art in the Modern Era

Course ID: 37451

Course Details: This course serves as an introduction to the history of public art in the modern and contemporary world. The history of public art is examined in relation to such concerns as the definition of public space, community involvement in the creative process, the institutional and economic support system for the arts, the modern understanding of memorial sculpture, and the use of the visual arts to foster public dialogue and cultural exchange.

Max Credits: 3
Min Credits: 3

58.360 Museum Issues

Course ID: 6246

Course Details: The art museum in the United States is a unique social institution because of its blend of public and private support and its intricate involvement with artists, art historians, collectors, the art market, and the government. This course will study the art museum's history and status in our society today. Special consideration will be given to financial, legal and ethical issues that face art museums in our time. Short papers, oral reports and visits with directors, curators and other museum officials in nearby museums will be included along with a detailed study of a topic of ones choice.

Max Credits: 3
Min Credits: 3

58.370 Art History and Film

Course ID: 6247

Course Details: Examination of issues of content, theory and criticism in the traditional, modern and contemporary lives of artists; autobiographies, biographies and historiographies as source of filmic expression. Focus on the interpretation and transformation of art historical records into filmic vision as revealed in set and costume design, music, camera technique and other aesthetic elements of film, as well as how such elements function to extend and convey directorial vision to movements in art history.

Max Credits: 3
Min Credits: 3

58.490 Art History Seminar

Course ID: 6248

Course Details: Study of particular artist, style or selected art historical problem. Topics to be announced. Course may be repeated.

Max Credits: 3
Min Credits: 3

58.491 Art History Seminar

Course ID: 6249
Course Details: Study of particular artist, style or selected art historical problem. Topics to be announced. Course may be repeated.

Max Credits: 3
Min Credits: 3

58.494 Directed Study in Art History

Course ID: 6251

Course Details: An individual supervised research project relating to stylistic, thematic or methodological issues in Art History, the result to be presented in a significant paper.

Max Credits: 3
Min Credits: 1

58.495 Advanced Tutorial in Art History

Course ID: 6252

Course Details: A program of directed study affords the advanced student with an additional opportunity to pursue a previously explored problem in greater depth or to initiate and investigate an additional problem. The purpose is to sharpen and refine skills for scholarly research and presentation

Max Credits: 3
Min Credits: 3

58.496 Practicum Experience in Art History

Course ID: 6253

Course Details: A program of on-campus and/or off-campus experiences for Art History students only. Specific requirements will vary depending upon department policies and the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a community, social, cultural or artistic area and for applying techniques of problem solving and/or credits. Students will be graded satisfactory or unsatisfactory.

Max Credits: 3
Min Credits: 3

59.101 Values and Creative Thinking

Course ID: 6257

Course Details: Values and Creative Thinking is a course designed specifically for freshmen. Throughout the semester you will be asked to examine your personal value system and how it relates to your education. The purpose of this course is to help you identify those individual qualities that you can use to achieve your highest academic potential. Specifically, this course is intended to help you develop greater self-awareness and confidence; creative and critical thinking skills; career planning skills designed to help you understand the full spectrum of available careers; an understanding of different computer technologies and multimedia techniques; an awareness of the role of values in determining your experiences and perspectives; problem solving and group decision making skills relating to issues that affect the quality of your life.

Max Credits: 3
Min Credits: 3

59.103 Freshman Honors Seminar II

Course ID: 35037

Course Details: (Spring Semester) Introduce students to the culture of Lowell through field trips, discussion, and active engagement. Students will demonstrate understanding through written reflection papers and participation in a photography exhibit, Eyes on Lowell. There will be some readings but the primary text will be the City of Lowell.

Max Credits: 2
Min Credits: 2
59.105 Comparative Arts

Course ID: 6258

Course Details: This course studies the aesthetic, artistic and intellectual similarities between art history and music history. By comparing modes of visual and aura representation, the course focuses on the development of human creativity and expression through the arts, from ancient times as 'art and morality' followed in the Renaissance as 'art and sciences' continued in the Enlightenment as 'art and society' contrasted in the nineteenth century as 'art and enlightenment'.

Max Credits: 3
Min Credits: 3

59.109 First Year Experience Seminar

Course ID: 35355

Course Details:
Max Credits: 1
Min Credits: 1

59.111 Foundations in Cultural Studies

Course ID: 34823

Course Details: This course explores a series of fundamental issues in the interdisciplinary field of cultural studies, addressing the breadth as well as the limits of the term culture. It will relate to languages, visual and performing arts, film, sports, food, music, and fashion, using case studies from different historical and geographical contexts.

Max Credits: 3
Min Credits: 3

59.115 Lowell as Text

Course ID: 35840

Course Details: First year seminar for students interested in exploring Lowell, past and present, and using the city to investigate various other issues beyond local.

Max Credits: 3
Min Credits: 3

59.203 History of Art I: Prehistoric to Medieval Art

Course ID: 6221

Course Details: A survey of the origins and development of painting, sculpture and architecture from prehistoric times to the Medieval period. Emphasis is placed on representative works of art from Ancient Egypt and Near East, Antiquity, Byzantine and Medieval, and Early Renaissance Europe. Methodological problems of interpretation, formal analysis and aesthetic principles are studies in these art works.

Max Credits: 3
Min Credits: 3

59.204 History of Art II: Renaissance to Modern Art

Course ID: 6222

Course Details: A survey of the origins and development of painting, sculpture, and architecture from Renaissance times to the Modern period. Emphasis is placed on representative works of art from the Renaissance, Baroque, Rococo, Nineteenth Century Movements-Neoclassicism, Romanticism, Impressionism, Cubism, Dadaism, Surrealism and Abstract Art. The aim of the course is to introduce the student to basic critical and art historical methods as well as the analysis of style and content within sequential cultural contexts.

Max Credits: 3
Min Credits: 3
59.208 Cultural Studies I
Course ID: 6265
Course Details: In this course, students gain an understanding of how the arts progress through examining earlier historical periods and using close studies of examples from different parts of the world. We will examine the Renaissance in Europe, the Hindu to Islamic period in the empires of Southeast Asia, dynastic changes in China, and the rise of Buddhism in South Asia.
Max Credits: 3
Min Credits: 3

59.209 Cultural Studies II
Course ID: 6266
Course Details: This course examines later cultural progressions around the world. These will include Classical, romantic and Modern periods in European arts and the cultural influences of colonial interactions on both the European powers and the colonized. We will also examine cultural arts in the era of technologies and the beginning of the modern era (such as recording and reproduction, architecture and technology), cultural globalization, and subcultures of the 20th century.
Max Credits: 3
Min Credits: 3

59.225 History of Picturing
Course ID: 6227
Course Details: This course surveys the major trends and functions of imaging and picturing, as well as its societal impact as it becomes a pervasive cultural and aesthetic entity since the invention of photograph, film and video. Lectures trace the chronological development of the medium; analyze images, culture and integrate discussions pertaining to the role of imaging as it affects the process of visual information as well as how imaging and picturing can affirm existing cultural structures or shape the course of new aesthetic images and ideas.
Max Credits: 3
Min Credits: 3

59.248 Values in American Culture
Course ID: 1248
Course Details: Deals with the development and interrelationship of American views on individualism, nature, science, technology, democracy, ethnicity, and the American dream. Readings begin with the Puritans and end with contemporary essayists. Deals with the development and interrelationship of American views on individualism, nature, science, technology, democracy, ethnicity, and the American dream. Readings begin with the Puritans and end with contemporary essayists.
Max Credits: 3
Min Credits: 3

59.300 Art History, Music & Culture
Course ID: 30428
Course Details: This course studies the aesthetic, artistic and intellectual similarities between art history and culture in western and non-western civilizations. Discussion of the arts focuses on the development in examining the human creativity and expression through the arts. Furthermore, this course surveys some of the fundamental aspects of art history and culture, such as the nature of aesthetic judgment, the task of art and music criticism, including formalist, representational, and contemporary theories on viewing, analyzing, and interpreting the arts.
Max Credits: 3
Min Credits: 3

59.303 Society and Technology
Course ID: 6281
Course Details: How safe is safe enough? Who really was Dr. Frankenstein? Was it possible not to create the A bomb? In this course we study decision-making capabilities crucial to survival in a technological age and examine the many value issues involved in understanding the nature of technological risk and its impact on modern society. Focusing on questions of scientific responsibility and societal safety, this course examines the changing attitudes toward technology and values.

Max Credits: 3
Min Credits: 3

59.315 Islamic Culture and Contemporary Society

Course ID: 6292

Course Details: This course examines the relationship between Islam, politics and culture in the contemporary Muslim world. This course will introduce students to the emergence and spread of Islam and the place the 'Muslim brotherhood' holds in the imagination of many Muslims. Students will gain a deeper understanding of the social, political and cultural complexity of the Muslim world. We will cover such regions as the Middle East, Africa, South and Southeast Asia as well as various places in the 'western' world. Topics will include the rise of political Islam, the various cultural expressions of Muslims, and the variation and divergences across Muslim cultures. This course could be taken by students from a variety of departments/majors: Islamic Studies, Political Science, History, Asian Studies, Cultural Studies, and Liberal Arts.

Max Credits: 3
Min Credits: 3

59.316 The Uses of Multimedia I

Course ID: 6293

Course Details: The Uses of Multimedia explores how multimedia is used on the Internet as well as providing a forum and a lab for the creation of multimedia web pages. The course meets twice a week, Tuesdays and Thursdays. Includes lectures, demos and hands-on activities and the creation of student multimedia projects on the web.

Max Credits: 3
Min Credits: 3

59.325 Technology & Labor in American Industry

Course ID: 6297

Course Details:

Max Credits: 3
Min Credits: 3

59.331 Greek & Roman Art

Course ID: 6302

Course Details: A study of Greek painting, sculpture, and architecture from the Cycladic to the Hellenistic period, and an examination of Roman Art from the Etruscan age to the beginning of Christian art. Emphasis is placed on the Greek Classical period and the Roman Empire.

Max Credits: 3
Min Credits: 3

59.332 Baroque Art in Italy

Course ID: 6239

Course Details: The development of painting, sculpture and architecture in Italy during the seventeenth century with special emphasis on Rome and Venice. The role of representative artists (Caravaggio, Bernini, Borromini, Pietro da Cortona, Artemisia Gentileschi, Elisabetta Sirani and Longhena) is emphasized.

Max Credits: 3
Min Credits: 3
59.340 Women and Art
Course ID: 6241
Course Details: Investigation of the various ways women have been portrayed in the visual arts from antiquity to the present. A chronological examination of selected female artists and their milieu from the Middle Ages to the twentieth century.
Max Credits: 3
Min Credits: 3

59.345 Pre-Raphaelite Art
Course ID: 6242
Max Credits: 3
Min Credits: 3

59.349 Literature, Politics and Genocide in Cambodia
Course ID: 36699
Course Details: This course will examine various literary and political responses to the Cambodian genocide, particularly personal accounts or literary testimony by survivors and government sanctioned legal proceedings. The course will consider how the literary and political responses to the Cambodian genocide have at different times paralleled, complimented and opposed each other. The course will also ask whether their overall effect contributes to or detracts from the serving of justice and the process of healing for the survivors. To pursue these questions, we will read selections from novels and poetry written by Cambodian survivors side by side with accounts of political activities of the Cambodian government and the international community to bring the perpetrators of the genocide to justice.
Max Credits: 3
Min Credits: 3

59.356 Village Empowerment: Overcoming Global Poverty
Course ID: 35736
Course Details: Using the village empowerment Peru Project at UML as a framework and case study, students will explore solutions to overcoming poverty in the world. Poverty in public health, education, income, infrastructure and the tools to overcome these are topics to be addressed. A service-learning group project is required to address the specific needs of communities in the Village Empowerment Project. Instructors are from colleges of engineering, management, health, art and science, and government.
Max Credits: 3
Min Credits: 3

59.360 Museum Issues
Course ID: 6246
Course Details: The art museum in the United States is a unique social institution because of its blend of public and private support and its intricate involvement with artists, art historians, collectors, the art market, and the government. This course will study the art museum’s history and status in our society today. Special consideration will be given to financial, legal and ethical issues that face art museums in our time. Short papers, oral reports and visits with directors, curators and other museum officials in nearby museums will be included along with a detailed study of a topic of one's choice.
Max Credits: 3
Min Credits: 3

59.363 Introduction to Disability Studies
Course ID: 6307
Course Details: This course provides students with a wide range of interests and backgrounds with the opportunity to examine their own
mental model (attitudes/values/ assumptions) of disability. It includes an overview of the nature of mental retardation and other disabilities and it provides opportunities to explore and understand the historical social response to disability. Students will look at a range of strategies for providing support and intervention and they will learn about how to effect change through a variety of strategies, including advocacy.

Max Credits: 3
Min Credits: 3

59.369 Art, History and Film

Course ID: 30431

Course Details: Examination of issues of content, theory and criticism in the traditional, modern and contemporary lives of artists; autobiographies, biographies and historiographies as source of filmic expression. Focus on the interpretation and transformation of art historical records into filmic vision as revealed in set and costume design, music, camera technique and other aesthetic elements of film, as well as how such elements function to extend and convey directorial vision to movements in art history.

Max Credits: 3
Min Credits: 3

59.370 Washington Center Term

Course ID: 6308

Course Details:

Max Credits: 12
Min Credits: 1

59.372 Italian Mannerism

Course ID: 6237

Course Details: A study on the impact of the High Renaissance in the sixteenth century, the subsequent development of early Mannerism in central Italy and the formation of the Proto-Baroque style in Venice and Northern Italy, the establishment of the courtly Mannerist style. The role of representative artists such as Anguissola, Pontormo, Rosso, Parmigianino, Bronzino, Beccafumi, Fontana, Vasari, Veronese, Bandinelli, Cellini, Palladio, Peruzzi and Ammanati is emphasized.

Max Credits: 3
Min Credits: 3

59.373 Italian Humanism

Course ID: 6022

Course Details: A study of the waning of the Middle Ages and the dawning of the Renaissance as seen through the work of Petrarch and Boccaccio. Emphasis is on the study of sources and the influence of Petrarch and Boccaccio upon the literatures of western Europe. Conducted in English.

Max Credits: 3
Min Credits: 3

59.382 Theatre History I: Ancient Greece through the 18th Century

Course ID: 33541

Course Details: A survey of ancient to early modern theatre in its historical and social contexts, tracing changes and developments in acting styles, theatre architecture, scenic practices, dramatic literature, and the audience. The course examines how theatre both reflects and shapes the changing beliefs and priorities of a culture.

Max Credits: 3
Min Credits: 3

59.383 Theatre History II: Nineteenth Century to the Present
Course ID: 33542
Course Details: A survey of theatre in its historical and social contexts from the 19th century to the present, focusing on innovations in design and technology, the advent of the director, the emergence of modern schools of acting, and the creation of new forms of theatre to suit the changing needs of a modern world.
Max Credits: 3
Min Credits: 3

59.396 Environmental Studies Practicum
Course ID: 33369
Course Details: This course is the service learning capstone for the Environmental Studies Minor (soon to be created, after approval of this course). It emphasizes the cross-disciplinary examination of contemporary environmental issues, starting from the premise that they are multi-dimensional - biophysical, cultural, economic, ethical, historical, technical, etc. It requires only a few class meetings and otherwise involves students in work with local and regional environmental agencies and organizations. This service work is meant to encourage students to make connections between theory and practice, as well as to expand the conceptual and practical tool kit they need to understand environmental controversies and work toward sustainability.
Max Credits: 4
Min Credits: 1

59.421 Italian Renaissance Art
Course ID: 6235
Course Details: A study of painting, sculpture, and architecture in Florence, Rome and Venice during the fifteenth and sixteenth centuries. Special emphasis on the formation of the High Renaissance style and the role of representative artists of the period, such as Leonardo, Michelangelo and Raphael in Central Italy; Giorgione and Titian in Venice.
Max Credits: 3
Min Credits: 3

59.459 Play Production
Course ID: 37386
Course Details: Introduction to the design and technical aspects of theatre through hands-on experience working on campus productions. Focus on basic principles of set, lighting, props, costume, makeup, and sound production. May be repeated for credit.
Max Credits: 3
Min Credits: 3

59.470 Directed Study in Peace and Conflict
Course ID: 6318
Course Details:
Max Credits: 3
Min Credits: 3

59.471 Project in Peace and Conflict
Course ID: 6319
Course Details:
Max Credits: 3
Min Credits: 3

59.480 Integrative Fieldwork in Developmental Disabilities I
Course ID: 6321
59.481 Integrative Fieldwork in Developmental Disabilities II

Course ID: 6322

Course Details: This course is a continuation of 47.480. The classroom experience accompanies the field placement and provides a critical examination of the nature of community and advocacy in the lives of people with disabilities. Students are provided with a forum to explore personal values and attitudes relative to community and to identify key elements of healthy communities. Strategies for supporting people with disabilities to assume valued, community roles will be identified. (Field Placement Required)

Max Credits: 3
Min Credits: 3

59.496 Directed Study in Peer Tutoring

Course ID: 6326

Course Details:

Max Credits: 9
Min Credits: 1

59.499 Directed Studies in Cultural Studies

Course ID: 35784

Course Details: An individual supervised research project relating to cultural studies. A significant research paper is required for completion of this course.

Max Credits: 6
Min Credits: 3

60.301 Intermediate Accounting I

Course ID: 6331

Course Details: Examines the generally accepted accounting principles relating to the preparation of financial statements. The student will study, in depth, the valuation and disclosure problems associated with the assets of the enterprise. The accounting framework and pronouncements of the Financial Accounting Standards Board are emphasized.

Max Credits: 3
Min Credits: 3

60.302 Intermediate Accounting II

Course ID: 6332

Course Details: Presents the in-depth study of the valuation and disclosure issues associated with corporate liabilities and stockholders' equity. Emphasis is placed on the statements of the Financial Accounting Standards Board.

Max Credits: 3
Min Credits: 3

60.303 Accounting Information Systems

Course ID: 6333
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

60.321 Cost Accounting

Course ID: 6335

Course Details: An examination of the manufacturing function from the view of the cost accountant. Managerial control of the elements of product costs will be studied with an emphasis on cost accumulation systems both historical and estimated.

Max Credits: 3  
Min Credits: 3

60.331 Cost Management Systems

Course ID: 6337

Course Details: This course is an upper-level management accounting course for non-accounting majors. It takes a decision-oriented approach and focuses on the manager’s view, as opposed to the accountant’s view, of the decision process and its related information needs. Traditional cost accounting and new cost management models will be explored and contrasted, but the emphasis will be on management systems which examine a proactive role in planning, managing, and reducing costs.

Max Credits: 3  
Min Credits: 3

60.401 Advanced Financial Accounting I

Course ID: 6344

Course Details: Explores issues in accounting for large, multinational business entities. Consolidation, mergers, home office/branch accounting, international accounting topics, partnership and nonprofit organizations are also examined.

Max Credits: 3  
Min Credits: 3

60.421 Auditing

Course ID: 6347

Course Details: An examination of the purposes of financial statement audits. The following topics will be examined in depth: auditing standards, professional ethics, legal responsibilities, internal control, audit evidence, financial statement disclosures and audit reports.

Max Credits: 3  
Min Credits: 3

60.431 Federal Income Taxes

Course ID: 6349

Course Details: Deals with the basic rules and regulations of the Internal Revenue Code as it affects the individual and the corporation. An understanding of the code is developed through lectures, assigned readings, research, and the solution to a wide variety of problems.

Max Credits: 3  
Min Credits: 3

60.479 Accounting Internship

Course ID: 6355

Course Details: Arrangements must be made with department internship coordinator.
Max Credits: 3  
Min Credits: 3 

**60.499 Independent Studies**

Course ID: 6356

Course Details: An opportunity for students to carry out individualized study relating to the field of accounting under the supervision of a member of the accounting faculty.

Max Credits: 3  
Min Credits: 3 

**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 

**60.621 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

60.645 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

60.655 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

61.300 Investments

Course ID: 6384
Course Details: Introduction to the principles of investment. Security analysis of stocks and bonds for markets, industries and firms. Primary and secondary capital markets, money markets, and other investment alternatives in terms of risk-return tradeoffs. Options and futures as investment alternatives. Emphasis is on fundamental and technical analyses.

Max Credits: 3
Min Credits: 3

61.301 Business Finance

Course ID: 6385
Course Details: Principles of financial management, including working and fixed capital, sources of funds, financial statements, financial planning and capital structure.

Max Credits: 3
Min Credits: 3

61.303 Methods of Financial Analysis

Course ID: 6387
Course Details: The techniques of financial analysis in depth. Topics covered include cash management, credit scoring, receivables monitoring, inventory management, financial statements analysis and forecasting, financial distress prediction, mergers and acquisitions techniques and other selected topics.

Max Credits: 3
Min Credits: 3

61.421 Portfolio and Security Analysis

Course ID: 6392
Course Details: Advanced course on investment theory and applications. Topics covered include stock market behavior, portfolio and capital market theories, and securities analysis.

Max Credits: 3
Min Credits: 3

61.431 Capital Planning

Course ID: 6393
Course Details: Advanced study of the principles of financial analysis. Covers topics such as acquisition of long-term assets, capital budgeting models, and the analysis of mutually exclusive projects.

Max Credits: 3
Min Credits: 3

61.434 Investment Management

Course ID: 6396
Course Details:

Max Credits: 3
61.479 Current Topics in Finance

Course ID: 35274

Course Details: This course expands the student's knowledge in the area of financial decisions for the sustainable growth of business organizations through investments in real assets and financial assets. Topics include investing in real assets under conditions of uncertain cash flows or inflation or projects have differing lives; decisions on whether to "Buy" or "lease." The topics also include investing in financial assets through Mergers, Takeovers and Acquisitions. Other related topics are disinvesting through Divestitures; avoidance of Financial Distress and Bankruptcy etc.

Max Credits: 3
Min Credits: 3

61.489 Internship In Finance

Course ID: 6399

Course Details: Opportunity for students to earn academic credit through the integration of professional on-the-job experience and related academic work. Project jointly supervised by a faculty member and representative of the employing organization.

Max Credits: 3
Min Credits: 3

61.491 International Finance

Course ID: 6400

Course Details: Financial aspects of international business operations. Evaluation of risks associated with multinational operation and managerial decision making under conditions of financial uncertainty.

Max Credits: 3
Min Credits: 3

61.499 Independent Study Finance

Course ID: 6401

Course Details: An opportunity for students to carry out individualized study relating to the field of finance under the supervision of a member of the faculty.

Max Credits: 3
Min Credits: 1

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
61.610 Global Financial Markets and Monetary Policy

Course ID: 6405

Course Details: This course examines the interactions between changing perceptions of macroeconomic conditions and movements in the prices and yields on financial market instruments. The orientation of this course is heavily institutional with emphasis on helping students develop a "Wall Street" perspective on asset choice and the likely impact of macroeconomic conditions and policies on financial market prices. At the same time, the dependence of macroeconomic policy outcomes on global financial markets' expectations of future real growth in the US and in the world economy, expectations of inflation, sovereign default risk and of interest rates will be stressed. This course should help students understand the macroeconomic and policy determinants of the interest rate environment in which corporate financing decisions occur.

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

61.691 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

62.201 Marketing Principles

Course ID: 6426

Course Details: The role of marketing in the economy. The elements of the marketing mix—product, price, distribution, and promotion—are discussed in the context of social and political constraints on marketing activity.

Max Credits: 3
Min Credits: 3

62.302 Marketing Research

Course ID: 6428

Course Details: Analysis of the information gathering function of marketing management. Design, execution and evaluation of marketing research.

Max Credits: 3
Min Credits: 3

62.303 International Marketing

Course ID: 6429

Course Details: The marketing aspect of international business. Cultural dynamics, economics, political and legal constraints as they affect international marketing institutions and practices.

Max Credits: 3
Min Credits: 3

62.311 Marketing Opportunity Analysis

Course ID: 6431

Course Details: Focuses on the strategic role of marketing and the functions, which leads the business to new products and new markets. Emphasis on market development and product development.

Max Credits: 3
Min Credits: 3

62.312 Marketing Tactics

Course ID: 6432

Course Details: Focuses on tactical process of managing the marketing mix. Emphasis on market penetration. Term project: marketing plan. Career relevance: understand the role of the marketing communications specialist, appreciate sales and service support activities.

Max Credits: 3
Min Credits: 3

62.313 Sales and Customer Relations

Course ID: 6433

Course Details: Focuses on the concept of customer value, operating decisions in sales, customer service, and account management. Focus is given on calculating the value of a good or service to the customer, professional selling and sales forecasting, retail and wholesale operations, purchasing, and logistics.
Max Credits: 3
Min Credits: 3

62.402 Buyer Behavior

Course ID: 6435

Course Details: Applications of behavioral theories and techniques to the understanding of consumer and organizational purchasing processes.

Max Credits: 3
Min Credits: 3

62.407 Retailing

Course ID: 6440

Course Details: Development, organization and management of various types of retailing institutions. Evaluation of retail locations and contemporary retailing problems.

Max Credits: 3
Min Credits: 3

62.496 Current Topics in Marketing

Course ID: 6446

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

62.498 Marketing Internship

Course ID: 6448

Course Details: Specific projects undertaken by senior marketing students under joint supervision of department internship coordinator and representative from the business organization hosting the internship. Enrollment restricted to marketing seniors selected by internship coordinator. P/NC (free elective credit) only.

Max Credits: 3
Min Credits: 3

62.499 Independent Study in Marketing

Course ID: 6449

Course Details: An opportunity for the student to carry out individualized study relating to the field of Marketing under the supervision of a member of the faculty

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

62.630 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

63.210 Operations Analysis Techniques

Course ID: 6486

Course Details: Introduction to quantitative methods for analyzing business problems. Analytic methods include decision analysis, linear programming, queuing and simulation. Applications address issues in areas such as marketing, production, finance and logistics.

Max Credits: 3
Min Credits: 3
63.300 Application Systems Development

Course ID: 6487

Course Details: Provides an understanding of the fundamental concepts of software application development for business in an object-oriented, Graphical User Interface (GUI) environment utilizing structured programming concepts. Course involves hands-on application development in a 4GL environment.

Max Credits: 3
Min Credits: 3

63.301 Management Information Systems

Course ID: 6488

Course Details: Structure and foundations of information systems for management from both a user’s and designer’s perspective.

Max Credits: 3
Min Credits: 3

63.303 Database Management Systems

Course ID: 34607

Course Details: An introduction to databases and Database Management Systems (DBMS). Topics include basic concepts of database technology, an introduction to SQL, techniques for logical and physical database design, interaction with a commercial DBMS, and data warehousing.

Max Credits: 3
Min Credits: 3

63.307 Systems Analysis and Design

Course ID: 6491

Course Details: An overview of the information system and systems development life cycle (SDLC). Emphasis on tools and techniques that analyst can use to document information systems. Current, classical and structured tools for describing data flow, data structure, process flow, file design, input and output design and program applications will be discussed.

Max Credits: 3
Min Credits: 3

63.308 Enterprise Systems Management

Course ID: 35576

Course Details: This course, a MIS elective, focuses on implementation of Enterprise Resource Planning systems (ERPs) and its impact on business change process in organizations. ERPs integrate information and applications, spanning the functional boundaries within an organization. The goals of the course are to help students understand ERP systems and their underlying components and technologies, and the business change process with ERP in organizations. The course covers people and technical issues during the pre-implementation, implementation and post-implementation stages of the ERP systems life-cycle.

Max Credits: 3
Min Credits: 3

63.371 Operations Management

Course ID: 6492

Course Details: Principles of production/operations management. Nature and function of production systems; operational planning and control; plant layout; materials handling; inventory and quality control.

Max Credits: 3
Min Credits: 3
63.402 Global Operations and Supply Chain Management

Course ID: 36450

Course Details: A supply chain consists of all of the activities and organizations required to produce and deliver a good or service from raw materials to the final end user. Global Operations and Supply Chain Management (GOSCM) involves the coordination of this complex network of organizations and flows of materials, funds, and information among and between the stages of a supply chain. GOSCM integrates the traditional business functions of operations, marketing, logistics, finance, and information systems in an international business context. The course traces the flow of products and services from development through delivery to the final user and will address topics such as global sourcing strategies, managing demand and supply uncertainties distribution strategies and logistics network design for global operations, global strategic alliances, and the role of information technology and Enterprise Resource Planning (ERP) in managing global supply chains.

Max Credits: 3
Min Credits: 3

63.404 Data Communications and Networks

Course ID: 6496

Course Details: A comprehensive overview of concepts and practice in Business Data Communications and Networking. Explores the principles and applications of data communications in organizations from familiar applications into the more technical aspects of telecom architecture. Analyzes the various types of telecom networks, and how they are designed and configured, including issues involving the management and decision-making process within the telecom department. Students provided with hands-on network administration and configuration experience with a LAN administrator.

Max Credits: 3
Min Credits: 3

63.407 Electronic Business

Course ID: 6499

Course Details: This course familiarizes students with current and emerging electronic commerce technologies using the Internet. Focus is on both Web Design and E-Business. The web design portion provides a foundation for designing dynamic interactive websites for electronic commerce. It addresses planning and developing well-designed websites that combine effective navigation with the balanced use of graphics, text, color, and database access. The electronic business section covers both the theory and practice of doing business over the Internet including issues relating to Internet technology for business advantage; managing electronic commerce funds transfer; reinventing the future of business through electronic commerce; business opportunities in electronic commerce; electronic commerce website design; social, political and ethical issues associated with electronic commerce; and business plans for technology ventures.

Max Credits: 3
Min Credits: 3

63.408 Current Topics in Management Information Systems

Course ID: 6500

Course Details: This course addresses one or more current topics to the field of Information Systems. Topics can change at each course offering. Typically, the course will focus on an emerging information technology, discussing fundamental concepts and the technology's application to and effect on business. Examples of possible topics are expert systems, hypermedia and hypertext systems, factory automation systems, and the planning for and management of information resources. Subject matter to be announced in advance. Visit the current semester schedule on the Continuing Studies website for more details.

Max Credits: 3
Min Credits: 3

63.409 Directed Study in Management Information Systems

Course ID: 6501

Course Details:

Max Credits: 3
Min Credits: 3
63.469 Logistics and Transportation

Course ID: 37423

Course Details: This case-based course will examine methods and strategies for managing and controlling material movement, with particular emphasis on international operations, from the purchase of production materials to the control of work in process to the distribution of the finished product. Strategies that will be discussed include the design of international distribution networks, the use of third-party logistics providers, and the creation of links between logistic systems and marketing to create competitive advantage. The course will also explore tactical issues that must be managed to pursue a logistics strategy successfully, including choices regarding means of transportation, packaging, and inventory policies. Underlying themes of the course will be the use of information technologies (such as electronic data interchange and bar coding) and mathematical models to support logistics decision-making.

Max Credits: 3
Min Credits: 3

63.470 Advanced Topics in Service Management

Course ID: 37422

Course Details: This course is intended to provide students with the necessary tools and understanding for managing service operations. Service firms represent the fastest-growing sector of the economy. This course will focus on the various aspects involved in the management of service operations. The service operations are managed differently to their intangibility, time-sensitivity, high levels of customer involvement and lack of engineering standards. This course will explore topics such as design and delivery of services, the measurement of productivity and quality, managing capacity and demand, redesign of service delivery processes, management of technology, and others.

Max Credits: 3
Min Credits: 3

63.471 Managerial Quality Control

Course ID: 6502

Course Details: Views quality control from the total or company-wide perspectives. It contains traditional material on statistical process control (SPC), quality cost, quality assurance, quality information systems, as well as the recent management theories and ideas of Deming, Jurand, Ishikawa, and Taguchi.

Max Credits: 3
Min Credits: 3

63.479 Directed Study in Operations Management

Course ID: 6507

Course Details: Topics of current interest in operations management. Subject matter to be announced in advance.

Max Credits: 3
Min Credits: 3

63.489 Internship in Management Information Systems

Course ID: 6508

Course Details: Opportunity for students to earn academic credit through the integration of professional work experience with related academic work. Project jointly supervised by a faculty member and representative of the employing organization.

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

63.630 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

63.779 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

63.798 Independent Study in Management Information Systems
Course ID: 6538
Course Details:
Max Credits: 3
Min Credits: 3

64.361 Starting a New Venture
Course ID: 33876
Course Details: This course is designed for students with a curiosity and interest in starting a new business. In this course, students will explore the entrepreneurship process including how entrepreneurs discover and evaluate the sources and opportunities for new business ventures; how they assemble the resources, how they operate and grow a new business; and finally how they harvest their hard work as successful entrepreneurs. The course covers a variety of topics associated with launching and running a new business venture, such as marketing, financing, building the venture team, legal and regulatory issues, and social and environmental issues.
Max Credits: 3
Min Credits: 3

64.362 Corporate Entrepreneurship
Course ID: 33877
Course Details: This course focuses on entrepreneurship in established companies. In order to compete in today's dynamic business environment, organizations need to spur and promote entrepreneurial thinking and actions as a way of remaining innovative and competitive. Thus, the course explores how the entrepreneurship process works within an existing organization, including the identification of strategies companies engage to rejuvenate their business, markets and industries. Students will also study how individuals can play a role in promoting entrepreneurial activities in their organizations.
Max Credits: 3
Min Credits: 3
64.463 Managing Innovation

Course Details: A critical issue for entrepreneurs and managers is how to translate opportunity into competitive advantage. This course examines theories of innovation and their application to real-world business opportunities. A particular focus is placed on emerging scientific and technical innovations and the opportunities and challenges they present to both existing businesses and new venture entrepreneurs. 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

64.464 Finance for Emerging Business Enterprises

Course Details: Course content covers financial aspects of an entrepreneurial venture from its start to a potential sale. Major sources of financing covered in the course include venture capital, private placement, bank credit, and public financing. Other financial concepts covered include organization of the business, financial forecasting, financial analysis, firm valuation and acquisitions.

Max Credits: 3
Min Credits: 3

64.480 Current Topics in Entrepreneurship

Course Details: Topics of current interest in entrepreneurship. 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

64.489 Internship in Entrepreneurship

Course Details: Opportunity for students to earn academic credit through the integration of professional work experience with related academic work. Project jointly supervised by a faculty member and representative of the employing organization.

Max Credits: 3
Min Credits: 3

64.640 New Venture Creation

Course Details: This course is designed for students who are interested in entrepreneurship. The focus is on entrepreneurship as a 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 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. 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

64.688 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
66.100 First Year Management Seminar - 1

Course ID: 34934

Course Details: This seminar will provide students with an introduction to those concepts that will help them succeed as university students during that first month and for the remainder of their academic careers. Some of the issues that will be addressed are: time management, appropriate and healthy personal life-styles, personal financial planning, the services provided by Career Services, the Centers for Learning, as well as the Tutoring Lab. Furthermore, students will be exposed to the College of Management's functional areas and learning objectives.

Max Credits: 1
Min Credits: 1

66.101 First-Year Management Seminar - 2

Course ID: 35081

Course Details: The purpose of the First-Year Management - 2 (FYMS - 2) is to deepen students understanding and appreciation of the functional areas within the College of Management along with their understanding of themselves as learners in the College. This will be accomplished through the administration of self-assessment tools such as the Myers Briggs Type Indicator (MBTI), participation in an online business simulation addressing the business functional areas and through participation on in-class and virtual teams.

Max Credits: 1
Min Credits: 1

66.210 Professional Communications

Course ID: 32962

Course Details: This course provides students with the theory and practice of successful oral and written communication in business. Emphasis is on the development and improvement of communication skills needed for today's fast-paced organizations. Such skills include written communication in short memos and reports, including the use of conferencing technology to convey information. Additionally, the course focuses on oral communication through presentations and discussions as well as the use of current presentation software.

Max Credits: 3
Min Credits: 3

66.301 Organizational Behavior

Course ID: 6612

Course Details: Examination of individuals, groups, and organizations from a behavioral and structural perspective. Topics include employee motivation and satisfaction, communication, power and politics, the dynamics of groups and teams, conflict management, and organizational design and change.

Max Credits: 3
Min Credits: 3

66.310 Human Resources Management

Course ID: 6613

Course Details: Current issues in the management of human resources. Recruitment, selection, work force training and development, reward systems, employee health and safety, legal issues, managing diversity, performance evaluation, and human resource planning.

Max Credits: 3
Min Credits: 3

66.410 Negotiation Strategy and Process

Course ID: 6637

Course Details: Analysis and application of the key factors that shape and characterize different negotiation situations; the analytical skill to diagnose potential areas of difference and select appropriate strategies to address them; the interpersonal skills to tactically manage
the specific communication and decision-making behaviors during the actual bargaining; and the ability to recognize how one's own personality, value system and perceptions affect the choice of tactics and behavior.

Max Credits: 3
Min Credits: 3

66.415 Managing Teams and Projects

Course ID: 6638
Course Details: Provides students with the knowledge and skills to effectively manage in the more flexible, team-oriented environments increasingly found in contemporary organizations. Emphasis on the dynamics of groups and how they are transformed into productive teams; strategies for systematic goal setting; building team structure; using the team as a basis for problem-solving; facilitating team processes. The course focuses on today's smaller, "self-renewing" organizations, as well as on more traditional work group settings.

Max Credits: 3
Min Credits: 3

66.420 Leadership Processes

Course ID: 6639
Course Details: Examines leadership as a dynamic influence process in organizations. The role of leader characteristics and styles, matching leadership behavior and situations, issues in power and politics, empowerment and participation, conditions for leadership effectiveness.

Max Credits: 3
Min Credits: 3

66.435 Comparative Management

Course ID: 6650
Course Details: Comparison of management concepts, systems and practices in different societies, and institutional settings. The impact of economic, social, political, and cultural variables on management styles, processes and organizational structures.

Max Credits: 3
Min Credits: 3

66.445 Contemporary Management Development

Course ID: 6653
Course Details: Provides students the opportunity to develop the skills and capabilities needed to select, gather, synthesize and use new information to enhance their professional growth and development.

Max Credits: 3
Min Credits: 3

66.450 Labor, Diversity, and Human Resource Management

Course ID: 6654
Course Details: In this course we examine solutions to two emerging questions: how do we manage, motivate, and reward the increasingly diverse American work force, and what part will American labor unions play in this process. We will study these issues using a variety of sociological, psychological, economic, legal, managerial, and comparative materials, but the focus will remain on the options available to the human resource manager.

Max Credits: 3
Min Credits: 3

66.480 Current Topics in Management

Course ID: 6668
66.489 Internship In Management

Course Details: Opportunity for students to earn academic credit through the integration of professional work experience with related academic work. Project jointly supervised by a faculty member and representative of the employing organization.

Max Credits: 3
Min Credits: 3

66.490 Strategic Management

Course Details: An integration of knowledge in the various functional areas of management toward solution of problems affecting the character and success of the total enterprise. Corporate strategy and its implementation via appropriate policies.

Max Credits: 3
Min Credits: 3

66.499 Independent Study in Management

Course Details: An opportunity for the student to carry out individualized study relating to the field of management under the supervision of a member of the faculty.

Max Credits: 3
Min Credits: 3

66.501 Organizational Behavior

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

66.511 Global Enterprise and Competition

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 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  

66.630 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  

66.655 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 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 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 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

66.725 Negotiations

Course Details: Pre-Requisite: MBA Foundation Core.

Max Credits: 3

Min Credits: 3

69.3CE Cooperative Education Work Experience I

Course Details: This zero credit course is specifically designated for undergraduate Business students who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program and have secured their first, full-time co-op employment. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an Industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.

Max Credits: 0

Min Credits: 0

69.4CE Cooperative Education Work Experience II

Course Details: This zero credit course is specifically designated for Business undergraduate students who are participating in the voluntary Business co-op curricular option, and have successfully secured their second, full-time co-op employment. The co-op experience is designed to provide students the opportunity to develop and enhance their business and professional skills within a business or industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by their Co-op Coordinator.

Max Credits: 0
Min Credits: 0

69.210 Professional Development Seminar

Course ID: 36956

Course Details: The Professional Development Seminar is designed to provide students with the necessary structure, resources, and support to successfully secure and engage in their first cooperative education experience. Through a variety of teaching methodologies and assignments, students will participate in a sequence of learning activities including self-assessment, industry research, and the development of co-op learning objectives. Students will prepare to engage in the job search process through resume writing, strategic interviewing, professional networking and through learning professional behavior and presentation skills. The goal of the course is to assist each student in developing a sound plan of action to successfully participate in the cooperative education experience.

Max Credits: 1
Min Credits: 1

69.310 Co-op Assessment 1

Course ID: 36957

Course Details: The primary goal of this seminar is to assist students in the overall assessment of their overall cooperative education experience. Through facilitated small group discussion, individual consultation and hands on practice, students will have an opportunity to identify and articulate their technical and professional skills, and explore how these skills and their co-op employment might be translated and leveraged into future work environments and their academic program at UML.

Max Credits: 1
Min Credits: 1

69.410 Co-op Assessment 2

Course ID: 36958

Course Details: This seminar is designed to support and assist students in the continued assessment of their cooperative education experience. Through a deepening of their work in Co-op Assessment 1, students will review their overall performance in the cooperative education program, while continuing to demonstrate their technical and professional skills through written work and public presentations to multiple audiences. It is expected that students will clearly define their future academic and career goals, enhance their professional networks, and develop a future plan to support their engineering aspirations.

Max Credits: 1
Min Credits: 1

70.100 Artbotics

Course ID: 33786

Course Details: This course is designed for students in a variety of majors to explore the intersection between Art and Computer Science, especially Robotics, through community-based public exhibitions and service-learning experience. In this project-driven class, you will learn founding principles in both the fields of Art and Computer Science, and put them into practice by creating interactive, tangible exhibits that are displayed in public settings. The knowledge and experience gained during the class will be further deepened by the service learning experience of mentoring high school students in the community. The course will also include guest lectures from practitioners in Art and Computer Science.

Max Credits: 4
Min Credits: 4

70.101 Art Concepts I (studio)

Course ID: 6823

Course Details: Art Concepts I will focus on learning the visual language of the creative process through an examination of the principles of two-dimensional visual organization. These fundamental basics form the underlying structure of all studio and communication arts. Through slide lecture, guest lectures, field trips, and studio projects, students will begin to understand the many forms that visual expression takes. The course will develop creative problem solving skills and students will learn to respond to personal challenge. Students will also be instructed in the principles of professional execution and be introduced to diverse modes of thought, media, and aesthetic expression.

Max Credits: 3
### 70.102 Art Concepts II

**Course ID:** 6824  
**Min Credits:** 3  
**Max Credits:** 3

Course Details: Art Concepts II will focus on learning the visual language of the creative process through an examination of the principles of three-dimensional visual organization. These fundamental basics form the underlying structure of architecture, environmental graphic design, product design and sculpture. Through slide lecture, guest lectures, field trips, and studio projects, students will begin to understand the many forms that three dimensional expression takes. The course will develop creative problem solving skills and students will learn to respond to personal challenge. Students will also be instructed in the principles of professional execution and be introduced to diverse modes of thought, media, and aesthetic expression. Art majors only. Fall and Spring.

### 70.113 Digital Foundations

**Course ID:** 35096  
**Min Credits:** 3  
**Max Credits:** 3

Course Details: This course explores the computer as a tool of the visual language. Topics included are raster and vector-based image making, art for the internet & mobile devices, and current image capture and output methods. This course will introduce Photoshop, Illustrator, Flash and a basic programming with the aim of expanding the artist's toolkit. Lectures, readings, and discussions will provide an overview of history and contemporary ideas on the use of computers in art.

### 70.117 Arbotics

**Course ID:** 33571  
**Min Credits:** 4  
**Max Credits:** 4

Course Details: Arbotics focuses on exploring the intersection among art, computer science, and robotics. The course is project-driven, and includes public exhibitions and service learning. Students will learn founding principles in both the fields of art and computer science, and put them into practice by creating interactive, tangible exhibits that are displayed in public settings. In the service learning component, students will mentor local high school students in the same topics. The course will also include guest lectures from practitioners in the fields.

### 70.201 Form And Content

**Course ID:** 6827  
**Min Credits:** 3  
**Max Credits:** 3

Course Details: Form and Content is considered the capstone course of the Art Foundations Requirement. Through a variety of studio assignments and individual projects students will explore the integration of humanities related concepts and develop an understanding of how visual artists think, live and function in the twenty first century. As part of the course requirements students will participate in the foundations exhibition at the end of the semester. Art majors only. Fall and Spring.

### 70.230 Typography

**Course ID:** 6830  
**Min Credits:** 3  
**Max Credits:** 3

Course Details: The study of lettering concepts and techniques, including the history of letters, styles and families of type, letter design, hand-drawn to computer-based lettering approaches and their effect and uses in communication. Emphasis will be on creative and aesthetic communication. Fall, alternate years.
70.231 Typography II
Course ID: 30372
Course Details: Continuation of 70.230
Max Credits: 3
Min Credits: 3

70.245 Desktop Publishing: Layout and Production
Course ID: 6832
Course Details: Introduces students to the complexities involved in preparing their designs for print: electronic page layout and design, proofing, specifying inks, trapping, cropping, overprinting, printing separations, proofing, and more. Students will learn about the differences between preparing their design work electronically or manually and will learn more about the different printing processes that are available. Printing terminologies and printing industry standards will be covered. Field trips may be made to area printing companies for demonstrations on the print production process.
Max Credits: 3
Min Credits: 3

70.255 Drawing - Form and Space
Course ID: 6835
Course Details: Provides a foundation in basic drawing concepts using a variety of media and approaches. The emphasis is on building visual literacy and its application to the realm of ideas. A wide range of assignments are given to develop graphic expression.
Max Credits: 3
Min Credits: 3

70.259 Papermaking
Course ID: 6836
Course Details: The papermaking course is designed to explore paper, not just as a surface to receive an image, but as a material capable of being an artistic expression in and of itself. The course will explore the processes and techniques of making images in handmade paper, making images on handmade paper, making visual designs out of handmade paper and casting handmade paper into three-dimensional sculptural forms. Spring, alternate years.
Max Credits: 3
Min Credits: 3

70.261 Photography I
Course ID: 6837
Course Details: A foundation course that covers the basic camera and darkroom techniques as well as aesthetic principles. Emphasis will be on black and white film and paper emulsions. Students learn to develop and print their own photographs. Fall and Spring.
Max Credits: 3
Min Credits: 3

70.262 Digital Imaging and Photography: Photoshop
Course ID: 6838
Course Details: This course will offer the student a transition between traditional photographic imaging and digital photographic imaging. The course will cover the fundamentals of digital scanning, digital capture and image manipulation. Image preparation for other media will also be explored. Basic familiarity with the Mac OS and/or Windows platforms required. 6 Contact Hours required for Day School students.
Max Credits: 3
Min Credits: 3
70.264 Computer Graphics & Illustration

Course ID: 6840

Course Details: Students will produce a number of illustrations, starting with the traditional approach to illustration and then rendering their concepts using computer illustration and imaging software. Topics include methods for rendering artwork, capturing an expressive illustrative style, and portraying different moods or messages within the illustration. Students will learn to illustrate effectively using the many tools available to them within several software applications.

Max Credits: 3
Min Credits: 3

70.265 Computer Art I

Course ID: 6841

Course Details: An aesthetics and communications course using the computer as the primary tool for translating art ideas into physical form. The emphasis will be on practical usages of existing Macintosh software as a means of creation.

Max Credits: 3
Min Credits: 3

70.266 Alternative Photo Processing

Course ID: 31970

Course Details: Alternative Photo Processing give the serious photography student an opportunity to learn historic and contemporary alternative processes such as Cyanotype, Van Dyke Brown, Kallitype, Palladium, and Image Transfers. Alternative methods of creating negatives utilizing photocopiers, inkjet printers, Cliché Verre, and Acrylic Lifts will give student the opportunity to make handmade photographs with and without a camera.

Max Credits: 3
Min Credits: 3

70.267 Printmaking

Course ID: 6842

Course Details: An introduction to basic printmaking processes and aesthetics with the emphasis on etching. The approach is concept oriented, emphasizing experimentation and exploration on an individual level to communicate ideas. Fall.

Max Credits: 3
Min Credits: 3

70.269 Color

Course ID: 6843

Course Details: A course in the systematic study of color and color theory to sharpen visual acuity, stimulate creativity and develop a greater facility in the use of color. Spring.

Max Credits: 3
Min Credits: 3

70.271 Painting I

Course ID: 6844

Course Details: Presents oil painting techniques as vehicles for serious creative expression. A variety of assignments will be given to help the student build proficiency in the use of color, paint handling, and subject matter.

Max Credits: 3
Min Credits: 3
70.273 Water Media Studio

Course ID: 6845

Course Details: The technical and creative use of water based media as they apply to fine arts and graphic design. Assignments in acrylic, gouache, watercolor, and ink are designed to stimulate independent thinking. A final self-assigned project is required.

Max Credits: 3
Min Credits: 3

70.275 Sculpture

Course ID: 6846

Course Details: The exploration of three-dimensional form through the use of basic materials, methods and approaches. Assignments will include expressive problems based on human and non-objective form relationships. Spring.

Max Credits: 3
Min Credits: 3

70.281 Ceramics I

Course ID: 6848

Course Details: Introduces the student to the basic hand-building techniques, wheel throwing, and ceramic sculpture. The course will also examine clay, the material, glaze techniques, and firing processes.

Max Credits: 3
Min Credits: 3

70.291 Graphic Design I

Course ID: 6849

Course Details: Exercises, lectures and projects will introduce students to graphic design principles and techniques. Course will begin with a fundamental study of image, form, and space relations, then cover such topics as working with grids, typography basics, page layout, the introduction of color, rendering techniques, history, and more. Students will be assigned a series of projects to enhance their visual communication skills.

Max Credits: 3
Min Credits: 3

70.297 Studio Workshop

Course ID: 6850

Course Details: Presents a study of studio problems in visual structures and organization, as well as an exploration of various media and techniques. Topics will vary. This course may be repeated.

Max Credits: 3
Min Credits: 3

70.298 Book Arts

Course ID: 6851

Course Details: Book Arts will engage students in the design and fabrication of handmade, one-of-a-kind artists books. A wide variety of material and processes will be investigated. Students will learn how to produce compelling book structures for visual and graphic content. The course will introduce students to the history of Eastern and Western methods of bookmaking as well as the contemporary practice of one-of-a-kind conceptual artists books. The three-dimensional possibilities of bookmaking will also be explored.

Max Credits: 3
Min Credits: 3
70.299 Studio Workshop

Course ID: 6852

Course Details: In this course you will learn how to develop your own ideas and artistic voice. Using the tools available to graphic designers and artists, you will work independently on several projects. You will explore visual representation through literal applications, metaphors, visual poetry, and studies in abstraction. The theme for the semester being autobiography, you will gather information from your personal lives to inform each project. Research and project development are important components of the course.

Max Credits: 3
Min Credits: 3

70.325 Ceramics II

Course ID: 35291

Course Details: Building on Ceramics I as an introductory course, Ceramics II will ask the student to explore functional and nonfunctional ceramic form. Students will be expected to challenge themselves with scale, advanced glaze methods and they will become familiar with kiln firings. Historical and contemporary issues in ceramics will be covered through lectures, slide presentations and critiques.

Max Credits: 3
Min Credits: 3

70.355 Drawing II

Course ID: 6855

Course Details: The emphasis is on giving form to ideas through building a solid sense of visual literacy. Assignments include a wide range of color media, surface, and subject matter with the focus on the psychological and structural use of color, creative experimentation, and the development of personal style. Fall and spring.

Max Credits: 3
Min Credits: 3

70.359 Sculpture II

Course ID: 6858

Course Details: A course allowing the student to further develop his or her techniques and understanding of sculptural form, leading to a more personal vocabulary. Conventional techniques will be extended to cover more contemporary materials and methods. Spring, alternate years.

Max Credits: 3
Min Credits: 3

70.361 Photography II

Course ID: 6860

Course Details: An advanced course in black and white photography that includes instruction in technique and vision. Emphasis will be on development of a cohesive body of work in photography.

Max Credits: 3
Min Credits: 3

70.362 Advanced Digital Imaging

Course ID: 6861

Course Details: Students will continue to develop their creative conceptualization skills and practice using advanced-level techniques in Photoshop as they create a number of visually compelling images. Projects will address visual problem solving for commercial applications and digital imaging as an emerging medium in fine art. Students should have basic knowledge of Photoshop and design composition skills prior to registering for this course.

Max Credits: 3


Min Credits: 3

**70.365 Computer Art II**

Course ID: 6862

Course Details: Designed to focus on advanced projects using the Macintosh platform. Focus is on design, layout, animation and video.

Max Credits: 3

Min Credits: 3

**70.369 Monotypes**

Course ID: 6864

Course Details: Exploration of the one-of-a-kind "painter's print". Emphasis is on the development of personal expression through a variety of assignments and techniques. Three portfolios of prints are required, two with assigned topics, and one with a self-assigned theme. Fall, alternate years.

Max Credits: 3

Min Credits: 3

**70.370 Figure Drawing**

Course ID: 6865

Course Details: The study of the draped and undraped figure from life, stressing both sound observation and the creative use of human form as a vehicle for personal expression. A variety of assignments, graphic media, and approaches will be given in order to help explore both philosophical and aesthetic issues. Fall, alternate years.

Max Credits: 3

Min Credits: 3

**70.371 Painting II**

Course ID: 6866

Course Details: Designed to allow students to develop individual style and approach to content through a series of self-initiated paintings. Students will work closely with the instructor to develop a cohesive series that has a sound philosophical and aesthetic basis. Spring, alternate years.

Max Credits: 3

Min Credits: 3

**70.372 2D Animation**

Course ID: 6867

Course Details: This course will provide students with the fundamental understanding about the process and the concepts in animation for narrative and experimental expression. Preproduction including scripting and storyboarding will be especially emphasized. Hybrid techniques in both traditional and digital animations including hand-drawing, stop-motion, rotoscoping, pixilation as well as tweening will be introduced. Static and kinetic aesthetics of moving images will be explored through the review of historic and contemporary animations, and through the production. Students from this course will make a much smoother transition to 3D animation courses, Language of Video, Interactive media as well as Web Design/Art. The course will also introduce the student to historical and contemporary perspectives related to the discipline.

Max Credits: 3

Min Credits: 3

**70.373 Professional Photography**

Course ID: 6868

Course Details: A professional level course in advertising product and studio portrait photography. Students will learn view camera techniques as well as principles of lighting using strobe equipment. Fall, alternate years.
**70.374 Introduction to 3D Modeling and Animation**

Course ID: 6869

Course Details: This course will focus mainly on the forms, materials, and composition of 3D computer graphics in the various environments. Students will explore the possibility of 3D computer graphics for creative expression as well as innovative visual communications such as animation, game, sculpture, print and design. Rendering, lighting and camera as well as material and texturing techniques will be also explored. The course will also introduce the student to historical and contemporary perspectives related to the discipline.

Max Credits: 3
Min Credits: 3

**70.375 Language of Video**

Course ID: 6870

Course Details: An introductory course in video camera principles and editing functions. Utilizing writing and still photography, students will explore the language of video in both images and sound as they produce factual documents and/or personal fiction.

Max Credits: 3
Min Credits: 3

**70.376 3D Animation I**

Course ID: 6871

Course Details: Students will learn the fundamentals of computer generated 3D modeling and animation. the emphasis will be on virtual sculpting, digital cinematography as well as the fundamental process of animation production including script & concept development, storyboarding, modeling, animating, rendering and post-production. Various independent short animations will be screened for aesthetic and critical inquiry along with the lectures dedicated to the production techniques. The course will also introduce the student to historical and contemporary perspectives related to the discipline.

Max Credits: 3
Min Credits: 3

**70.378 Interactive Media**

Course ID: 6873

Course Details: This course will introduce the student to the processes of game conceptualization and game prototyping. Immersive and interactive media will be explored. Interactive, engaging game design will be emphasized. Conceptual drawings, storyboarding, 3D modeling and multimedia authoring will be employed. Proficiency in 3D model building and familiarity with Mac OS and/or Windows platforms required.

Max Credits: 3
Min Credits: 3

**70.379 Website Design**

Course ID: 6874

Course Details: This course will focus on the creation of visual content for the web and will explore what constitutes a visually exciting and engaging site. Other topics that will be covered are: file formats, compression, web color strategies, and platform standards. Basic familiarity with Mac OS and/or Windows platforms required.

Max Credits: 3
Min Credits: 3

**70.381 Advanced Game Design**
Course ID: 6876
Course Details: This advanced level course is designed for students who have completed Interactive Game Design and who are interested in exploring interactive game strategies and multilevel game design. Basic familiarity with Mac OS and/or Windows platforms required.
Max Credits: 3
Min Credits: 3

70.384 Advanced Web Design

Course ID: 6877
Course Details: This advanced-level course is designed for students who have completed Website Development (90.238) and Website Design (70.379). The course will cover advanced topics such as user-centered design, information architecture, testing, and usage analysis. Students will have the opportunity to further develop their design, development, and conceptualization skills.
Max Credits: 3
Min Credits: 3

70.385 Streaming Media for the Web

Course ID: 6878
Course Details: This is an advanced course for those with intermediate or advanced ability in World Wide Web technology who want to explore the use of continuous feed, streaming audio, video, and 3D virtual worlds. The course will examine current technologies with special attention to emerging protocols and standards for audio and video publishing. Basic familiarity with Mac OS and/or Windows platforms required.
Max Credits: 3
Min Credits: 3

70.389 Web Design III

Course ID: 30373
Course Details:
Max Credits: 3
Min Credits: 3

70.390 Illustration Studio

Course ID: 6879
Course Details: This course provides students with a variety of experiences involving skills and techniques including computer use related to the execution of illustrations for children's books, fashion drawings, record albums, book jackets, folders, posters, and magazines. Field trips, discussions related to job opportunities and preparation of portfolios are integral parts of the instruction. Fall.
Max Credits: 3
Min Credits: 3

70.391 Graphic Design II

Course ID: 6880
Course Details: Students will be assigned a variety of advanced-level projects dealing with areas such as logo design, publication design, interactive screen design, direct mail projects, corporate identity systems, poster design, and more. Projects in this class are designed to better develop the students' ability to take a project to its final stage and render it as a professional portfolio piece.
Max Credits: 3
Min Credits: 3

70.395 Advertising Design Studio

Course ID: 6885
Course Details:
Course ID: 6882

Course Details: Instruction in lettering, layout of commercial media as well as in the creative aspects of advertising is an integral part of the course. Practical problems, field trips, and technical guidance from preliminary layouts to finished work will help prepare students for the commercial art field. Spring.

Max Credits: 3
Min Credits: 3

70.397 Art and Copy

Course ID: 6883

Course Details: The real world of advertising incorporates selling words and memorable images in a dynamic visual/verbal design unit. As copywriters and art directors, students learn to think pictures and see words as they prepare advertising campaign concepts for a variety of products and media, including print and television. Spring, alternate years.

Max Credits: 3
Min Credits: 3

70.398 Documentary Image

Course ID: 6884

Course Details: In a world of increasing manipulation, documentary photographs still astound us with their visual truths. In this course, students will utilize words and images "the primary tools of the photojournalist" to explore the significant issues of our time. Works by Fenton, O'Sullivan, Gardner, Riis, Hine, Bourke-White, Lange, Smith, Davidson, Salgado, Mark and others are studied for content, style, and inspiration. Fall, alternate years.

Max Credits: 3
Min Credits: 3

70.400 Portfolio Production Seminar

Course ID: 6886

Course Details: This course is designed to help students to organize their work into a professional package and prepare it for presentation. Students may decide to rework existing portfolio pieces or complete additional design projects to enhance their existing portfolios and fully demonstrate their design capabilities. Mock interviews will be conducted in which students will have an opportunity to discuss their work. Includes an end-of-semester portfolio review.

Max Credits: 3
Min Credits: 3

70.425 Ceramics III

Course ID: 35288

Course Details: Ceramics III will require students to develop a personal visual voice in clay, resulting in a focused coherent body of work. Students will be expected to develop productive studio habits, continue to explore advanced glaze methods and participate in kiln firings.

Max Credits: 3
Min Credits: 3

70.461 Photography Workshop

Course ID: 6887

Course Details:

Max Credits: 3
Min Credits: 3

70.471 Painting III
Course ID: 30837

Course Details: The focus of this class is to give individual students the opportunity to work in an independent manner, expand their ideas and develop the ability to articulate both conceptually and formally the needs of their own work. The class combines studio work, presentations, visiting lecturers and individual and group critiques, with an emphasis on understanding and embracing risk as a necessary component of a painter's studio practice. Critiques are designed to provide feedback, encourage, challenge, and nurture each student's vision. Assignments are given on an individual basis. Students are expected to support their work by research of both historical and contemporary art.

Max Credits: 3
Min Credits: 3

70.475 Sculpture III

Course ID: 30834

Course Details:

Max Credits: 3
Min Credits: 3

70.490 Graphic Design III

Course ID: 31971

Course Details:

Max Credits: 3
Min Credits: 3

70.491 Advanced Studio

Course ID: 6889

Course Details: In order to enable students to expand expression in areas of their choice, they may repeat any studio course that is the most advanced offered in that given subject. They will be given more freedom within assignments and be expected to perform on a more advanced level.

Max Credits: 3
Min Credits: 3

70.492 Advanced Studio

Course ID: 6890

Course Details: In order to enable students to expand expression in areas of their choice, they may repeat any studio course that is the most advanced offered in that given subject. They will be given more freedom within assignments and be expected to perform on a more advanced level. Fall and Spring.

Max Credits: 3
Min Credits: 3

70.494 Directed Study

Course ID: 6891

Course Details: A special problem in studio art is investigated through conferences and studio work.

Max Credits: 3
Min Credits: 3

70.495 Advanced Tutorial

Course ID: 6892
Course Details: A program of directed studies which affords the advanced students an opportunity to pursue a previously explored problem in greater depth. The purpose is to sharpen and refine skill, content and presentation.

Max Credits: 3  
Min Credits: 3

70.497 Senior Studio

Course ID: 6894

Course Details: This course is designed to culminate four years of art experience for the BFA studies. The development of personal approach to media and idea is emphasized. Each student will be responsible for developing a self-assigned thematic concern. No assignments will be made by the instructor who will act only as an advisor and coordinator. Course evaluation is by the Senior Studio Review Committee. Enrollment restricted to majors in BFA program. Fall and Spring.

Max Credits: 6  
Min Credits: 6

71.100 Fundamentals of Musicianship

Course ID: 6896

Course Details: A study of the visual and aural symbolics of music and their application to the comprehension of the architectural, organizational, and aural elements of music literature.

Max Credits: 3  
Min Credits: 3

71.101 Music Theory 1

Course ID: 6897

Course Details: An intensive study of the theoretical language of music. Stresses part writing in S.A.T.B. and basso continuo realization with a free instrumental part which utilizes free voice leading relative to the use of non-harmonic activity and the harmonic principles through first and second inversion triads. Instruments of the string section are covered, and appropriate listening assignments are given. Original composition in the style being studied is required.

Max Credits: 3  
Min Credits: 3

71.102 Music Theory 2

Course ID: 6898

Course Details: Serves as a continuation of the practices of 71.101 relative to part writing (both vocal and instrumental) including secondary triads, the Neapolitan sixth, modal interchange, dominant sevenths in inversion and root position, modulation, and secondary dominants. Instrumentation covers the woodwind section, and original composition in the style being covered is required.

Max Credits: 3  
Min Credits: 3

71.103 Aural Skills 1

Course ID: 6899

Course Details: Development of basic sight singing, listening, and dictation skills as they relate to music theory and analysis. Activities include singing (using moveable do/tonic do solmization), listening, and dictation (melodic, harmonic and rhythmic) of diatonic music. Music majors only. Coreq. 710.101

Max Credits: 1  
Min Credits: 1

71.104 Aural Skills 2
Course ID: 6900
Course Details: Development of basic sight singing, listening and dictation skills as they relate to music theory and analysis. Activities include singing (using moveable do/tonic do solmization), listening, and dictation (melodic, harmonic and rhythmic) of more diatonic music. Music majors only. Prerequisite: 71.101 and 71.103. Coreq. 71.102
Max Credits: 1
Min Credits: 1

71.105 Freshman Chorus
Course ID: 35560
Course Details: A vocal ensemble consisting of all first-year music students, the Choir aims to build a community among those students by having them all share a common experience. Whether they have an extensive musical background or are novice musicians with little or no formal training, the First-Year Choir is intended to help students overcome the natural apprehensions that are associated with the first year of college. Additionally, the Choir will encourage ALL students to be comfortable singing in front of their peers and instructors, thereby making their experience in Aural Skills less daunting.
Max Credits: 0
Min Credits: 0

71.108 Musicianship & Analysis I
Course ID: 37726
Course Details: An intensive, critical and integrated study of musical concepts. Through applied experiences composing, improvising, writing, performing, listening, and analyzing, students will explore and develop competencies in hearing, understanding and applying concepts of musical sound, timbre, and texture; time, shape, and form; pulse; meter; rhythmic subdivision; melodic contour; plainchant; pentatonic melodies; and interlocking melodic systems.
Max Credits: 5
Min Credits: 5

71.109 Musicianship & Analysis 2
Course ID: 37727
Course Details: An intensive, critical and integrated study of musical concepts. Through applied experiences composing, improvising, writing, performing, listening, and analyzing, students will explore and develop competencies in hearing, understanding and applying concepts of asymmetrical meters; rhythmic subdivision (expanded); major and minor scales; two-voice melodies; drones and pedal points; root/fifth relationships; functional bass lines; triadic harmony; and song forms.
Max Credits: 5
Min Credits: 5

71.110 Basic Music Theory
Course ID: 6901
Course Details: Studies the symbolics of music and their application to the comprehension of the architectural, organizational, and aural elements of music literature. Non-Music majors only.
Max Credits: 3
Min Credits: 3

71.201 Music Theory 3
Course ID: 6902
Course Details: A continuation of practices of Music Theory II relative to part writing both vocal and instrumental including remote modulation and satellite keys, the diminished seventh, augmented sixth, ninth, eleventh, and thirteenth extensions, sequential secondary dominants and secondary sevenths. Instrumentation covers the brass section; original work in the style being covered and in various formal configuration is required.
Max Credits: 3
Min Credits: 3

**71.202 Music Theory 4**

Course ID: 6903

Course Details: A study of twentieth century music theory via a compositional approach relative to tertial, quartal, and secundal vertical sonorities, and linear combinations featuring modal and synthetic scale resources as well as serial and preserial atonality.

Max Credits: 3
Min Credits: 3

**71.203 Aural Skills 3**

Course ID: 6904

Course Details: Presents an intensive application of requisite skills to chromatic and non-diatonic music, changing and composite meters, displaced accents, cross rhythms, and a vertical approach to reading often necessary in the study of scores. Advanced tonal as well as tonal literature is considered. Harmonic dictation continues to follow the sequence and progress of 71.201.

Max Credits: 1
Min Credits: 1

**71.204 Aural Skills 4**

Course ID: 6905

Course Details: A concentration on the techniques employed in solving the notation and musical problems of the music of the 20th century. The consideration include synthetic and nonwestern scales, pitch sets and twelve-tone serialism.

Max Credits: 1
Min Credits: 1

**71.335 Arranging**

Course ID: 6915

Course Details: Analysis and practical application of techniques of scoring for vocal and instrumental combinations in varied configurations. Scoring projects for in-class performance, effective arranging of music in a variety of styles, and problem solving for the arranger will be included.

Max Credits: 3
Min Credits: 3

**71.495 Directed Study in Music Theory**

Course ID: 6933

Course Details: Individual work under the supervision of a member of the music theory faculty on a wide variety of topics approved by the instructor and the theory faculty. Permission of chairperson required.

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

72.001 Applied Music

Course ID: 6951

Course Details:

Max Credits: 3
Min Credits: 3

72.100 Recital Attendance

Course ID: 6955

Course Details: Required attendance at scheduled Thursday Recital Hours and ten concerts/recital each semester from those listed on the Department of Music Performance Calendar. Seven semesters required of all music majors.

Max Credits: 0
Min Credits: 0

72.101 Applied Keyboard 1

Course ID: 6956

Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.

Max Credits: 2
Min Credits: 2

72.102 Applied Keyboard 2

Course ID: 6957

Course Details:

Max Credits: 2
Min Credits: 2

72.111 Applied Voice 1

Course ID: 6958

Course Details: Studio instruction in graduated sequence with voice as the principal instrument.

Max Credits: 2
Min Credits: 2

72.112 Applied Voice 2

Course ID: 6959

Course Details: Studio instruction in graduated sequence with voice as the principal instrument.

Max Credits: 2
Min Credits: 2
72.121 Applied Woodwinds 1
Course ID: 6960
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

72.122 Applied Woodwinds 2
Course ID: 6961
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

72.131 Applied Brass & Percussion 1
Course ID: 6962
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument.
Max Credits: 2
Min Credits: 2

72.132 Applied Brass & Percussion 2
Course ID: 6963
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument.
Max Credits: 2
Min Credits: 2

72.141 Applied Strings 1
Course ID: 6964
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

72.142 Applied Strings 2
Course ID: 6965
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

72.152 Performance Keyboard 1
Course ID: 6968
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3
72.162 Performance Voice 1
Course ID: 6969
Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.172 Performance Woodwinds 1
Course ID: 6970
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.182 Performance Brass & Percussion 1
Course ID: 6971
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.192 Performance Strings 1
Course ID: 6972
Course Details: Studio instruction in graduated sequence with strings as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.201 Applied Keyboard 3
Course ID: 6973
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.
Max Credits: 2
Min Credits: 2

72.202 Applied Keyboard 4
Course ID: 6974
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.
Max Credits: 2
Min Credits: 2

72.211 Applied Voice 3
Course ID: 6975
Course Details: Studio instruction in graduated sequence with voice as the principal instrument.
Max Credits: 2
Min Credits: 2
72.212 Applied Voice 4
Course ID: 6976
Course Details: Studio instruction in graduated sequence with voice as the principal instrument.
Max Credits: 2
Min Credits: 2

72.221 Applied Woodwinds 3
Course ID: 6978
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

72.222 Applied Woodwinds 4
Course ID: 6979
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

72.231 Applied Brass & Percussion 3
Course ID: 6980
Course Details:
Max Credits: 2
Min Credits: 2

72.232 Applied Brass & Percussion 4
Course ID: 6981
Course Details:
Max Credits: 2
Min Credits: 2

72.241 Applied Strings 3
Course ID: 6982
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

72.242 Applied Strings 4
Course ID: 6983
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2
72.251 Performance Keyboard 2
Course ID: 6985
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.252 Performance Keyboard 3
Course ID: 6986
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.261 Performance Voice 2
Course ID: 6987
Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.262 Performance Voice 3
Course ID: 6988
Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.271 Performance Woodwinds 2
Course ID: 6989
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.272 Performance Woodwinds 3
Course ID: 6990
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.281 Performance Brass & Percussion 2
Course ID: 6991
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3
72.282 Performance Brass & Percussion 3
Course ID: 6992
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.291 Performance Strings 2
Course ID: 6993
Course Details: Studio instruction in graduated sequence with strings as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.292 Performance Strings 3
Course ID: 6994
Course Details:
Max Credits: 3
Min Credits: 3

72.301 Applied Keyboard 5
Course ID: 6995
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.
Max Credits: 2
Min Credits: 2

72.302 Applied Keyboard 6
Course ID: 6996
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.
Max Credits: 2
Min Credits: 2

72.311 Applied Voice 5
Course ID: 6997
Course Details: Studio instruction in graduated sequence with voice as the principal instrument.
Max Credits: 2
Min Credits: 2

72.312 Applied Voice 6
Course ID: 6998
Course Details: Studio instruction in graduated sequence with voice as the principal instrument.
Max Credits: 2
Min Credits: 2
72.321 Applied Woodwinds 5
Course ID: 6999
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

72.322 Applied Woodwinds 6
Course ID: 7000
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

72.331 Applied Brass & Percussion 5
Course ID: 7001
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument.
Max Credits: 2
Min Credits: 2

72.332 Applied Brass & Percussion 6
Course ID: 7002
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument.
Max Credits: 2
Min Credits: 2

72.341 Applied Strings 5
Course ID: 7003
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

72.342 Applied Strings 6
Course ID: 7004
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

72.351 Performance Keyboard 4
Course ID: 7005
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3
72.352 Performance Keyboard 5
Course ID: 7006
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.361 Performance Voice 4
Course ID: 7007
Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.362 Performance Voice 5
Course ID: 7008
Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.371 Performance Woodwinds 4
Course ID: 7009
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.372 Performance Woodwinds 5
Course ID: 7010
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.381 Performance Brass & Percussion 4
Course ID: 7011
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.382 Performance Brass And Percussion 5
Course ID: 7012
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3
72.391 Performance Strings 4
Course ID: 7013
Course Details: Studio instruction in graduated sequence with strings as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.392 Performance Strings 5
Course ID: 7014
Course Details: Studio instruction in graduated sequence with strings as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

72.401 Applied Keyboard 7
Course ID: 7015
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.
Max Credits: 2
Min Credits: 2

72.402 Applied Keyboard 8
Course ID: 7016
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument.
Max Credits: 2
Min Credits: 2

72.411 Applied Voice 7
Course ID: 7017
Course Details: Studio instruction in graduated sequence with voice as the principal instrument.
Max Credits: 2
Min Credits: 2

72.412 Applied Voice 8
Course ID: 7018
Course Details: Studio instruction in graduated sequence with voice as the principal instrument.
Max Credits: 2
Min Credits: 2

72.421 Applied Woodwinds 7
Course ID: 7019
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2
**72.422 Applied Woodwinds 8**

Course ID: 7020
Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument.
Max Credits: 2
Min Credits: 2

**72.431 Applied Brass And Percussion 7**

Course ID: 7021
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument.
Max Credits: 2
Min Credits: 2

**72.432 Applied Brass And Percussion 8**

Course ID: 7022
Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument.
Max Credits: 2
Min Credits: 2

**72.441 Applied Strings 7**

Course ID: 7023
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

**72.442 Applied Strings 8**

Course ID: 7024
Course Details: Studio instruction in graduated sequence with strings as the principal instrument.
Max Credits: 2
Min Credits: 2

**72.451 Performance Keyboard 6**

Course ID: 7031
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3

**72.452 Performance Keyboard 7**

Course ID: 7032
Course Details: Studio instruction in graduated sequence with keyboard as the principal instrument for performance majors.
Max Credits: 3
Min Credits: 3
### 72.461 Performance Voice 6

Course ID: 7033

Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3

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### 72.462 Performance Voice 7

Course ID: 7034

Course Details: Studio instruction in graduated sequence with voice as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3

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### 72.471 Performance Woodwinds 6

Course ID: 7035

Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3

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### 72.472 Performance Woodwinds 7

Course ID: 7036

Course Details: Studio instruction in graduated sequence with woodwind as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3

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### 72.481 Performance Brass And Percussion 6

Course ID: 7037

Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3

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### 72.482 Performance Brass And Percussion 7

Course ID: 7038

Course Details: Studio instruction in graduated sequence with brass or percussion as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3

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### 72.491 Performance Strings 6

Course ID: 7039

Course Details: Studio instruction in graduated sequence with strings as the principal instrument for performance majors.

Max Credits: 3

Min Credits: 3
72.492 Performance Strings 7
Course ID: 7040
Course Details: Studio instruction in graduated sequence with strings as the principal instrument for performance majors.
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

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

73.100 Observation Lab I
Course ID: 33187
Course Details: All students who are registered for 73.151 Introduction to Music Education are required to sign up for Observation lab 1 and complete 15 hours of school observations outlined by course Instructor.
Max Credits: 0
Min Credits: 0

73.141 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

73.142 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
73.143 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

73.144 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

73.145 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

73.151 Introduction To Music Education

Course ID: 7097

Course Details: Designed to provide the student with an overview of the principles and practices of music education in today's public schools. Students will observe regular classrooms and music instruction at all levels of N-12 education. This course is a prerequisite for all professional education courses in music education and includes the component of required pre-practicum fieldwork.

Max Credits: 2
Min Credits: 2

73.162 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

73.200 Observation Lab 2

Course ID: 33188

Course Details: All students who are registered for 73.410 Globas Music for the Classroom are required to sign up for Observation Lab 2 and complete 20 hours of school observations outlined by course instructor.

Max Credits: 0
Min Credits: 0

73.212 Special Topics: Sound Thinking
Course ID: 35114
Course Details: Special Topics: Sound Thinking is an interdisciplinary elective for sophomore-level undergraduates that explores issues of sound production, musical form, or music in multimedia, depending on faculty and student interest. It is co-taught by Music and Computer Science faculty.
Max Credits: 3
Min Credits: 3

73.241 Introduction to Strings Pedagogy 1
Course ID: 7104
Course Details:
Max Credits: 1
Min Credits: 1

73.242 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

73.244 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

73.245 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

73.300 Observation Lab 3
Course ID: 31889
Course Details:
Max Credits: 0
Min Credits: 0

73.301 Technology in Music Education
Course ID: 7110
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.
73.394 Choral Repertoire and Rehearsal Techniques

Course ID: 7114

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

73.400 Observation Lab 4

Course ID: 33189

Course Details: All students who are registered to 73.430 General Music Methods 2 are required to sign up for Observation Lab 4 and complete 20 hours of school observations outlined by course Instructor.

Max Credits: 0
Min Credits: 0

73.410 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

73.420 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

73.430 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

73.492 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

**73.493 Instrumental Ensemble Lab**

Course ID: 7140

Course Details: Designed to supplement the experiences of the instrumental methods courses. Students gain experience performing on secondary instruments, planning lessons for beginning and intermediate level instrumental ensembles, sand conducting in these settings.

Max Credits: 1
Min Credits: 1

**73.494 Choral Ensemble Lab**

Course ID: 7141

Course Details: Designed to supplement the experiences of the choral and vocal methods courses. Students gain experience by planning lessons for elementary and secondary school level vocal ensembles and conducting in these settings.

Max Credits: 1
Min Credits: 1

**73.496 Directed Study: Music Education**

Course ID: 7143

Course Details: Individual work under the supervision of a member of the music education faculty on a specific topic approved by the instructor and the music education faculty. Permission of Coordinator of Music Education required.

Max Credits: 3
Min Credits: 3

**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 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 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 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 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 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 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 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 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 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 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

73.583 Intro to Technology Applications for the Music Classroom

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 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

73.650 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

74.101 European Art Music

Course ID: 7194
Course Details: An aural introduction to the various types of European concert music from the 18th through the 20th century. This course emphasizes aural acquaintance with literature and genre and consists of in-class listening and discussion designed to enhance the aural experience. Required of all first year music majors as a prerequisite to Music History 1 and 2.

Max Credits: 1
Min Credits: 1

**74.102 Introduction To Non European Musics**

Course ID: 7195

Course Details: An introduction to selected world musics from a contextual perspective which explores music as an integral part of both society and culture and its function in labor, ritual and celebration. Aspects of instrumental classification, spontaneity and improvisation, as well as elements of music as both organized sound and silence in all cultures will be considered. This includes timbre, melody, rhythm, harmony, form, and texture. Required of all first year music majors as a prerequisite to Music History 1 and 2.

Max Credits: 1
Min Credits: 1

**74.104 Musical Practices I**

Course ID: 37724

Course Details: Musical Practices I includes the basic study of musical elements, vocabularies, and concepts in Western musical traditions, supplemented with global perspectives. Students will develop critical inquiry skills to study how music is experienced throughout Western culture, broadening the student's understanding of different musical structures, diverse arenas of production, while exploring professional, creative outlets for this knowledge. At the same time common conventions of musical style will be examined which tie the Western tradition together regardless of when or where the music originated.

Max Credits: 1
Min Credits: 1

**74.105 Musical Practices 2**

Course ID: 37725

Course Details: Musical Practices 2 builds upon the basic study of musical elements, vocabularies, and concepts established in Musical Practices 1, extending the exploration of these principles in more depth, with a primary focus on non-western musical traditions and cultural practices.

Max Credits: 1
Min Credits: 1

**74.161 Music of Western Civilization**

Course ID: 7198

Course Details: A survey of music from earliest times to the present. Significant forms, styles, composers, and aesthetic concepts are examined. Open to non-music majors only.

Max Credits: 3
Min Credits: 3

**74.262 Survey of Music History 2**

Course ID: 7204

Course Details: Analyzes musical forms and styles from 1750 to present.

Max Credits: 3
Min Credits: 3

**74.301 American Music**

Course ID: 7206

Course Details: An historical, cultural and contextual survey of diverse styles of concert and vernacular music in the United States from the colonial era to the present. Open to music and non-music majors.

Max Credits: 3
74.311 American Musical Theatre

Course ID: 7209

Course Details: African-American concert Music is a survey of orchestral works by Black classical composers starting from the 1890s through the Harlem Renaissance to present-day composers. Open to music majors and non-music majors.

Max Credits: 3
Min Credits: 3

74.355 Jazz

Course ID: 7212

Course Details: An intense study of the history of jazz from its origins to the present, covering a wide selection of styles and schools of jazz in various ensemble configurations.

Max Credits: 3
Min Credits: 3

74.386 History of Rock Music

Course ID: 7223

Course Details: Traces the roots of American popular music from its origins and influences from the earliest European song forms to American folk songs, Gospel, Country, Rhythm and Blues, Jazz, and other popular forms up through current trends as related to the development of the music industry and other socio-musical influences of the commercial song from the 1500s to the present.

Max Credits: 3
Min Credits: 3

74.456 Film Music

Course ID: 35562

Course Details: A study of music in sound cinema from the 1920s to the present. The course focuses on the expressive, formal, and semiotic function that film music serves, either as sound experienced by the characters, as another layer of commentary to be heard only by the viewer, and/or some mixture of the two. Composers to be studied include Max Steiner, Bernard Hermann, Jerry Goldsmith, John Williams, Danny Elfman, and others, as well as film scores that rely upon a range of musical styles, including classical, popular, and non-Western. The singularly most important goal of the course will be to study how music functions in a given film, regardless of its musical style. In the process, ancillary ideas will emerge including discovering how music establishes psychological moods, guides emotions, and reveals aspects of the narrative structure of the film. By the end of the course, the student will have gained a greater understanding of both music and film and it is likely that students will never watch or listen another movie in quite the same way.

Max Credits: 3
Min Credits: 3

74.464 Music Of Classic Era

Course ID: 7232

Course Details: A study of the solo, chamber, symphonic and operatic literature from 1720-1827.

Max Credits: 3
Min Credits: 3

74.495 Directed Study: Music History

Course ID: 7239

Course Details: Individual work under the supervision of a member of the music history faculty. May be repeated with permission of the chairperson.

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

**75.131 Introduction To Keyboard 1**

Course ID: 7258

Course Details: The emphasis is placed on such keyboard skills as the playing of several scale forms, basic chord progressions, harmonization of melodies, accompaniment patterns, basic solo literature, development of keyboard reading necessary to a working knowledge of the keyboard and basic improvisational concepts.

Max Credits: 1

Min Credits: 1

**75.132 Introduction To Keyboard 2**

Course ID: 7259

Course Details: A study of more advanced chord progressions, ensemble keyboard playing, patriotic songs, more advanced accompaniment patterns and advanced solo literature and a continuation of the use of improvisational techniques.

Max Credits: 1

Min Credits: 1

**75.233 Conducting 1**

Course ID: 7262

Course Details: Training in basic baton technique and related study for instrumental and choral conducting.

Max Credits: 2

Min Credits: 2

**75.234 Conducting 2**

Course ID: 7263

Course Details: Continuation of 75.233 exploring more advanced choral and instrumental conducting techniques.

Max Credits: 2

Min Credits: 2

**75.255 Piano Accompanying 1**

Course ID: 7267
Course Details: This course is designed for both piano and non-piano majors. A discussion of concepts of form with special emphasis on working together with and being sensitive to other musicians will be emphasized. Accompaniments will consist of music for instrumental and vocal soloists and ensembles and will include simple harmonizations and improvisations based on melodies from folk, classical, jazz, and popular music. Techniques of adjustment and cooperation in performance will also be discussed.

Max Credits: 1
Min Credits: 1

**75.256 Piano Accompanying 2**

Course ID: 7268

Course Details: A continuation of Piano Accompanying 1 utilizing more advanced music literature from the genres as well as a refining of the philosophies of sensitivity and working with other musicians.

Max Credits: 1
Min Credits: 1

**75.361 Jazz Improvisation 1**

Course ID: 7279

Course Details: A study of basic jazz structures, motives, chord progressions, scales, melodic analysis, use of some approach techniques, tensions and their application to improvisation. Includes in class performance by small instrumental and/or vocal groups.

Max Credits: 3
Min Credits: 3

**75.394 Performance Seminar I**

Course ID: 7284

Course Details: The study and performance of selected works from the repertoire of each of the five primary areas of performance; keyboard, voice, woodwinds, strings, and brass/percussion. Emphasis will be placed on student and faculty performance, leading to detailed consideration of the relationship between the demands of the composer and the problems of the performer and the manner in which these concerns influence the musical and artistic judgments necessary to achieve a quality performance.

Max Credits: 3
Min Credits: 3

**75.453 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

**75.463 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
75.474 Practical Intonation
Course ID: 7290
Course Details: The study of orchestral and band instruments relative to intonation. The development of conceptual awareness relative to the various characteristics of pitch, which are inherent in the design of the various instruments. Identification of problematic intonation and procedures to alleviate problems through performance.
Max Credits: 3
Min Credits: 3

75.493 Performance Seminar 1
Course ID: 7293
Course Details: The study and performance of selected works from the repertoire of each of the five primary areas of performance; keyboard, voice, woodwinds, strings, and brass/percussion. Emphasis will be placed on student and faculty performance, leading to detailed consideration of the relationship between the demands of the composer and the problems of the performer and the manner in which these concerns influence the musical and artistic judgments necessary to achieve a quality performance.
Max Credits: 3
Min Credits: 3

75.494 Performance Seminar 2
Course ID: 7294
Course Details: Designed as a "master class" experience for students in each of the five primary areas of performance, keyboard, voice, woodwinds, strings, and brass/percussion, with a separate section for each area wherever possible. Class sessions will consist of student performance of selected literature followed by critical analysis from faculty and peers. Each section will be supervised by the appropriate area coordinator and will also involve invited guest performers selected from faculty, applied faculty and other noted artists.
Max Credits: 3
Min Credits: 3

75.495 Directed Study: Research In Performance
Course ID: 7295
Course Details: Permission of chairperson required.
Max Credits: 3
Min Credits: 1

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

**76.010 Ensemble 1**

Course ID: 7311
Course Details:
Max Credits: 1  
Min Credits: 1

**76.020 Ensemble 2**

Course ID: 7312
Course Details:
Max Credits: 2  
Min Credits: 2

**76.101 University Orchestra**

Course ID: 7313
Course Details: Open to all students by audition. Works from the orchestral repertoire are studied and publicly performed with additional opportunities for solo accompaniment.
Max Credits: 2  
Min Credits: 2

**76.103 Wind Ensemble**

Course ID: 7315
Course Details: Open to all students by audition. Compositions are selected from a wide repertoire of wind ensemble literature for study and performance. Opportunity for solo performance with wind ensemble accompaniment.
Max Credits: 2  
Min Credits: 2

**76.105 Concert Band**

Course ID: 7316
Course Details: Open to all students by audition. Selected band repertoire studied and performed.
Max Credits: 2  
Min Credits: 2

**76.106 Marching Band**

Course ID: 7317
Course Details: Open to all students of the University, without regard for major field of study. The marching band performs at University events and at selected band festivals throughout New England. Custom musical arrangements and visual designs are featured. No audition required.

Max Credits: 2
Min Credits: 2

76.108 Studio Orchestra

Course ID: 7318

Course Details: Open to all students by audition. A wide spectrum of jazz orchestration and solo performance is studied and performed.

Max Credits: 2
Min Credits: 2

76.147 Ensemble Performance 1

Course ID: 7319

Course Details: This ensemble provides students with an introduction to the skills, knowledge, and attitudes necessary for satisfactory ensemble performance, namely: adequate technical facility for successful ensemble participation; functional knowledge of musical grammar and syntax in reference to its application in ensemble performance; proper application of aural and rhythmic skills in an ensemble setting; music sensitivity in relation to ensemble performance; and a knowledge of the protocols of ensemble preparation and performance. Emphasis on utilization of major scales and chords through application in both classical and jazz styles.

Max Credits: 2
Min Credits: 2

76.148 Ensemble Performance 2

Course ID: 7320

Course Details: Ensemble Performance 2 is an introduction to the fundamentals of the jazz idiom, jazz theory, and jazz improvisation. Topics include correct interpretation of jazz rhythm and articulation, basic jazz theory, and the development of improvised melodies. Students will play in small ensembles, or "combos", in this course. Students are expected to have at least an intermediate level of skill on their instruments at the time they begin this course.

Max Credits: 2
Min Credits: 2

76.149 Ensemble Performance 3

Course ID: 7321

Course Details: Introduction to multiple styles of American popular music: more advanced harmony and rhythm; improvising on common chord progressions; semi-independent combos.

Max Credits: 2
Min Credits: 2

76.150 Ensemble Performance 4

Course ID: 7322

Course Details: Performing advanced jazz and pop compositions; advanced improvisation; semi-independent combos.

Max Credits: 2
Min Credits: 2

76.151 Brass Ensemble

Course ID: 7323

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

76.153 Percussion Ensemble

Course ID: 7324
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

76.154 Classical Guitar Ensemble

Course ID: 7325
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

76.156 Electric Guitar Ensemble

Course ID: 7327
Course Details: Open to all students by audition. Provides experience in the performance of string orchestra literature.
Max Credits: 1
Min Credits: 1

76.158 Piano Ensemble

Course ID: 7328
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

76.159 Mixed Chamber Ensemble

Course ID: 7329
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

76.160 String Ensembles

Course ID: 7330
Course Details: Open to all students by audition. Provides experience in the performance of string orchestra literature.
Max Credits: 1
Min Credits: 1

76.161 Small Jazz Ensemble
Course ID: 7331
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

76.162 Jazz Laboratory Ensemble

Course ID: 7332
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

76.164 World Music Ensemble

Course ID: 37357
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

76.170 Contemporary Electronic Ensemble

Course ID: 7335
Course Details: Explores the electronic production and manipulation of music in a live ensemble setting. Students will incorporate synthesis, signal processing, sampling, etc. into a musical framework. Beside performing from the constantly expanding repertoire of electronic music, students will be encouraged to create original compositions and arrangements for the ensemble. A public performance will be given at the end of each semester.
Max Credits: 1
Min Credits: 1

76.201 Chamber Singers

Course ID: 7336
Course Details: A small, select choir open to all singers by audition. Performs music ranging from the present day to the Middle Ages.
Max Credits: 2
Min Credits: 2

76.202 University Choir

Course ID: 7337
Course Details: Open to all students by audition. Includes the study and performance of a wide variety of choral compositions.
Max Credits: 2
Min Credits: 2

76.210 Opera Workshop

Course ID: 7339
Course Details:
Max Credits: 1
Min Credits: 1

76.251 Choral Union

Course ID: 7340
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

76.501 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

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: Open to all students by audition. Provides a wide range of performance experience through varied brass literature.

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

**76.570 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

77.201 Computers In Music Business

Course ID: 7372
Course Details: An introduction into the use of Macintosh, DOS, and other computer systems and software applications used within the Music Industry. Topics will include programs, input devices, disk drives, I/O ports, peripherals, communication networks, operating systems, the internet, MIDI, sound cards, interactive multi-media, and the use of such applications as: word processors, spreadsheets, data bases, desk top publishing.
Max Credits: 3
Min Credits: 3

77.301 Music Business 1

Course ID: 7373
Course Details: A systematic look at career options in the Music Industry. Topics discussed include: songwriting, music publishing, national and international copyright law, music licensing, artist management, and concert promotion.
Max Credits: 3
Min Credits: 3

77.302 Music Business 2

Course ID: 7374
Course Details: A systematic look at career options in the Music Industry. Topics include: music merchandising, arts administration, record promotion, marketing, and distribution, radio and television broadcasting, advertising and jingle production, and film scoring.
Max Credits: 3
Min Credits: 3

77.303 Music Publication and Copyright

Course ID: 7375
Course Details: A thorough study of the legal environment within the Music Industry. Topics discussed include: music publishing, national and international copyright law, live performance, managers & agents, music organizations, recording agreements, music publishing, film and television music production, music merchandising, and other contractual obligations.
77.304 Music Promotion and Merchandising

Course ID: 7376
Course Details: A thorough study of the principles and application of marketing, promotion, and distribution of products within the Music Industry. Case studies of various music products and companies will be studied and analyzed.

Max Credits: 3
Min Credits: 3

77.401 Music Business Seminar

Course ID: 7378
Course Details: Prepares students to undertake their Internship by providing an in-depth study of how to prepare successfully to enter a career path.

Max Credits: 3
Min Credits: 3

77.404 Music Business Entrepreneur

Course ID: 7381
Course Details:

Max Credits: 3
Min Credits: 3

77.495 Directed Studies In Music Business

Course ID: 7383
Course Details: Permission of coordinator required.

Max Credits: 3
Min Credits: 3

77.499 Music Business Internship

Course ID: 7384
Course Details: Music Business Internship

Max Credits: 6
Min Credits: 6

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 he 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

**78.301 Music, Technology and Society**

Course ID: 7387

Course Details: Examines how recording technology has changed music and the relationships of music and society. The course studies and evaluates the application of technology to making music, to music listening, to styles of music, and to music's roles in society, other art forms, and media. The evolving importance of technology in music over the past century is charted through the study of musical examples and through viewing how human values are reflected in this century's timely music. Studies will be based on assigned readings, lectures and discussions, examination of current and historically significant music recordings, motion pictures and media pieces for this artistry, their use of available technology, and their impact on human values and society.

Max Credits: 3
Min Credits: 3

**78.305 Survey: Music Technology**

Course ID: 7388

Course Details: The use of technology in music listening, performance, analysis, composition, recording and music study will be presented. The dimensions and applications of technology will be discussed as related to aesthetics, the musician's experiences, musical style, and the musical experience. Basic introduction to the technologies of audio recording. Course includes required reading, listening, session participation. Music Majors Only.

Max Credits: 3
Min Credits: 3

**78.310 Introduction To Recording**

Course ID: 7389

Course Details: The theory and usage of audio-recording/reproduction components are explored at a basic level and supplemented by hands-on experience. The aesthetics of recording media and their influence on society are discussed in relation to the artistic and commercial functions of the media. Individual research on a subject of interest to the student is required.

Max Credits: 3
Min Credits: 3

**78.350 Video Production**

Course ID: 7390

Course Details: An introductory course in the fundamentals of video technology and production; encompassing signal transmission, tape formats, transduction, optical characteristics of lenses and cameras, production equipment and procedures, and post-production equipment and techniques; hands-on experience via video and audio for video projects. Permission of Coordinator and Chair.

Max Credits: 3
78.360 Critical and Analytical Listening

Course ID: 7391

Course Details: The recognition and identification of timbral modifications and spatial characteristics. Aural analysis of historically significant and current music recordings for recording techniques, musical balance, performance intensity, sound quality and imaging. Development of critical listening skills and sound evaluation techniques.

Max Credits: 3
Min Credits: 3

78.390 Acoustics & Psychoacoustics

Course ID: 7392

Course Details: The physical attributes of sound and acoustic measurement; displacement, time, velocity, acceleration, force, energy, resonance, wave shapes and spectral energy distribution are examined for most instruments; acoustic properties of the ear and enclosed environments; acoustic measurements and instruments. The interrelationships and differences of physical acoustics and psychoacoustics are stressed.

Max Credits: 3
Min Credits: 3

78.410 Recording Production

Course ID: 7393

Course Details: Intermediate audio production. Planning and executing recording sessions which involve a variety of musical ensembles under diverse recording conditions; live-performance/concert recordings; multi-track recording, overdub, and remix procedures; application of informed musical judgment to the mixing process; and research in recording techniques. Laboratory required. Permission of Coordinator and Chair.

Max Credits: 3
Min Credits: 3

78.411 Audio Theory

Course ID: 7394

Course Details: Advanced audio theory. An in-depth examination of the principles and operating specifications of the major components of the modern recording studio: mastering and multi-track recorders, mixing consoles, microphones, monitoring systems, and signal processing equipment. Recording projects and technical research. Laboratory required. Permission of Coordinator and Chair.

Max Credits: 3
Min Credits: 3

78.420 Sound Synthesis 1

Course ID: 7395

Course Details: Sound synthesis equipment and techniques are studied and supplemented with sound synthesis studio laboratory work. The course will cover practices and principles of analog and digital sound synthesis and their historic origins, related audio equipment and applications, theories of sound samplers and sequencers, and an introduction to MIDI applications in sound synthesis and recording production. Permission of Coordinator and Chair.

Max Credits: 3
Min Credits: 3

78.421 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

78.430 Computer Applications in Music

Course ID: 7397

Course Details: Applications of computers to audio production is emphasized in studies of computer generated and controlled sound sources and devices, algorithmic composition, computer music, digital signal processing, advanced MIDI applications and programming, and computer synchronization of audio and video. Laboratory work required. SRT majors and minors. Permission of Coordinator and Chair.

Max Credits: 3
Min Credits: 3

78.440 Multitrack Production

Course ID: 7398

Course Details: 24-track recording. Session planning and preparation, tracking process; microphone techniques and applications; incorporating processing; planning the mix and sound stage; MIDI applications, rough mixdown. Recording project required.

Max Credits: 3
Min Credits: 3

78.441 Advanced Multitrack Production

Course ID: 7399

Course Details: Advanced production techniques; tape machine calibration; automation and final mixdown; digital multitracking; SMPTE applications; premastering and mastering. Recording project required.

Max Credits: 3
Min Credits: 3

78.450 The Recording Industry

Course ID: 7400

Course Details: A detailed survey of the many career options of the audio-recording industry: position duties and responsibilities. Guest lecturers from diverse careers in the industry share their experiences, disciplines, and backgrounds. Permission of Coordinator and Chair.

Max Credits: 3
Min Credits: 3

78.460 Audio For Visuals

Course ID: 7401

Course Details: This course is designed to introduce students to the theory and practice of video post-production on non-linear digital editing platforms. These systems include Audio Vision, ProTools, and Sonic Solutions. Students are required to complete audio tracks for several video shorts and will learn about such diverse topics as SMPTE, word clock, digital sync, DSP, blackburst, genlock, S/P-DIF, AES/EBU, digital recording and mixing, ADR, music beds, cues, FX, Foley recording, and random access theory and techniques. Permission of Coordinator and Chair.

Max Credits: 3
Min Credits: 3

78.470 Recording Studio Repair and Maintenance
Course ID: 7402

Course Details: Hands-on experience in repair and maintenance techniques. Common minor repairs and routine maintenance of recording equipment; test equipment and tools; power supplies, op-amps, and low-noise amplifiers; distortion; analog and digital hardware; and interface considerations. Permission of Coordinator and Chair

Max Credits: 3
Min Credits: 3

78.493 Internship in SRT

Course ID: 7405

Course Details: Practical experience in audio-recording under the supervision of a professional firm. At least twenty hours per week for fifteen weeks is spent working at an entry-level position for a firm involved in audio.

Max Credits: 6
Min Credits: 6

78.494 Senior Project In Sound Recording Technology

Course ID: 7406

Course Details: Advanced projects developed in consultation with faculty advisor. Typical projects include production of a complete record album, investigation of experimental recording techniques, and original research in recording technology. To be completed in place of 78.493 by students not choosing an internship. Permission of Coordinator and Chair

Max Credits: 6
Min Credits: 6

78.495 Directed Study in Sound Recording Technology

Course ID: 7407

Course Details: Individual work under the supervision of a member of the SRT faculty on a topic or area of production approved by the instructor and the Coordinator of SRT. Permission of Coordinator and Chair

Max Credits: 3
Min Credits: 3

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

78.550 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

78.590 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

78.630 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

78.740 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

78.743 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

78.745 Continued Graduate Research SRT

Course ID: 35280
Course Details: Thesis/Project Continued Research
Max Credits: 1
Min Credits: 1

79.360 Aesthetics and Critical Studies of Graphic Design

Course ID: 7427
Course Details: Examination of the aesthetic theories and practice of graphic design. Significant practitioners of the art will be highlighted.
Max Credits: 3
Min Credits: 3

79.361 Aesthetics and Critical Studies of New Media

Course ID: 7428
Course Details: Examination of the aesthetic theories and practice of new media. Significant practitioners of the art will be highlighted.
Max Credits: 3
Min Credits: 3

79.380 Understanding Movies: Cinema as Social Commentary

Course ID: 37494
Course Details: This film theory seminar has several main objectives: to study the production of meaning in films; to analyze how moving images are used in social representation; and to introduce students to the visual and critical language of cinema. In this course, we will view a series of films by international authors. These address some of the most pressing issues of today's global world such as identity, subjectivity, difference and otherness, race relations, representations of gender and sexuality, immigration, war, colonialism and post-colonialism, poverty, and social inequalities. The films that we watch will be studied not as isolated cinematic texts but as illustrations and examples of theories of representation. Students will develop their critical analysis skills by being introduced to theoretical concepts such as "the gaze" in art and cinema as well as formal elements such as mise-in-scene, cinematography, editing, and sound.
Max Credits: 3
Min Credits: 3

79.494 Directed Study in Aesthetic Concepts

Course ID: 7430

Course Details: An individual supervised research project relating to questions of aesthetic interpretation and understandings. Fall and Spring.

Max Credits: 3
Min Credits: 3

79.496 Practicum Experience in Aesthetic Concepts

Course ID: 7432

Course Details: A program of on-campus and/or off-campus experiences for art majors only. Specific requirements will vary depending upon department policies and the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a community, social, cultural or artistic area and for applying techniques of problem solving and/or credits. Students will be graded "satisfactory" or "unsatisfactory". Fall and Spring.

Max Credits: 3
Min Credits: 3

81.111 Principles of Biology I

Course ID: 7466

Course Details: Introduces topics such as the chemical and physical basis of life, its evolution, diversity, distribution, and interrelationships of life forms. The central theme of genetic replication, translation, expression, and selection will be emphasized as a unifying principle which determines and integrates structure and function at the cellular, individual population, and community levels of organization. Designed for those students who intend to pursue career options in the biological sciences, biotechnology or related areas such as medicine, biomedical research, radiological sciences or environmental sciences. It is the first-semester course of a two-semester sequence.

Max Credits: 3
Min Credits: 3

81.112 Principles of Biology II

Course ID: 7467

Course Details: Serves as a continuation of the 81.111/81.112 sequence for those students who intend to pursue career options in the biological sciences or related professional areas such as medicine, biomedical research or environmental sciences. Molecular energy exchange in organisms (photosynthesis and respiratory metabolism), the common functional needs of support, locomotion, nutrition, internal communication and the maintenance of homeostasis are considered. Control and regulation of organisms at levels beyond the individual are considered through discussions of population and community ecology.

Max Credits: 3
Min Credits: 3

81.115 Introduction To Biology Seminar

Course ID: 7470

Course Details: Freshman Seminar in Biology (Honors section available) This course offers a small group seminar format for problem solving and discussion with faculty and staff. It is designed for individual participation in exploring concepts related to material considered in Principles of Biology I and II (81.111 and 81.112). Required of freshman students; optional, with permission of instructor, to others registered in lecture section.

Max Credits: 1
Min Credits: 1
81.116 Freshman Seminar in Biology

Course ID: 7471

Course Details: This course is designed to acclimate incoming students to their new University environment. Students will learn about the Biology program, its faculty and staff members, University resources, and other information useful for success.

Max Credits: 1
Min Credits: 1

81.117 Experimental Biology I

Course ID: 7472

Course Details:
Max Credits: 1
Min Credits: 1

81.118 Experimental Biology II

Course ID: 7473

Course Details:
Max Credits: 1
Min Credits: 1

81.122 Biology for Health Sciences

Course ID: 38070

Course Details: Develops a basic understanding of biological topics relevant to students in the health sciences. Course will introduce students to biochemistry, cell biology, cellular respiration, cell replication, genetics, inheritance and molecular biology. Introduction to prions, viruses, prokaryotic and eukaryotic biology will also be covered.

Max Credits: 3
Min Credits: 3

81.124 Biology for Health Sciences Lab

Course ID: 38071

Course Details: Develops a basic understanding of biological topics relevant to students in the health sciences. Course will introduce students to biochemistry, cell biology, cellular respiration, cell replication, genetics, inheritance and molecular biology. Introduction to prions, viruses, prokaryotic and eukaryotic biology will also be covered.

Max Credits: 1
Min Credits: 1

81.201 General Microbiology

Course ID: 7474

Course Details: A study of the general properties of bacteria and viruses (anatomy, physiology, genetics, metabolism, cultivation, and growth); discussions include major microbial infections in man (etiologic agent, antibiotics and chemotherapy) and an examination of the role of the microbes in the environment.

Max Credits: 3
Min Credits: 3

81.203 General Microbiology Laboratory

Course ID: 7475
Course Details: A series of laboratory exercises covering basic qualitative and quantitative techniques commonly employed in a microbiology laboratory.

Max Credits: 2
Min Credits: 2

81.210 Biology for Engineers
Course ID: 37711
Course Details: Develops a basic understanding of the science of biology for engineering students, including and introduction to biochemistry, cell biology, metabolism, genetics, genomics, molecular biology, cell growth, and nutrition. Both eukaryotic and prokaryotic biology will be covered.
Max Credits: 3
Min Credits: 3

81.212 Biology for Engineers Laboratory
Course ID: 37712
Course Details: This laboratory course will build on 81.210. It will provide an introduction to several basic biological techniques and approaches used in biological engineering laboratories.
Max Credits: 1
Min Credits: 1

81.220 Principles of Cell and Molecular Biology
Course ID: 37710
Course Details: This course will cover basic topics in cell and molecular biology, including structures of proteins, lipids, carbohydrates and nucleic acids, structure of DNA and its replication and repair, transcription, and cell-cell communication. The molecular biology of cells and the regulation of cellular processes will be emphasized.
Max Credits: 3
Min Credits: 3

81.233 Experimental Methods in Biology
Course ID: 37713
Course Details: This is a project-based course designed to introduce students to the methods of general biological laboratory research. Techniques will be introduced in the context of interrelated experiments during a semester-long project. Techniques will include, but are not limited to: making solutions, pipetting, using sterile technique, gel electrophoresis, DNA transformations, minipreps, and other molecular and microscopic methods.
Max Credits: 2
Min Credits: 2

81.235 Genetics
Course ID: 36858
Course Details: The theories of both classical and molecular genetics are explored with emphasis on the experimental evidence which has laid the foundation for contemporary understanding of genetics, included is the nature of the genetic material, gene action, genetic recombination, gene regulation, gene interaction, the production and inheritance of genetic phenotypes, chromosomal mechanics, and the behavior of genes in populations.
Max Credits: 3
Min Credits: 3

81.237 Problems in Genetics
Course ID: 36859
Course Details: Techniques of genetic analysis using molecular, prokaryotic and eukaryotic systems. There is an emphasis on problem solving and statistical methods.
Max Credits: 1
Min Credits: 1

81.240 Evolution, Ecology and Conservation

Course ID: 37718
Course Details: Over 5 million species thrive in amazingly diverse habitats on Earth ranging from the extreme freezing cold of the poles to the lush warmth of the tropics. How did this fantastic diversity arise on our earth? How are these species intimately interconnected with one another, their communities and their ecosystem? How can we save this remarkable biodiversity from extinction? This course will address these key questions by examining the fundamental concepts of evolution, ecology and conservation biology. Students will be expected to attend a discussion section in which they will examine case studies and primary scientific literature.
Max Credits: 3
Min Credits: 3

81.242 Problems in Evolution, Ecology and Conservation

Course ID: 37714
Course Details: A discussion session designed to reinforce material presented in 81.240, Evolution, Ecology and Conservation. An emphasis will be placed on problem solving.
Max Credits: 1
Min Credits: 1

81.252 Physiology

Course ID: 7481
Course Details: Presents a comprehensive study of the fundamental mechanisms governing mammalian physiology. The role of cell physiology in determining systemic functions and coordinating biological control systems will be emphasized. Maintenance of homeostasis will be discussed in terms of biochemical, cytological, anatomical, and physical principles.
Max Credits: 3
Min Credits: 3

81.254 Physiology Laboratory

Course ID: 7482
Course Details:
Max Credits: 2
Min Credits: 2

81.300 Directed Research Experience II

Course ID: 7485
Course Details:
Max Credits: 2
Min Credits: 2

81.301 Microbiology

Course ID: 36856
Course Details: General properties of bacteria and viruses including anatomy, physiology, genetics, metabolism, cultivation, growth,
control and their role in the ecosystems, and industry.

Max Credits: 3
Min Credits: 3

**81.303 Microbiology Laboratory**

Course ID: 36855

Course Details: A series of laboratory exercises covering basic qualitative and quantitative techniques commonly employed in a microbiology laboratory including sterile technique, microscopy, enrichment and isolation, and prevention.

Max Credits: 2
Min Credits: 2

**81.306 Invertebrate Zoology**

Course ID: 7487

Course Details: A survey of the phyla of invertebrate animals. Discussions include their physiology, development, morphology, behavior, ecology and adaptations. Corequisite: 81.308

Max Credits: 3
Min Credits: 3

**81.308 Invertebrate Zoology Lab**

Course ID: 7488

Course Details: A broad spectrum of living and preserved specimens are studied in the laboratory with regard to both structure and function. Corequisite 81.306

Max Credits: 1
Min Credits: 1

**81.315 Principles of Ecology**

Course ID: 7491

Course Details: A series of lectures concerned with the interrelationships of organisms with their abiotic environment with emphasis on the New England area. Selected current topics will supplement the text.

Max Credits: 3
Min Credits: 3

**81.317 Principles of Ecology Laboratory**

Course ID: 7492

Course Details: A series of laboratory exercises to supplement and illustrate lectures of 81.315. Field trips are an integral part of the course involving sampling and analysis of such ecosystem components as water, soil, invertebrate fauna and characteristic flora of various habitats. Directed readings, quizzes, practical exam and oral presentation of a research topic are integral parts of the course.

Max Credits: 2
Min Credits: 2

**81.320 Botany**

Course ID: 7493

Course Details: Serves as an introduction to the study of the plant kingdom dealing with the structure, function, and diversity of plants with an emphasis on seed plants. The physiology, morphology, and taxonomy of plants is emphasized.

Max Credits: 3
Min Credits: 3

81.322 Botany Laboratory

Course ID: 7494

Course Details: Emphasizes material covered in 81.320 using field and laboratory exercises.

Max Credits: 1
Min Credits: 1

81.324 Economic Botany

Course ID: 38098

Course Details: Discussions on how humans use plants. Topics will include: Structure and characteristics of woods and their uses in construction of various items, agricultural uses of food plants and spices, poisonous plants, medicinal plants, plants used in religious ritual and plants used as hallucinogens, plants that have altered human history.

Max Credits: 3
Min Credits: 3

81.335 Principles of Genetics

Course ID: 7498

Course Details: The theories of both classical and molecular genetics are explored with emphasis on the experimental evidence which has laid the foundation for contemporary understanding of genetics. Included is the nature of the genetic material, gene action, genetic recombination, gene regulation, gene interaction, the production and inheritance of genetic phenotypes, chromosomal mechanics, and the behavior of genes in populations.

Max Credits: 3
Min Credits: 3

81.337 Experimental Genetics

Course ID: 7499

Course Details: Techniques of genetic analysis using molecular, prokaryotic and eukaryotic systems. There is an emphasis on problem solving and statistical methods.

Max Credits: 1
Min Credits: 1

81.401 Supervised Teaching Biology I

Course ID: 7508

Course Details: Through observation, preparation of material and presentation of demonstrations in selected courses offered by the Department of Biological Sciences, the student becomes familiar with the materials and teaching/learning situations in biology.

Max Credits: 1
Min Credits: 1

81.402 Supervised Teaching Biology II

Course ID: 7509

Course Details: Through observation, preparation of material and presentation of demonstrations in selected courses offered by the Department of Biological Sciences, the student becomes familiar with the materials and teaching/learning situations in biology.

Max Credits: 1
Min Credits: 1
81.404 Environmental Microbiology

Course ID: 7510

Course Details: Examination of microbial communities in natural and artificial environments and interactions between microorganisms and their abiotic environments. Consideration is given to the role of microorganisms in the flux of energy and matter through ecosystems at molecular, ecosystem, and global scales; microbial consortia and symbioses; and modern techniques in environmental microbiology.

Max Credits: 3
Min Credits: 3

81.409 Photobiology

Course ID: 36853

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

81.411 Senior Research Biology

Course ID: 7512

Course Details: An individual, directed one-year research program for senior biology majors selected on the basis of previous academic performance at the end of the junior year. A topic will be chosen after consultation with a faculty member. A report of the research in the form of a thesis is required.

Max Credits: 4
Min Credits: 4

81.412 Senior Research: Biology

Course ID: 7513

Course Details: An individual, directed one-year research program for senior biology majors selected on the basis of previous academic performance at the end of the junior year. A topic will be chosen after consultation with a faculty member. A report of the research in the form of a thesis is required.

Max Credits: 4
Min Credits: 4

81.413 Invertebrate Zoology II

Course ID: 35512

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

81.415 Invertebrate Zoology Lab II

Course ID: 35513

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
81.416 Climate Change: Science, Communication, and Solutions

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

81.419 Biochemistry

Course Details: Studies the structure and properties of proteins, carbohydrates, and lipids which combined with a discussion of elementary enzymology allows for detailed descriptions of several important degradative and biosynthetic pathways, their integration and regulation. Throughout the course, emphasis is on methods and practical application of fundamental information to the solution of problems of current biomedical interest.

Max Credits: 3
Min Credits: 3

81.421 Biochemistry Techniques

Course Details: A series of discussions and "hands on" laboratory exercises emphasizing techniques and use of equipment most commonly employed in biochemical-biomedical research laboratories. Techniques to be mastered include: cell culture, cell fractionation, enzyme purification, ultracentrifugation, UV-visible spectrophotometry, spectrofluorometry, various types of chromatography (thin layer, gas, gel exclusion, ion exchange), electrophoresis, liquid scintillation spectrometry, and the safe handling and application of radioisotopes to problems in biochemistry. Wherever possible, the principles presented in 81.419 will be used as a basis for experimentation using the above techniques.

Max Credits: 2
Min Credits: 2

81.423 Biology of Global Change

Course Details: An examination of the role of life processes in controlling the cycling of elements on the surface of the Earth and atmosphere from the molecular to the global level. Students will learn how the different physical components of Earth interact, how these interactions are influenced by life, and how they affect Earth's habitability now and in the future.

Max Credits: 3
Min Credits: 3

81.426 Evolutionary Biology

Course Details: Examines the patterns and processes of biological evolution that have led to the diversity of life. Topics covered include 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, students will read and discuss classic and contemporary primary literature from evolutionary biology.

Max Credits: 3
Min Credits: 3
81.428 Molecular Biotechnology: Recombinant Protein Production

Course ID: 37369

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.

Max Credits: 3
Min Credits: 3

81.432 Genomics

Course ID: 37715

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.

Max Credits: 3
Min Credits: 3

81.434 Genomics Laboratory

Course ID: 37716

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

81.437 Biology and Evolution of Arthropoda

Course ID: 37441

Course Details: A detailed examination of phylum Arthropoda from developmental, ecological, genetic, morphological and paleontological perspectives. Specific topics include the relationships of arthropods to protoarthropod-like groups including tardigrades and onychophorans, the evolution of segmentation, and current perspectives on relationships within the phylum.

Max Credits: 3
Min Credits: 3

81.439 Biology and Evolution of Arthropoda Laboratory

Course ID: 37442

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

81.440 Advances in Plant Biology

Course ID: 32943

Course Details: Examination of a range of topics in plant biology with an emphasis on processes that are unique to plants. The course will focus first on the role of plants in human affairs, and basic plant anatomy, physiology and genetics followed by three or more topics at an advanced level. Typical focus areas may include biosynthesis and regulation of fatty acids, metabolism of aromatic amino acids, studies of pathways leading to the synthesis of useful natural plant products and the genetic manipulation of plants to promote plant
81.442 Cell Biology

Course ID: 7521

Course Details: Deals with the study of the cell and its cytoplasm incorporating the structure of cell membranes and the organelles they define; specialized organelles dealing with energy capture and transduction, some aspects of histochemical and biochemical studies on cytoplasmic organelles at the electron microscopic level. An introduction into cytogenetics and nuclear cytology; a brief discussion of prokaryotic cells.

Max Credits: 3
Min Credits: 3

81.451 Senior Seminar in Biology

Course ID: 7523

Course Details: This course instructs students in developing effective writing and speaking skills required for preparation of scientific manuscripts and presentations, and communicating in the scientific world. Students will be required to prepare and present oral presentations and to submit written reports.

Max Credits: 2
Min Credits: 2

81.452 Senior Seminar II

Course ID: 7524

Course Details: Seminar discussion of selected topics of current research interest. An oral seminar presentation as well as a written report are required of all biology seniors.

Max Credits: 1
Min Credits: 1

81.457 Advanced Invertebrate Zoology

Course ID: 33457

Course Details: Comparative functional morphology, life histories, and phylogeny of a particular taxon (Crustacea, Molusca) of invertebrates.

Max Credits: 3
Min Credits: 3

81.459 Advanced Invertebrate Zoology Laboratory

Course ID: 33458

Course Details: Classification, identification, anatomy and physiology of selected invertebrates.

Max Credits: 1
Min Credits: 1

81.460 Stem Cell Biology

Course ID: 33651

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

81.467 Molecular Biology
Course ID: 1234
Course Details: A study of the principles and specialized techniques of cloning, purifying, and manipulating recombinant DNA molecules.
Max Credits: 3
Min Credits: 3

81.472 Virology
Course ID: 7528
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 virus-cell interaction at the molecular level.
Max Credits: 3
Min Credits: 3

81.476 Cell Culture
Course ID: 1233
Course Details: A series of lecture and laboratory exercises that will focus on the in vitro culture and analysis of multiple cell type 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

81.482 Cancer Biology
Course ID: 33459
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

81.488 Structural Biology
Course ID: 37717
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.
Max Credits: 3
Min Credits: 3

81.489 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 exercises. 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

81.490 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

81.491 Senior Project: Biology

Course ID: 7531
Course Details: Individual, directed one semester research project taken in the fall and/or spring. Presentation of an acceptable project plan at the time of registration is required. A project report is required.

Max Credits: 4
Min Credits: 4

81.492 Senior Project: Biology

Course ID: 7532
Course Details: Individual, directed one semester research project taken in the fall and/or spring. Presentation of an acceptable project plan at the time of registration is required. A project report is required.

Max Credits: 4
Min Credits: 4

81.493 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

81.495 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

81.496 Practicum Experience

Course ID: 7533
Course Details: On-campus and/or off-campus experiences are developed by the student in consultation with a member of the student's major department. Specific requirements will vary depending upon department policies and the nature of the program undertaken by the student. The intent of the practicum experience is to provide an occasion for investigation of a scientific area and for applying techniques of problem solving and/or skills which are appropriate to the student's major discipline. The practicum experience may not be substituted for a required course in the major.

Max Credits: 3
Min Credits: 3

81.498 Directed Study: Biology
Course ID: 33123
Course Details:
Max Credits: 2
Min Credits: 2

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 deutorostome 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

81.521 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 therapeuticals. 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

81.532 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, Molusca) 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
81.560 Stem Cell Biology

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: 1

81.567 Molecular Biology

Course Details: A study of the principles and specialized techniques of cloning, purifying, and manipulating recombinant DNA molecules.

Max Credits: 3
Min Credits: 3

81.572 Virology

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 virusscell interaction at the molecular level.

Max Credits: 3
Min Credits: 3

81.576 Cell Culture

Course Details: A series of lecture and laboratory exercises that will focus on the in vitro culture and analysis of multiple cell type 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 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
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

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

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 interet, publishing ethics, biosecurity, and electronic science collaborations/team research.

Max 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

81.707 Internship Biology

Course ID: 35831

Course Details: Internship or co-op.

Max Credits: 1

81.708 Graduate Course Review

Course ID: 35575

Course Details: Internship or co-op.

Max 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

82.3CE Cooperative Education Work Experience I
Course ID: 37663
Course Details: This zero credit course is specifically designated for undergraduate students in the College of Sciences who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program and have secured their first, full-time co-op employment. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.
Max Credits: 0
Min Credits: 0

82.4CE Cooperative Education Work Experience II
Course ID: 37802
Course Details: This zero credit course is specifically designed for undergraduate students from participating majors in the College of Sciences, who are participating in the voluntary co-op experience is designed to provide students the opportunity to develop and enhance their technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by their Co-op Coordinator.
Max Credits: 0
Min Credits: 0

82.210 Professional Development Seminar
Course ID: 36959
Course Details: The Professional Development Seminar is designed to provide students with the necessary structure, resources, and support to successfully secure and engage in their first cooperative education experience. Through a variety of teaching methodologies and assignments, students will participate in a sequence of learning activities including self-assessment, industry research, and the development of co-op learning objectives. Students will prepare to engage in the job search process through resume writing, strategic interviewing, professional networking and through learning professional behavior and presentation skills. The goal of the course is to
assist each student in developing a sound plan of action to successfully participate in the cooperative education experience.

Max Credits: 1
Min Credits: 1

**82.310 Co-op Assessment 1**

Course ID: 36960

Course Details: The primary goal of this seminar is to assist students in the overall assessment of their overall cooperative education experience. Through facilitated small group discussion, individual consultation and hands on practice, students will have an opportunity to identify and articulate their technical and professional skills, and explore how these skills and their co-op employment might be translated and leveraged into future work environments and their academic program at UML.

Max Credits: 1
Min Credits: 1

**82.410 Co-op Assessment 2**

Course ID: 36961

Course Details: This seminar is designed to support and assist students in the continued assessment of their cooperative education experience. Through a deepening of their work in Co-op Assessment 1, students will review their overall performance in the cooperative education program, while continuing to demonstrate their technical and professional skills through written work and public presentations to multiple audiences. It is expected that students will clearly define their future academic and career goals, enhance their professional networks, and develop a future plan to support their engineering aspirations.

Max Credits: 1
Min Credits: 1

**83.100 Introduction to Biology**

Course ID: 7612

Course Details: Presents environmental and organismal structural interrelationships and relates these to the chemical evolutionary basis of life. Not suitable for credit towards any degree in the Division of Sciences.

Max Credits: 3
Min Credits: 3

**83.101 Life Science I**

Course ID: 7613

Course Details: Presents environmental and organismal structural interrelationships and relates these to the chemical evolutionary basis of life. Suitable as a Natural Science Elective for a degree in the Division of Sciences.

Max Credits: 3
Min Credits: 3

**83.102 Life Science II**

Course ID: 7614

Course Details: Emphasis is on systems structure and function. The cellular organization of plants and animals leads into physiological processes of higher organisms with great emphasis on humans. Among topics considered are nutrition and digestion, cellular metabolism, circulation, respiration, excretion, nervous and skeletal-muscular systems. Also considered are the chemical interactions of these systems with immunity, hormonal and reproductive processes. Suitable as a Natural Science Elective for a degree in the Division of Sciences.

Max Credits: 3
Min Credits: 3

**83.103 Life Science I Laboratory**
Course ID: 7615
Course Details: Concerned with experimentation and interpretation of some of the concepts of Life Science I. Suitable as a Natural Science Elective for a degree in the Division of Sciences.
Max Credits: 1
Min Credits: 1

83.104 Life Science II Laboratory

Course ID: 7616
Course Details: Involved with experimentation and interpretation of some of the concepts of Life Science II. Suitable as a Natural Science Elective for a degree in the Division of Sciences.
Max Credits: 1
Min Credits: 1

83.105 Introduction to Biology Lab

Course ID: 7617
Course Details: Introduction to Biology Laboratory is a co-requisite course for the Introduction to Biology online lecture course - 83.100. The two courses together fulfill a GenEd Science requirement. The lab course can be taken concurrently with the lecture course or subsequent to it. Weekly labs correspond directly with the chapter assignments provided by the 83.100 instructors.
Max Credits: 1
Min Credits: 1

83.110 Microbes and Society: Good, Bad and Ugly

Course ID: 35780
Course Details: Examines historical aspects of microbial interactions with human society, including the use of microbes in food production, agriculture, biotechnology, industry and environmental preservation; explores bioterrorism, the problem of antibiotic resistance and surveys some historical and contemporary microbial diseases.
Max Credits: 3
Min Credits: 3

83.123 Nutrition and Disease

Course ID: 7620
Course Details: Serves as an interdisciplinary survey course for students not majoring in biology, which deals with human nutrition as it relates to various chronic disease states. Methods of detection and treatment of the disorders are considered as well as general concepts of health promotion/disease prevention based on the Dietary Guidelines for Americans. Specific topics covered include the role of nutrition in: heart disease, diabetes, cancer, obesity, alcoholism, and eating disorders. Not suitable for credits toward any degree in the Division of Sciences.
Max Credits: 3
Min Credits: 3

83.125 Plants and Human Society

Course ID: 7621
Course Details: This course is designed primarily to fulfill the science elective requirement for the non-science major. Its purpose is to provide the undergraduate student who is not majoring in the biological sciences with an introduction to the study of plants and their importance in our everyday world. The importance of plants in agriculture, medicine and industry will be emphasized. Not suitable for credit towards any degree in the Division of Sciences.
Max Credits: 3
Min Credits: 3
83.127 Plants & Human Society Lab
Course ID: 30382
Course Details: Not suitable for credit towards any degree in the Division of Sciences.
Max Credits: 1
Min Credits: 1

83.214 Human Ecology
Course ID: 7626
Course Details: Designed to reveal and discuss the increasing problems of overpopulation in regard to environmental deterioration, living space, limits of natural resources and the adverse effects of human alteration on destruction of the natural ecosystem. The implications of current literature and news items will be emphasized. Not suitable for credit towards any degree in the Division of Sciences.
Max Credits: 3
Min Credits: 3

84.101 Applied Chemistry for Non-Scientists
Course ID: 7633
Course Details: Provides an understanding of basic chemical principles -- atomic structure, bonding and interparticle forces, physical and chemical properties of matter through hands-on examination of matter and the application of principles to understanding the chemistry of current issues (e.g., environmental chemistry, biochemistry, food and drug chemistry) and the analysis of problems dealing with these issues. This course is not available for credit for Science or Engineering majors.
Max Credits: 3
Min Credits: 3

84.102 Forensic Science for the Non-Scientist
Course ID: 35546
Course Details: This course presents the inherently fascinating topics of crime and criminal investigations as a pathway for teaching the fundamental chemical concepts most often covered in an introductory non-majors course. This course capitalizes on the surge of interest in the scientific investigation of crime (as sparked by CSI and other television shows) and will collate the theme of forensic science with the fundamentals of chemistry. The course material will be continually updated with each offering.
Max Credits: 3
Min Credits: 3

84.105 Intro to the Discipline of Chemistry
Course ID: 36857
Course Details: This course provides an introduction to chemistry as a career. Required of chemistry majors, it discusses historical aspects of the field and modern career paths, including academic and industrial chemistry. Students are presented with information regarding career opportunities in chemistry, including: analytical/environmental, forensics, inorganic, organic, materials, pharmaceutical/biochemistry, polymer, and theoretical/physical. They are also given an introduction to graduate school and teaching opportunities often pursued following the B.S. degree. In addition to lectures by the instructor, guests from industry and government laboratories are invited to discuss "what it means to be a chemist".
Max Credits: 1
Min Credits: 1

84.111 General Chemistry I
Course ID: 7634
Course Details: Provides a one-semester survey of inorganic chemistry: the structure and properties of matter, chemical reactions, stoichiometry, gas laws, solution chemistry, kinetics, equilibrium, and acid-base chemistry.
Max Credits: 3
Min Credits: 3

84.112 General Chemistry II

Course ID: 7635

Course Details: Surveys the basic principles of organic chemistry and biochemistry with emphasis on biochemical aspects of carbohydrates, lipids, proteins and nucleic acids. Various metabolic pathways are also emphasized.

Max Credits: 3
Min Credits: 3

84.113 General Chemistry Laboratory I

Course ID: 7636

Course Details: Lab experiments designed to illustrate the principles covered in 84.111.

Max Credits: 1
Min Credits: 1

84.114 General Chemistry Laboratory II

Course ID: 7637

Course Details: Uses laboratory experiments designed to illustrate the principles discussed in 84.112.

Max Credits: 1
Min Credits: 1

84.117 Selected Topics in Chemistry

Course ID: 30383

Course Details: A one semester general chemistry course for mechanical engineering students. The properties of matter, chemical bonding, stoichiometric relationships, energy and chemical thermodynamics, kinetics, chemical equilibrium, electrochemistry and nuclear chemistry are the major areas discussed. Relationships among chemistry, material science and engineering are central to the course. Problem solving is emphasized.

Max Credits: 3
Min Credits: 3

84.121 Chemistry I

Course ID: 7639

Course Details: Provides an introduction to the basic concepts of chemistry through classroom discussions and demonstrations. Topics include chemical calculations, atomic structures, the periodic table, basic bonding theory, solutions, liquids, and gases. Restricted to science, engineering, and engineering technology majors.

Max Credits: 3
Min Credits: 3

84.122 Chemistry II

Course ID: 7640

Course Details: Serves as a continuation of 84.121. Topics include thermodynamics; kinetics, acids and bases; an introduction to organic chemistry; chemical equilibrium; precipitation reactions; and electrochemistry. Restricted to science, engineering, and engineering technology majors.

Max Credits: 3
Min Credits: 3
84.123 Chemistry I Laboratory

Course ID: 7641

Course Details: Studies experimental chemical principles and chemical transformation that is coordinated with topics considered in 84.121. Some of the more important reactions of elements, oxides, acids, bases, and salts are examined. Other topics include chemical separation, purification, preparation of inorganic salts, quantitative determinations dealing with the formula of a compound, gas laws, and colligative properties. Careful techniques and precise measurements are stressed. Restricted to science, engineering, and engineering technology majors.

Max Credits: 1

Min Credits: 1

84.124 Chemistry II Laboratory

Course ID: 7642

Course Details: Serves as a continuation of the laboratory study begun in 84.123 that is coordinated with topics of 84.122. Topics include: thermochemistry, kinetics, spectroscopy, titration, pH, equilibrium reaction and constants. Some aqueous solution reactions and organic reactions are examined. Accurate measurements and precise instrumental and apparatus operation are expected. Restricted to science, engineering, and engineering technology majors.

Max Credits: 1

Min Credits: 1

84.135 Honors Chemistry I

Course ID: 7643

Course Details: A more in-depth view of the topics covered in Chemistry I, (84.121). Topics include chemical reactions and calculations, atomic history and structures, the behavior of gases and bonding theory. Open to students enrolled in the Honors Program, and may be taken instead of 84.121.

Max Credits: 3

Min Credits: 3

84.136 Honors Chemistry II

Course ID: 7644

Course Details: A continuation of 84.135. A more in-depth view of the topics covered in Chemistry II (84.122). Topics include solutions, kinetics, thermodynamics, acids and bases, chemical equilibrium, electrochemistry and solubility. Open to students enrolled in the Honors Program, and may be taken instead of 84.122.

Max Credits: 3

Min Credits: 3

84.204 Introduction to Organic and Polymer Chemistry

Course ID: 7650

Course Details: This course is a one-semester overview of organic chemistry for plastics engineering majors. Organic chemistry and its associated principles underscore a broad component of the plastics engineering curriculum. It is desirable therefore for such students to develop a basic appreciation of the fundamental reactions in organic chemistry, as well as an understanding of the interaction of organic compounds with their environment. Students will therefore be expected to secure a basic understanding of, e.g., chemical bonding, the chemistry of alkanes, alkenes, alkynes, aromatic compounds, substitution and elimination reactions, reactions of organic alcohols, ethers, epoxides, aldehydes and ketones, carboxylic acids, and amine compounds. When appropriate, examples will be provided that relate to those typical polymerization reactions (e.g. free-radical or ionic) employed to manufacture commercial polymer materials. Coverage will include synthesis of organic chemicals and polymers from natural and sustainable materials.

Max Credits: 3

Min Credits: 3

84.205 Principles Of Organic Chemistry Laboratory

Office of the Registrar  83 Broadway Street, Dugan 101, Lowell, MA 01854-5129
Course Details: Introduction to the basic skills and techniques used in the synthesis, purification, and characterization of representative organic compounds. Open to Plastics Engineering students in the fall semester and Chemical Engineering students in the spring semester.

Max Credits: 1
Min Credits: 1

84.221 Organic Chemistry IA
Course ID: 7655
Course Details: Studies the basic principles and reactions which characterize the chemical behavior of carbon compounds. Nomenclature, reactions, reaction mechanisms, and stereochemistry will be covered. Required for chemistry majors.

Max Credits: 3
Min Credits: 3

84.222 Organic Chemistry IIA
Course ID: 7656
Course Details: A continuation of 84.221 including an introduction to infrared and NMR spectroscopy and biochemistry. The application of organic reactions in multi-step synthesis is stressed.

Max Credits: 3
Min Credits: 3

84.227 Organic Chemistry Laboratory I
Course ID: 7661
Course Details: Laboratory work designed to emphasize the techniques of organic synthesis and the use of instrumentation for identification and characterization of organic compounds. Required for chemistry majors.

Max Credits: 2
Min Credits: 2

84.228 Organic Chemistry Laboratory II
Course ID: 7662
Course Details: A continuation of 84.227 including an introduction to semimicro organic techniques. Planning and successfully carrying out reactions published in the chemical literature are emphasized. Required for chemistry majors.

Max Credits: 2
Min Credits: 2

84.229 Organic Chemistry Laboratory IA
Course ID: 7663
Course Details: Reviews techniques, skills, and heuristic approaches in the synthesis, purification, and identification of organic compounds. IR, GC, and NMR instrumental methods are included.

Max Credits: 1
Min Credits: 1

84.230 Organic Chemistry II A Lab
Course ID: 7664
Course Details: A continuation of 84.229.
Max Credits: 1
Min Credits: 1

**84.260 Information Retrieval**

Course ID: 7665

Course Details: An introduction to the important chemical and chemical-related reference sources including journals, patents, technical publications, and compiled reference works, and instructions in their use. Assignments require the use of each source discussed. Online searching using computerized chemical and chemical related databases is also introduced.

Max Credits: 2
Min Credits: 2

**84.301 Special Topics: Chemistry**

Course ID: 7667

Course Details:

Max Credits: 3
Min Credits: 3

**84.303 Forensic Science I**

Course ID: 35812


Max Credits: 3
Min Credits: 3

**84.304 Forensic Science II**

Course ID: 35813

Course Details: Drug Analysis I, Drug Analysis II, Chemistry of combustion and Arson, Chemistry of color and colorants, Analysis of ink and paints, Chemistry of polymers, Analysis of fibers and papers.

Max Credits: 3
Min Credits: 3

**84.305 Forensic Science I Laboratory**

Course ID: 35814

Course Details: Locard's exchange principle, Reagent preparation, crime scene investigation, a case of deductive reasoning, crime scene sketching, Forensic glass analysis, Fingerprint, Introduction to Microscopy, Color perception.

Max Credits: 1
Min Credits: 1

**84.306 Forensic Science II Laboratory**

Course ID: 35815

Course Details: Forensic hair analysis, Handwriting comparison, Fluorescence detection of drug, Introduction to Immunoassay and enzyme catalysis, Fluorescence microscopy Analysis of gunshot residues, Analysis of metal, Analysis of flammable.

Max Credits: 1
Min Credits: 1
84.313 Analytical Chemistry I
Course ID: 7668
Course Details: Focuses on the evaluation of analytical data, aqueous and non-aqueous acid-base systems, oxidation reduction and complexation equilibria, solubility and precipitation, solvent extraction, ion-exchange and chromatographic methods.
Max Credits: 3
Min Credits: 3

84.314 Analytical Chemistry II
Course ID: 7669
Course Details: Introduces modern instrumental methods of chemical analysis. Topics to be discussed include ultraviolet, infrared nuclear magnetic resonance, emission and atomic absorption spectroscopy. Mass spectrometry, chromatography, thermal and electrochemical methods of analysis will also be covered.
Max Credits: 3
Min Credits: 3

84.315 Analytical Chemistry Laboratory I
Course ID: 7670
Course Details: Experiments emphasizing the topics presented in 84.313 are conducted.
Max Credits: 2
Min Credits: 2

84.316 Analytical Chemistry Laboratory II
Course ID: 7671
Course Details: Presents laboratory experiments designed to complement the coverage of topics in 84.314.
Max Credits: 2
Min Credits: 2

84.339 Physical Chemistry Principles
Course ID: 7676
Course Details: A one-semester course designed for plastics engineering majors. Physical chemical concepts of importance to plastics and polymeric materials are emphasized and include kinetics, spectroscopy, phase rule, and statistical thermodynamics.
Max Credits: 2
Min Credits: 2

84.344 Physical Chemistry I
Course ID: 7678
Course Details: Covers basic physical chemical topics: laws of thermodynamics, solutions, chemical and phase equilibria, electrochemistry, kinetics, atomic, and molecular structure.
Max Credits: 3
Min Credits: 3

84.345 Physical Chemistry II
Course ID: 7679
Course Details: Serves as a continuation of 84.344.
Max Credits: 3
Min Credits: 3

84.346 Physical Chemistry Laboratory I

Course ID: 7680
Course Details: Laboratory work designed to exemplify principles covered in 84.344. Required for chemistry majors.
Max Credits: 2
Min Credits: 2

84.347 Physical Chemistry Laboratory II

Course ID: 7681
Course Details: Provides laboratory work designed to exemplify the principles of chemical kinetics, equilibrium, and spectroscopy.
Max Credits: 1
Min Credits: 1

84.350 Physical Bioinorganic Laboratory

Course ID: 7682
Course Details: Coordination compounds are utilized in a core of experiments to illustrate basic physiochemical techniques and analysis of experimental data in electrochemistry and kinetics. A project lab is carried out to apply and extend techniques learned.
Max Credits: 2
Min Credits: 2

84.407 Undergraduate Thesis

Course ID: 7689
Course Details: Research in biochemistry, electrochemistry or analytical, organic, inorganic, physical or polymer chemistry. Progress report required.
Max Credits: 3
Min Credits: 3

84.408 Undergraduate Thesis II

Course ID: 7690
Course Details: A continuation of 84.407. Both semesters must be taken and not more than six credits may be used in meeting degree requirements. A written thesis and seminar are required. The written thesis is to follow the conventional form of introduction, literature survey, data, results, and conclusions. One copy of the thesis must be filed in the Department office.
Max Credits: 3
Min Credits: 3

84.443 Advanced Inorganic Chemistry

Course ID: 30385
Course Details: The chemical behavior, structure and methods of preparation and nomenclature of the more common elements and their compounds.
Max Credits: 3
Min Credits: 3

84.445 Advanced Inorganic Lab
Course Details: Laboratory to study the reactions of ions in aqueous solutions and to carry out inorganic syntheses and characterizations.

Max Credits: 2
Min Credits: 2

84.450 Introduction To Biochemistry

Course Details: An introductory study of the fundamental principles of biochemistry including the chemistry of proteins, carbohydrates, nucleic acids and lipids, thermodynamics, kinetics and mechanisms of enzyme action, intermediary metabolism and selected topics in molecular biology.

Max Credits: 3
Min Credits: 3

84.502 Matter in Context

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 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

84.523 Organic Reaction Mechanisms

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 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
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 (energy), 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

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

**84.653 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

84.763 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

85.102 Weather Forecasting Seminar

Course ID: 7764

Course Details: Introduction to forecasting techniques including use of upper air observations and numerical forecast guidance. This course is intended primarily for students majoring in the various options of environmental science. It does not satisfy specific science requirements for majors in the Division of Science.

Max Credits: 1
Min Credits: 1

85.120 The Nature of Science

Course ID: 7765

Course Details: In this course students are introduced to the role of critical thinking in the development of scientific theories. Several major areas of science are explored with a focus on the link between conceptual thought and the resulting physical laws. The importance to society of scientists and citizens making informed decisions on science/technology issues are examined. Methods to gather and assess data are discussed and a number of examples of the use of scientific principles to prove fact or fraud are studied. The students will learn how to question propositions put before them.

Max Credits: 3
Min Credits: 3

85.141 Weather and Climate

Course ID: 7766

Course Details: Serves as a general meteorology course for the non-science major. Topics include: atmospheric composition, solar radiation, temperature, moisture and condensation relationship between air pressure and wind, weather patterns, severe weather, optical phenomena in the atmosphere, and the behavior and possible change of climate. This course satisfies the Gen Ed science requirement, but not specific science requirements for majors in the Division of Science.

Max Credits: 3
Min Credits: 3

85.143 Weather and Climate Laboratory

Course ID: 7767

Course Details: The laboratory encourages students to apply knowledge from the lectures to a variety of atmospheric and climatic phenomena developed from data analysis, experimentation, and maps. Synthesis and critical thinking are encouraged in the solution of problems.

Max Credits: 1
Min Credits: 1

85.213 Atmospheric Science Laboratory

Course ID: 7770

Course Details: The plotting and analysis of meteorological data is introduced, with the goal of understanding the basis for various ways of looking at weather systems. After each technique is introduced, students will see the computer counterpart using the workstations in the weather lab. Both the strengths and weaknesses of automated displays are made clear to students, thus making them better able to interpret the computer images on a daily basis.

Max Credits: 1
Min Credits: 1

85.214 Meteorology Analysis Laboratory
Course ID: 7771

Course Details: The use of the skew-T diagram to understand the vertical structure in the atmosphere is the main focus of this course. Students will learn to plot and analysis atmospheric sounding data, and to recognize various structures in the analyzed data. Both hand and computer-aided analysis will be compared.

Max Credits: 1
Min Credits: 1

85.234 Scientific FORTRAN Programming

Course ID: 7772

Course Details: A basic course in computer programming using FORTRAN 90/95. Topics include programming arithmetic, decisions, repetition, input/output structures, arrays and array processing, and simple algorithms for searching and sorting.

Max Credits: 3
Min Credits: 3

85.291 Practicum in Meteorology

Course ID: 7773

Course Details:

Max Credits: 3
Min Credits: 1

85.301 Atmospheric Dynamics

Course ID: 7774


Max Credits: 3
Min Credits: 1

85.304 Methods in Meteorology I

Course ID: 7776

Course Details: The application of vector analysis to dynamic meteorology. Three-dimensional divergence and vorticity, circulation, and solenoids. Selected ordinary and partial differential equations of fluid mechanics and their solutions. Spectral decomposition of hemispheric wave motion.

Max Credits: 3
Min Credits: 3

85.305 Methods in Meteorology II

Course ID: 7777

Course Details: Fundamentals of numerical weather prediction. Data analysis methods in meteorology using the techniques of curve fitting, correlation, and power spectrum analysis. Solution of stability problems.

Max Credits: 3
Min Credits: 3

85.308 Forecasting and Synoptic Techniques I

Course ID: 7779
Course Details: Explores techniques of synoptic analysis including graphical subtraction, thickness analysis, isentropic analysis, streamlines and trajectories, divergence and vorticity. The use of a computer to perform these computations is explored through student projects.

Max Credits: 3
Min Credits: 3

85.309 Forecasting and Synoptic Techniques II

Course Details: Explores three-dimensional structure and dynamics of mid-latitude storm systems; capabilities and limitations of the barotropic model; quasi-geostrophic model; and operational primitive equation models. Some mesoscale phenomena are covered as time permits including coastal cyclogenesis, thermal lows, and sea-breeze circulations.

Max Credits: 3
Min Credits: 3

85.313 Physical Climatology

Course Details: Atmospheric processes determining the climate: solar and terrestrial radiation, elevation and thermal properties of surfaces, atmospheric circulations and eddy conduction between the atmosphere and land or sea surfaces, heat and water balance of earth’s surface and the atmosphere; hydrologic cycle; and climatic simulation models.

Max Credits: 3
Min Credits: 3

85.340 Tropical Meteorology

Course Details: An introduction to the tropical atmosphere including tropical climatology, structure and dynamics of easterly waves, tropical cyclones and monsoonal circulations.

Max Credits: 3
Min Credits: 3

85.350 Satellite and Radar Meteorology

Course Details: Explores theory and applications of radar, satellites, and lidar. Use of satellite imagery as a forecasting aide, theory and use of satellite profiling, and application of conventional and Doppler radar to severe weather and short term forecasting. Use of lidar and other profiling techniques to determine vertical temperature structure and turbulence.

Max Credits: 3
Min Credits: 3

85.403 Physical Meteorology

Course Details: Explores solar and terrestrial radiation processes and the heat balance of the atmosphere; fundamentals of radiation theory; radiative transfer processes in the atmosphere; atmospheric condensation processes; and nucleation theory and the growth of water drops and ice crystals by condensation, sublimation and accretion.

Max Credits: 3
Min Credits: 3

85.410 Advanced Forecasting

Course Details: Explores...
Course Details: Advanced analysis techniques and their use as forecasting tools are explored in both manual and computer formats. Techniques include moisture advection, moist isentropic trajectories, boundary layer destabilization, and other state-of-the-art techniques. Application of techniques to small and mesoscale phenomena.

Max Credits: 3
Min Credits: 3

85.415 Advanced Atmospheric Dynamics I


Max Credits: 3
Min Credits: 3

85.416 Advanced Atmospheric Dynamics II


Max Credits: 3
Min Credits: 3

85.420 Introduction to Operational Numerical Weather Prediction

Course Details: In this class, the student will learn the structure and science behind modern numerical weather prediction models and how to use them to solve real-world issues facing modern meteorological consultants. The student will learn how to operate and apply a modern numerical weather prediction model to study such issues as offshore wind farm siting, solar power prediction, and energy load forecasting. Students should be prepared to use Linux-based PC's (supplied) to perform and submit projects.

Max Credits: 3
Min Credits: 3

85.471 Air Pollution

Course Details: Air Pollution

Max Credits: 3
Min Credits: 3

85.484 Space Weather

Course Details: Space Weather is an emerging field of space science focusing on understanding the conditions and processes on the sun, in the interplanetary space, and in the Earth's magnetosphere, ionosphere and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human life or health. This course is an introduction level course. It applies knowledge learned in Physics I and II in particular in electromagnetics to a real situation: space. 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 solar surface, solar wind, bow shock, magnetopause, magnetosphere, magnetotail, radiation belts, ring currents, and 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 space environment.

Max Credits: 3
Min Credits: 3

85.491 Directed Study

Course ID: 7793

Course Details: Students, through regular and frequent consultation with the instructor, undertake independent study of a particular area of meteorology.

Max Credits: 3

Min Credits: 1

85.495 Honors Research in Atmospheric Science

Course ID: 7794

Course Details: An individual or team research project carried out by qualified students with the approval of and supervision by a faculty member.

Max Credits: 3

Min Credits: 3

85.496 Practicum Experience in Meteorology

Course ID: 7795

Course Details: A program of on-campus and/or off-campus experiences developed by the student in consultation with a faculty member and, when appropriate, a member of the staff of an off-campus firm. May be repeated up to a maximum of six credits. The practicum may not be substituted for a nonelective course in the major.

Max Credits: 3

Min Credits: 1

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 System 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 climate 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: 9
Min Credits: 1

85.768 Doctoral Dissertation
Course ID: 32226
Course Details:
Max Credits: 9
Min Credits: 9

87.101 Environmental Science Seminar
Course ID: 7840
Course Details: A survey of the field of environmental science, curriculum options, and career opportunities. Presentations by members of the department and guest speakers. This course is intended primarily for students majoring in the various options of environmental science. It does not satisfy specific science requirements for majors in the Division of Science.
Max Credits: 1
Min Credits: 1

87.102 Environmental Problems Seminar
Course ID: 7841
Course Details: A survey of environmental problems and issues. Topics include air, water, and noise pollution; solid and liquid waste disposal; and the social, political, and economic implications of these issues. Readings, discussions, guest speakers, and field trips. This course is intended primarily for students majoring in the various options of environmental science. It does not satisfy specific science requirements for majors in the Division of Science.
Max Credits: 1
Min Credits: 1

87.115 Astronomy
Course ID: 7847
Course Details: Offers an introduction to the study of astronomy including historical development, instruments, solar system dynamics, planetary evolution, stellar systems and stellar evolution. Several field trips are included. This course satisfies the Gen Ed science requirement, but not specific science requirements for majors in the Division of Science.
Max Credits: 3
Min Credits: 3

87.117 Astronomy Lab
Course ID: 7848
Course Details: Intended to develop a deeper understanding of astronomy through an exposure to the methods and materials used in astronomical analysis. Corequisite: 87.115 I,II(0,2)1
Max Credits: 1
Min Credits: 1

87.201 Earth and Environmental Systems I
Course ID: 7850
Course Details: An integrated study of the interactions between the lithosphere, hydrosphere, atmosphere, and biosphere. Emphasis will be placed on the physical and biological principles which underlie and control these interactions, pollution, geologic hazards, climate change, and social and political aspects which govern our relationship with the natural environment.
Max Credits: 3
Min Credits: 3

87.202 Earth And Environmental Systems II
Course ID: 7851
Course Details: A continuation of Principles of Earth & Environmental Systems.
Max Credits: 3
Min Credits: 3

87.203 Earth And Environmental Systems Laboratory
Course ID: 7852
Course Details: 
Max Credits: 1
Min Credits: 1

87.204 Earth And Environmental Systems Laboratory
Course ID: 7853
Course Details:
Max Credits: 1  
Min Credits: 1

87.301 GIS in Earth and Environmental Sciences

Course ID: 37132

Course Details: This course introduces earth and environmental science students to applications of geographic information systems, emphasizing hands-on field experience in collecting spatial location data and in mapping environmental data using GIS software. Covers fundamentals of: geodesy; spherical and plane coordinate systems; spatial data concepts, including error, accuracy, and precision; location measurement technologies including GPS: vector and raster GIS data structures and file types, basic GIS operations, including georeferencing of raster files and editing of vector files; assembly of field data over a base map; analysis of spatial relationships using GIS tools; symbology and methods of map presentation.

Max Credits: 3  
Min Credits: 3

87.496 Practicum

Course ID: 7866

Course Details: A program of on-campus and/or off-campus experiences developed by the student in consultation with a faculty member from the Department and, when appropriate, a member of the staff of an off-campus firm. May be repeated to a maximum of six credits. The practicum may not be substituted for a required course in the major.

Max Credits: 3  
Min Credits: 1

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 SOx, NOx 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
89.101 General Geology

Course ID: 7881

Course Details: Presents a study of the earth with emphasis on earth materials, earth structure (crustal and internal), earth history, and the development of life. Designed for the general student.

Max Credits: 3
Min Credits: 3

89.103 General Geology Laboratory

Course ID: 7883

Course Details: Topics covered include rock and mineral identification; interpretation of topographic and geologic maps; earthquakes and rock deformation; ground water, streams, wind, and glaciers and the sculpting of the Earth's surface; and natural hazards and their impacts to humans.

Max Credits: 1
Min Credits: 1

89.151 Earth and Life

Course ID: 7891

Course Details: This course will trace the changes in both the Earth and a variety of organisms through an investigation of fossils, field sites, map interpretation, and basic earth science principles. The effects of physical change and geobiochemical processes on evolution will be stressed as will the effects of life on Earth. Students will gain an appreciation of the very special nature of the earth and its symbiont life forms when seen against the background of other planets.

Max Credits: 3
Min Credits: 3

89.153 Earth and Life Laboratory

Course ID: 7892

Course Details: This laboratory will concentrate on the identification of fossils, discrimination of fossils from sedimentary structures, and interpretation of ancient environments from lithology, fossils, and maps. A field trip is required.

Max Credits: 1
Min Credits: 1

89.215 Forensic Geology

Course ID: 30952

Course Details: This course deals with the application of geological and related principles to the solution of various types of crimes. The course will explore the use of evidence (rocks and minerals, soils, geochemistry, etc.) to identify the source and hence the potential perpetrator of the crime.

Max Credits: 3
Min Credits: 3

89.301 Mineralogy and Crystallography

Course ID: 7903

Course Details: This course will introduce the concepts of crystallography necessary to prepare the student to use the analytical equipment of Optical Mineralogy and X-ray Crystallography. It also contains topics on the physical properties and chemistry of minerals aimed at improving the student's ability to identify mineral samples. A significant portion of the course will be devoted to an introduction to optical methods using oil immersion and thin section techniques.

Max Credits: 3
Min Credits: 3

89.303 Mineralogy And Crystallography Laboratory

Course ID: 7904

Course Details: Techniques of crystallographic description. Megascopeic and microscopic techniques of mineral identification.

Max Credits: 1

Min Credits: 1

89.304 Igneous & Metamorphic Petrology

Course ID: 7905

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

89.306 Igneous and Metamorphic Petrology Laboratory

Course ID: 7906

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

89.314 Hydrogeology

Course ID: 7907

Course Details: This course investigates the science of water in a geologic setting with special emphasis on the distribution, movement, and chemistry of the water. The course will include the following topics: techniques for measuring elements in the hydrologic equation, accuracy of hydrologic measurement, statistical studies of floods, and study of groundwater for both steady-state and transient conditions.

Max Credits: 3

Min Credits: 3

89.315 Environmental Geochemistry

Course ID: 7908

Course Details: Application of geochemical principles to environmental problems including air pollution and atmospheric processes, climate change, water chemistry and water-rock interactions, and the transport and dispersal of organic and inorganic pollutants.

Max Credits: 4

Min Credits: 4

89.316 Geomorphology

Course ID: 7909

Course Details: A study of the physical and chemical processes at work on the earth's surface which result in the formation and development of surface features. Emphasis is placed on the mechanics of erosion (water, wind, ice, and waves) and the morphology and spatial distribution of the resultant landforms.

Max Credits: 3

Min Credits: 3
89.318 Geomorphology Laboratory
Course ID: 7910
Course Details: Investigates landforms and surficial processes through an interpretation of maps and field work. Environmental applications of surficial processes are stressed.
Max Credits: 1
Min Credits: 1

89.322 Structural Geology
Course ID: 7911
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

89.324 Structural Geology Laboratory
Course ID: 7912
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

89.352 Sedimentation And Stratigraphy
Course ID: 7915
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

89.354 Sedimentation And Stratigraphy Laboratory
Course ID: 7916
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

89.456 Applied Geophysics
Course ID: 7920
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

89.495 Honors Research Geology
Course ID: 7922
Course Details: An independent scientific research project carried out by a qualified senior under the supervision of a faculty member.

Max Credits: 3
Min Credits: 1

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

89.510 Glacial and Pleistocene Geology

Course ID: 7923

Course Details:
Max Credits: 3
Min Credits: 3

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 basingeometry and geology; water movement in the zone of aeration, the interaction of ground water with surface water, the transport and dispersion of contaminants, and the use of modeling for groundwater management.

Max Credits: 3
Min Credits: 3

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

89.585 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

91.100 Media Computing

Course ID: 8054

Course Details: Introduction to computer programming using multimedia applications. Programming data structures are covered by
manipulating pictures, sounds and video. Linear Data structures such as arrays and matrices are manipulated in a computer
programming language Java and C.

Max Credits: 3
Min Credits: 3

91.101 Computing I

Course ID: 8055

Course Details: Introduction to computing environments: introduction to an integrated development environment; C, C++, or a similar
language. Linear data structures; arrays, records, and linked lists. Abstract data types, stacks, and queues. Simple sorting via
exchange, selection, and insertion. Basic file I/O. Programming style documentation and testing. Ethical and social issues. Effective Fall
2013, Co-req 91.103 Computing 1 Lab.

Max Credits: 3
Min Credits: 3

91.102 Computing II

Course ID: 8056

Course Details: Pointers. Lists, stacks and queues. Binary trees, AVL trees, n-ary trees. Advanced sorting via quicksort, heapsort, etc.
Characters and strings. Graphs. Advanced file techniques. Recursion. Programming style, documentation, and testing. Ethical and
social issues. This course includes extensive laboratory work. Effective Fall 2013, Co-req: Computing 2 lab.

Max Credits: 3
Min Credits: 3

91.112 Undeclared Science Seminar

Course ID: 36238

Course Details: Discussions will be conducted on a wide range of topics in the sciences to familiarize the student with the programs,
procedures, research, and educational opportunities at the University.

Max Credits: 1
Min Credits: 1

91.113 Exploring the Internet

Course ID: 8058

Course Details: This course focuses on the primary tools used to navigate the Internet from a Windows desktop: e-mail and the web
browsers. In addition, this course covers many of the other applications of the Internet: ftp, listserv, newsgroups, chat, search engines,
and portals. Students will complete hands-on exercises, including construction of their personal web page. Not for computer science
majors.

Max Credits: 3
Min Credits: 3

91.117 Arbotics

Course ID: 33571

Course Details: Arbotics focuses on exploring the intersection among art, computer science, and robotics. The course is project-driven,
and includes public exhibitions and service learning. Students will learn founding principles in both the fields of art and computer
science, and put them into practice by creating interactive, tangible exhibits that are displayed in public settings. In the service learning
component, students will mentor local high school students in the same topics. The course will also include guest lectures from
practitioners in the fields.

Max Credits: 4
Min Credits: 4

91.201 Computing III
Course ID: 8064


Max Credits: 4
Min Credits: 4

91.203 Assembly Language Programming

Course ID: 8066

Course Details: Presents the organization and operation of a conventional computer, including principal instruction types, data representation, addressing modes, program control, I/O, assembly language programming, including instruction mnemonics, symbolic addresses, assembler directives, system calls, and macros, the usage of text editors, symbolic debuggers, and loaders, and the use of pseudocode in guiding structured assembly language programming.

Max Credits: 4
Min Credits: 4

91.204 Computing IV

Course ID: 8067


Max Credits: 3
Min Credits: 3

91.211 Computer Science for SRT Applications

Course ID: 8069

Course Details: This course is an introduction to C programming, with applications in sound recording technology. Students will write and execute several programs that perform operations pertinent to SRT, including manipulating MIDI codes, performing simple signal processing functions, processing sampled data, and synthesizing sound algorithmically. Not for computer science majors.

Max Credits: 3
Min Credits: 3

91.212 Special Topics: Sound Thinking

Course ID: 35253

Course Details: Special Topics: Sound Thinking is an interdisciplinary elective for sophomore-level undergraduates that explores issues of sound production, musical form, or music in multimedia, depending on faculty and student interest. It is co-taught by Music and Computer Science Faculty.

Max Credits: 3
Min Credits: 3

91.301 Organization of Programming Languages

Course ID: 8076

Course Details: Analytical approach to the study of programming languages. Description of the salient features of the imperative, functional, logical, and object-oriented programming paradigms in a suitable metalanguage such as Scheme. Topics include iteration, recursion, higher-order functions, types, inheritance, unification, message passing, orders of evaluation, and scope rules. Elementary syntactic and semantic descriptions. Implementation of simple interpreters.

Max Credits: 3
Min Credits: 3
91.304 Foundations of Computer Science
Course ID: 8077
Max Credits: 3
Min Credits: 3

91.305 Computer Architecture
Course ID: 8078
Course Details: Examines the basic functional components of a computer system including the CPU, memory systems, and I/O systems. Each of these three areas will be developed in detail with a focus on the system design and component integration. Topics will include CPU control and ALU operation, computer timing, data address and I/O bus activity, addressing model, programmed and DMA I/O, and instruction sets and micro code.
Max Credits: 3
Min Credits: 3

91.308 Operating Systems
Course ID: 1228
Course Details: Presents an introduction to major operating systems and their components. Topics include processes, concurrency and synchronization, deadlock, processor allocation, memory management, I/O devices and file management, and distributed processing. Techniques in operating system design, implementation, and evaluation will be examined.
Max Credits: 3
Min Credits: 3

91.309 Database I
Course ID: 8080
Course Details: This course surveys topics in database management systems. Topics include access methods, data models (relational, semantic, object-oriented and object-relational), query languages, database design, query optimization, concurrency control, recovery, security, integrity, client-server architecture, and distributed database systems. A database application project will be assigned.
Max Credits: 3
Min Credits: 3

91.310 Database II
Course ID: 8081
Course Details: Advanced topics in database systems, including distributed database systems, query optimization, concurrency control, knowledge bases, deductive databases, extendibility, and object-oriented database systems. Additional topics may include benchmarking, scientific databases, and parallelism. Software engineering principles will be applied to the development of components of a database management system.
Max Credits: 3
Min Credits: 3

91.350 Special Topics
Course ID: 8085
Course Details:
Max Credits: 3
91.401 Software Project I

Course ID: 8093

Course Details: Specification, design, and implementation of a one- or two-semester software project proposed to a directing faculty member. Projects may be proposed as a one- or two-semester effort based on faculty approval. A two-semester effort requires subsequent registration for 91.402. Prerequisite: Students must submit a proposal to the directing faculty member, obtain his/her signed approval, and forward a copy of the signed proposal to department chairperson.

Max Credits: 3
Min Credits: 1

91.404 Analysis of Algorithms

Course ID: 8095

Course Details: Development of more sophisticated ideas in data type and structure, with an introduction to the connection between data structures and the algorithms they support. Data abstraction. Controlled access structures. Trees, lists, graphs, arrays; algorithms design strategies; backtracking, greedy storage, divide and conquer, branch and bound. Elementary techniques for analysis; recursion equations, estimations methods, elementary combinatorial arguments. Examination of problem areas such as searching, sorting, shortest path, matrix and polynomial operations, and the indicated representations and algorithms. The student will use the techniques learned in this course and in previous courses to solve a number of logically complex programming problems.

Max Credits: 3
Min Credits: 3

91.405 Parallel Processing

Course ID: 8096

Course Details: A study of parallel architectures and parallel algorithms, including classification of architectures, characterization of performance, design of parallel algorithms, evaluation of parallel software, and languages for parallel processing. Students will write and execute programs for several different parallel machines.

Max Credits: 3
Min Credits: 3

91.406 Compiler Construction I

Course ID: 8097

Course Details: Includes both theory and practice. A study of grammars; specification and classes; the translation pipeline: lexical analysis, parsing, semantic analysis, code generation and optimization; and syntax-directed translation. Use of automatic generation tools in the actual production of a complete compiler for some language.

Max Credits: 3
Min Credits: 3

91.411 Software Engineering I

Course ID: 8099

Course Details: Software Engineering is an essential discipline for any computer science major. In this class you will learn skills that will help you design and build software projects for advanced computer science classes. This course provides an introduction to systematic techniques for development of software, i.e., "the Engineering of Software." Topics to be discussed include software life-cycle, group coordination, requirements specification, software design, software testing and software maintenance. Emphasis is given to the development of one complex software system and the system documentation necessary for such a complete software product. The students will mock the software cycle via a medium-to-large semester-long project.

Max Credits: 3
Min Credits: 3

91.412 Software Engineering II

Max Credits: 3
Min Credits: 3
Course ID: 8100

Course Details: Software development methodologies for large-scale systems. Project organization, life cycle concept, data modeling, structured analysis and design, information hiding, and the use of computer-aided software engineering (CASE) tools. Team projects are required; these emphasize the design, documentation, and maintenance of complex software systems. Not open to students who have taken 91.523 Software Engineering I.

Max Credits: 3
Min Credits: 3

91.413 Data Communications I

Course ID: 8101

Course Details: This course provides an introduction to fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications. Topics include: TCP/IP and OSI layered network architectures and associated protocols, application layer, network programming API (sockets), transport, congestion, flow control, routing, addressing, autonomous systems, multicast and link layer. Examples will be drawn primarily from the Internet.

Max Credits: 3
Min Credits: 3

91.414 Data Communications II

Course ID: 8102

Course Details: A continuation of 91.413. Topics include Multimedia Networks, network Management, Network Security, Wireless and Mobile Networks. Students will track discussion in IETF committees and work in a dedicated network laboratory.

Max Credits: 3
Min Credits: 3

91.420 Artificial Intelligence

Course ID: 8104

Course Details: Discusses LISP, tree and graph searching algorithms: breadth first, depth first, and uniform cost. Also covers heuristic search methods, admissibility, and games: mini-max, alphaBeta. Students will learn theorem proving and question answering.

Max Credits: 3
Min Credits: 3

91.421 Data Mining

Course ID: 8105

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

91.427 Computer Graphics I

Course ID: 8107

Course Details: Introduction to graphics systems and concepts. History of graphics. Introduction to hardware, software, and mathematical tools. Graphics languages and APIs (GKS, PHIGS, Direct 3D,OpenGL). Graphics data structures and algorithms for 2D and 3D modeling and viewing. Input, archiving, and display architectures. Introduction to hidden line and hidden surface removal.

Max Credits: 3
Min Credits: 3
91.428 Computer Graphics II

Course ID: 8108

Course Details: An advanced course in computer graphics for students familiar with basic issues in computer graphics. Details on hidden line and surface removal, 2D and 3D curve and surface generation. Rendering, illumination, and color models. Realism through precision (ray tracing) and imprecision (fractals). Windowing and user interface management systems. Modern hardware architectures. Animation and simulation systems.

Max Credits: 3
Min Credits: 3

91.450 Robotics I

Course ID: 8111

Course Details: An introduction to robotics, including laboratory. In the lab, students build and program robots. Topics to be covered include sensors, locomotion, deliberative architectures, reactive architectures, and hybrid architectures.

Max Credits: 3
Min Credits: 3

91.451 Robotics II

Course ID: 8112

Course Details: Advanced topics in robotics, including laboratory. Topics to be covered include map making, path planning, computer vision and learning. Research-level robots are used in the laboratories.

Max Credits: 3
Min Credits: 3

91.457 Computer Security

Course ID: 8117

Course Details: Basic concepts of cryptography, data security, information theory, complexity, number theory, and finite field theory; encryption algorithms including the Data Encryption Standard (DES) and public key systems; incorporating cryptographic controls into computers; key management; access controls; information flow controls; and inference controls.

Max Credits: 3
Min Credits: 3

91.460 Selected Topics

Course ID: 8120

Course Details: Depends on faculty interest, student demand, and developments in the field.

Max Credits: 3
Min Credits: 3

91.461 Graphical User Interface Programming I

Course ID: 8121

Course Details: This is a first course in the design and implementation of graphical user interfaces (GUIs) for windowing environments. The course involves numerous programming projects that are evaluated on design and layout of the user interface, coding style, and comprehensiveness of documentation. The course may be taken on its own, but is intended to be followed by 91.462 to complete a two-course CS project sequence.

Max Credits: 3
Min Credits: 3
91.462 Graphical User Interface Programming II

Course ID: 8122

Course Details: A second course in the design and implementation of graphical user interfaces for windowing environments.

Max Credits: 3

Min Credits: 3

91.490 Directed Studies in Computer Science

Course ID: 8131

Course Details: Individual study for a student desiring more advanced or more specialized work. This course may not be taken more than twice and may not be substituted for scheduled offerings. Prerequisite: Students must submit a proposal to the directing faculty member, obtain his/her signed approval, and forward a copy of the signed proposal to the department chairperson.

Max Credits: 4

Min Credits: 1

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.
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

91.546 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.
**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 Details:
Max Credits: 3
Min Credits: 3

91.593 Cooperative Education

Course Details:
Max Credits: 1
Min Credits: 0

91.604 Network Optimization

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 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-lexical 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

91.641 Advanced Topics in Visualization

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 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

91.701 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

91.741 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
Min Credits: 1

91.769 Continued Graduate Research

Course ID: 8236
Course Details:
Max Credits: 9
Min Credits: 9

92.107 Elementary Math for Teaching: Numbers and Operations

Course ID: 37557
Course Details: The Number and Operations course for elementary and middle school teachers examines the three main categories in the Number and Operations strand of Principles and Standards of School Mathematics (NCTM) -- Understanding numbers, representations, relationships, and number systems; the meanings of operations and relationships among those operations; and reasonable estimation and fluent computation. Not for Science / Engineering majors.

Max Credits: 3
Min Credits: 3

92.111 Quantitative Reasoning

Course ID: 8242

Course Details: An introduction to the mathematics concepts and skills important in modern society, even for non-technical pursuits. The course will emphasize conceptual understanding as well as a facility in performing elementary computations. Topics to be examined will include types of reasoning, problem-solving methods, techniques of estimation, algebraic essentials, and the nature of probability and statistics. No credit in Science or Engineering.

Max Credits: 3
Min Credits: 3

92.111SI SI for Quantitative Reasoning & Introduction to Statistics

Course ID: 8240

Course Details: This course provides supplemental instruction in mathematics to students whose Elementary Algebra Accuplacer exam scores indicate the need for such instruction. The credits in this course can not be used to satisfy the credits required for graduation, but may be used to satisfy the credits required for full time student status.

Max Credits: 2
Min Credits: 2

92.121 Management Precalculus

Course ID: 8245

Course Details: Review of algebra: operations on the real numbers, factoring, radical notation, and rational exponents. Linear and quadratic equations, rational expressions. Graphs of functions, straight lines, parabolas, exponential and log functions, systems of equations, and linear mathematical models. Prerequisites: No credit for math/science/engineering majors.

Max Credits: 3
Min Credits: 3

92.121SI Management Pre-Calculus Supplemental Instruction

Course ID: 36826

Course Details: Taken simultaneously with 92.121, this 1-credit course offers students retaking 92.121 supplemental instructions to foster a greater opportunity for successful completion of Management Precalculus. The course credit cannot be used to satisfy the credits required for graduation, but may be used to satisfy credits required for full time student status.

Max Credits: 1
Min Credits: 1

92.122 Management Calculus

Course ID: 8246

Course Details: Differential calculus: limits, continuity, derivatives, differentials, higher-order derivatives, implicit differentiation, maxima and minima of functions, and applications of derivatives to business and economics. Integrals and Applications to business. No credit in Science or Engineering

Max Credits: 3
Min Credits: 3

92.123 Precalculus Mathematics II
Course ID: 8247
Course Details: Reviews angles and their measure, the trigonometric functions, solving triangles, law of sines, law of cosines, circular functions and their graphs, vectors and trigonometric identities. Not for Science / Engineering majors.
Max Credits: 3
Min Credits: 3

92.125 Calculus A
Course ID: 8249
Course Details: Serves as a first course in calculus and provides a brief review of analytic geometry and trigonometric functions. The course progresses to the study of inverse functions, limits, continuity, derivatives, rules for differentiation of algebraic and transcendental functions, chain rule, implicit differentiation, linear approximation, differentials, and maximum and minimum values.
Max Credits: 3
Min Credits: 3

92.126 Calculus B
Course ID: 8250
Course Details: Serves as a continuation of 92.125. The course covers L'Hopital's Rule, optimization problems, Newton's method, sigma notation, integration, area between curves, volume, arc length, surface area, integration by parts, trigonometric substitution, partial fraction decomposition, and improper integrals.
Max Credits: 3
Min Credits: 3

92.127 Preparation for Calculus
Course ID: 8251
Course Details: A review of precalculus (algebra and trigonometry) together with development of problem solving skills. No credit for math/science/engineering majors.
Max Credits: 4
Min Credits: 4

92.128 Calculus IA
Course ID: 8252
Course Details: Provides a review of pre-calculus algebra and trigonometry integrated with the first half of Calculus I: limits, continuity, derivatives, basic derivative formulas, chain rule, implicit differentiation. For math/science/engineering majors, only two credits of this course may be applied toward a degree.
Max Credits: 4
Min Credits: 4

92.128SI Calculus IA Supplemental Instruction
Course ID: 38061
Course Details: Taken simultaneously with 92.128, this 1-credit course offers students retaking 92.128 supplemental instructions to foster a greater opportunity for successful completion of Calculus IA. The course credit cannot be used to satisfy the credits required for graduation, but may be used to satisfy credits required for full time student status.
Max Credits: 1
Min Credits: 1

92.129 Calculus IB
Course ID: 35267
Course Details: Provides a review of pre-calculus algebra and trigonometry integrated with the second half of Calculus I: L'Hospital's Rule, optimization problems, curve sketching, Newton's Method, antiderivatives. For math/science/engineering majors, only two credits of this course may be applied toward a degree. For pre-requisites, completion of this course is equivalent to 92.131 Calculus I.

Max Credits: 4
Min Credits: 4

92.131 Calculus I

Course ID: 8254
Course Details: Serves as a first course in calculus. Functions, limits, continuity, derivatives, rules for differentiation of algebraic and transcendental function; chain rule, implicit differentiation, related rate problems, max/min problems, and curve sketching. Integrals and areas.

Max Credits: 4
Min Credits: 4

92.132 Calculus II

Course ID: 8255
Course Details: Serves as a continuation of Calculus I. Volume, arc length, surface area, pressure and force. Differentiation and integration of trigonometric, inverse trigonometric, exponential, logarithmic, and hyperbolic functions. Improper integration, infinite series, Taylor and MacLauren series.

Max Credits: 4
Min Credits: 4

92.138 Calculus for the Life Sciences I

Course ID: 38099
Course Details: This is a single variable calculus course with applications to the life sciences. Review of basic algebra, functions and graphs. The Derivative: Basic definition, formulas and methods. Applications of differentiation, including curve sketching and maximum-minimum problems. Study of exponential and logarithmic functions motivated by growth, decay and logistic modes. Introduction to integration, techniques, applications and the fundamental theorem. Approximation methods.

Max Credits: 4
Min Credits: 4

92.141 Honors Calculus I

Course ID: 8260
Course Details: This course covers the same topics as 92.131 Calculus I, but in an enriched environment.

Max Credits: 4
Min Credits: 4

92.142 Honors Calculus II

Course ID: 8261
Course Details: This course covers the same topics as 92.132 Calculus II, but in an enriched environment.

Max Credits: 4
Min Credits: 4

92.151 Explorations in Mathematics

Course ID: 8263
Course Details: An introduction to the nature of mathematics, providing insights into what mathematics is, what it accomplishes, and how it is pursued as a human enterprise. The course will stress concepts and relevance to modern experience, with topics to be selected at the discretion of each instructor from a wide variety of interesting and illustrative fields of mathematics. No credit in Science or Engineering.

Max Credits: 3
Min Credits: 3

92.210 Functions and Modeling

Course ID: 37657

Course Details: Engage in lab-based activities designed to strengthen their problem-solving skills and expand knowledge of the topics in secondary mathematics, focusing especially on topics from precalculus and the transition to calculus. Explore a variety of contexts that can be modeled using families of functions. Topics include conic sections, parametric equations and polar equations. Multiple representations, transformations, data analysis techniques and interconnections among geometry, probability and algebra. Quantitative approaches and building relationships between discrete and continuous reasoning will be recurrent themes.

Max Credits: 3
Min Credits: 3

92.221 Linear Algebra I

Course ID: 8281

Course Details: Elementary set theory and solution sets of systems of linear equations. An introduction to proofs and the axiomatic methods through a study of the vector space axioms. Linear analytic geometry. Linear dependence and independence, subspaces, basis. Inner products. Matrix algebra. Applications of the above will also be discussed.

Max Credits: 3
Min Credits: 3

92.222 Linear Algebra II

Course ID: 8282

Course Details: Linear transformations. Linear operators, change of basis, inner product and the diagonalization problem. Quadratic forms. Convex sets and geometric programming, input/output models for an economy, Markov chains, other applications of linear algebra.

Max Credits: 3
Min Credits: 3

92.225 Calculus C

Course ID: 8285

Course Details: Serves as a continuation of 92.126. This course covers integration by parts, integration of trigonometric integrals, trigonometric substitution, partial fraction, numeric integration, improper integrals, L'Hopital's Rule, indeterminate forms, sequences, infinite series, integral tests, comparison tests, alternating series tests, power series, Taylor series, polar coordinates, graphs and areas in polar coordinates, and parametric equations.

Max Credits: 3
Min Credits: 3

92.226 Calculus D

Course ID: 8286

Course Details: Serves as a continuation of 92.225. This course covers curvature, cylindrical surfaces, dot and cross products, curves and planes in three space, cylindrical and spherical coordinates, functions of two variables, chain rule, directional derivatives and gradient, tangent planes, and double and triple integrals in rectangular, polar, cylindrical and spherical coordinate systems.

Max Credits: 3
Min Credits: 3
92.227 Elementary Math for Teaching: Geometry and Measurement

Course ID: 37459

Course Details: This is a mathematics content course which covers the geometry/measurement strands of the Massachusetts Curriculum Frameworks in Mathematics at a collegiate level. The goal is not only to prepare students for the elementary mathematics MTEL, but to lay the groundwork for graduate work in elementary mathematics education. The course centers around "Big Ideas" such as Equivalence, Proportionality, Transformations; and Shapes & Solids. Not for Science / Engineering majors.

Max Credits: 3
Min Credits: 3

92.231 Calculus III

Course ID: 8287

Course Details: Serves as a continuation of Calculus II Polar Coordinates, parametric equations, vectors and analytic geometry in space. Functions of several variables, partial derivatives, and chain rule. Tangent planes and normal lines. Maxima and minima, Lagrange multipliers, and multiple integrals.

Max Credits: 4
Min Credits: 4

92.234 Differential Equations

Course ID: 8289

Course Details: Classification and solution of ordinary differential equations of the first order and higher orders. The Laplace transform. Applications.

Max Credits: 3
Min Credits: 3

92.236 Engineering Differential Equations

Course ID: 8290

Course Details: Introduction to differential equations with an emphasis on engineering applications. Topics include first-order equations, higher-order linear equations with constant coefficients, and systems of first-order equations. Applications of each topic are introduced and qualitative, analytical, and numerical solution techniques are studied. Laplace transform methods are discussed. The software package MATLAB may be used throughout the course.

Max Credits: 3
Min Credits: 3

92.241 Honors Calculus III

Course ID: 8291

Course Details: Covers the same topics as 92.231 Calculus II, but in an enriched environment.

Max Credits: 4
Min Credits: 4

92.244 Honors Differential Equations

Course ID: 8293

Course Details: Introduction to differential equations. Topics include first-order equations, second-order and higher-order linear equations, systems of first-order linear equations with constant coefficients, and Laplace transforms.

Max Credits: 3
Min Credits: 3
92.283 Introduction to Statistics

Course ID: 8302

Course Details: An introduction to descriptive statistics, graphing and data analysis, probability laws, discrete and continuous probability distributions, correlation and regression, inferential statistics. No credit for Math, Science, or Engineering majors.

Max Credits: 3
Min Credits: 3

92.283SI SI for Quantitative Reasoning & Introduction to Statistics

Course ID: 8240

Course Details: This course provides supplemental instruction in mathematics to students whose Elementary Algebra Accuplacer exam scores indicate the need for such instruction. The credits in this course can not be used to satisfy the credits required for graduation, but may be used to satisfy the credits required for full time student status.

Max Credits: 2
Min Credits: 2

92.301 Introduction to Applied Mathematics I

Course ID: 8303

Course Details: Discusses vector analysis, Green's Theorem, Divergence Theorem, Stokes' Theorem, Fourier series, integrals, and partial differential equations of physics and engineering.

Max Credits: 3
Min Credits: 3

92.305 Introduction to Real Analysis I

Course ID: 8307


Max Credits: 3
Min Credits: 3

92.321 Discrete Structures I

Course ID: 8321

Course Details: Presents propositional logic, combinatorics, methods of proof, mathematical systems, algebra of sets, matrix algebra, relations and functions, recursion and generating functions, applications to computer science, and graph theory.

Max Credits: 3
Min Credits: 3

92.322 Discrete Structures II

Course ID: 8322

Course Details: Examines graph theory, trees, algebraic systems, Boolean algebra, groups, monoids, automata, machines, rings and fields, applications to coding theory, logic design, and sorting.

Max Credits: 3
Min Credits: 3

92.330 Symbolic Logic

Course ID: 8323
Course Details: This course is an introduction to symbolic logic. Symbolic logic provides a solid foundation in formal reasoning for students preparing for further study in mathematics, linguistics, cognitive science, computer science or philosophy. Topics include propositional logic, first-order logic and systems of deduction, Tarski's notion of model, and the completeness and incompleteness theorems of Gödel. Prerequisite: 92.321.

Max Credits: 3
Min Credits: 3

**92.360 Mathematic Structure for Computer Engineers**

Course ID: 8327


Max Credits: 3
Min Credits: 3

**92.362 Numerical Analysis I**

Course ID: 8328

Course Details: Focuses on the theory and application of numerical techniques including error analysis. Also discusses solution of linear, nonlinear and differential equations, interpolation, numerical integration, and curve fitting. Computer solutions are emphasized.

Max Credits: 3
Min Credits: 3

**92.363 Intro to Data Analysis**

Course ID: 8329

Course Details: Computer analysis of data derived from research conducted in physical, social, and life sciences. Data preparation, data modification, file manipulation, and descriptive statistics using SPSS. Programming ability is not required. No credit in Science or Engineering.

Max Credits: 3
Min Credits: 3

**92.375 Senior Seminar I**

Course ID: 30392

Course Details: Student works with an advisor to develop a proposal for a senior project that will be carried out as part of 92.475 Senior Seminar II. Generally taken during the spring of the junior year. Prerequisite: permission of instructor.

Max Credits: 1
Min Credits: 1

**92.385 Applied Statistics**

Course ID: 8340

Course Details: Introduction to experimental design, data analysis and formal statistical procedures from an applied point of view.

Max Credits: 3
Min Credits: 3

**92.386 Probability and Statistics I**

Course ID: 8341

Course Details: Provides a one-semester course in probability and statistics with applications in the engineering sciences. Probability of events, discrete and continuous random variables cumulative distribution, moment generatory functions, chi-square distribution,
density functions, distributions. Introduction to estimation, hypothesis testing, regression and correlation.

Max Credits: 3
Min Credits: 3

92.403 Mathematical Analysis

Course ID: 8344

Course Details: The real numbers, completeness, sequences of real numbers, functions, continuity, uniform continuity, differentiability, the Riemann integral, series of real numbers, sequences and series of functions, uniform convergence, power series.

Max Credits: 3
Min Credits: 3

92.407 Probability and Mathematical Statistics I

Course ID: 8346

Course Details: Addresses the topics of probability, random variables, discrete and continuous densities, expectation and variance, special distributions (binomial, Poisson, normal, etc.), moment generating functions, joint and conditional distributions, transformations of variables, sampling, and the central limit theorem.

Max Credits: 3
Min Credits: 3

92.411 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

92.413 Number Theory

Course ID: 8351

Course Details: Studies congruencies and the Chinese Remainder Theorem, Primitive roots, quadratic reciprocity, approximation properties of continued fractions, Pell's equation. Recent application of number theory such as primality testing, cryptology, and random number generation will also be covered.

Max Credits: 3
Min Credits: 3

92.420 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

92.421 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

92.426 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

92.427 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

92.435 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

92.445 Partial Differential Equations

Course ID: 8325

Course Details:
Max Credits: 3
Min Credits: 3

92.448 Mathematics of Signal Processing

Course ID: 8365


Max Credits: 3
Min Credits: 3

92.450 Mathematical Modeling

Course ID: 8366

Course Details: Applications of mathematics to real life problems. Topics include dimensional analysis, population dynamics wave and heat propagation, traffic flow.
Max Credits: 3
Min Credits: 3

92.466 Stat Program Using SAS
Course ID: 31925
Course Details:
Max Credits: 3
Min Credits: 3

92.475 Senior Seminar II
Course ID: 8385
Course Details: Undergraduate seminar on advanced mathematical topics. Students are required to develop an understanding of an advanced subject beyond the scope of an existing course or synthesize two or more different areas form their curriculum. Students are required to participate in the seminar, present their results to the Department and write a substantial thesis in their topic area. Essential course elements include library research, original research, and both verbal and written exposition. The first semester is a graduation requirement for majors in mathematics.
Max Credits: 3
Min Credits: 3

92.476 Senior Seminar III
Course ID: 8386
Course Details: An optional second semester seminar to allow for continuation of study initiated in Senior Seminar I.
Max Credits: 3
Min Credits: 3

92.486 Probability and Math Statistics II
Course ID: 8394
Max Credits: 3
Min Credits: 3

92.490 Selected Topics
Course ID: 8396
Course Details: Individual study for the student desiring more advanced or more specialized work. Course may not be substituted for scheduled offerings. Prerequisite: Permission of Department Chair.
Max Credits: 3
Min Credits: 1

92.491 Directed Study in Algebra
Course ID: 8397
Course Details: Individual study for the student desiring more advanced or more specialized work in algebra. May be repeated for a total of six semester credits. Course may not be substituted for scheduled offerings.
Max Credits: 3
Min Credits: 3
92.494 Directed Study in Statistics

Course ID: 8400

Course Details: Individual study for the student desiring more advanced or more specialized work in Statistics. May be repeated for a total of six semester credits. Course may not be substituted for scheduled offerings. Prerequisite: Permission of Department Chair.

Max Credits: 3
Min Credits: 3

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


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.
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

92.530 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

92.535 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


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; othonormal 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

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

92.570 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


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

94.301 Organization of Programming Languages

Course ID: 30805
Course Details: Analytical approach to the study of programming languages. Description of the salient features of the imperative, functional, logical, and object-oriented programming paradigms in a suitable metalanguage such as Scheme. Topics include iteration, recursion, higher-order functions, types, inheritance, unification, message passing, orders of evaluation, and scope rules. Elementary syntactic and semantic descriptions. Implementation of simple interpreters. Note: This course is for CS graduate students needing to fulfill prerequisite requirements. It is not available to CS undergraduates without specific permission from the Undergraduate Coordinator.

Max Credits: 3
Min Credits: 3

94.304 Foundations of Computer Science

Course ID: 34537
Course Details: A survey of the mathematical foundations of Computer Science. Finite automata and regular languages. Stack Acceptors and Context-Free Languages. Turing Machines, recursive and recursively enumerable sets. Decidability. Complexity. This course involves no computer programming. This course is for CS graduate students needing it to fulfill prerequisite requirements. It is not available to CS undergraduates without specific permission from the Undergraduate Coordinator.

Max Credits: 3
Min Credits: 3

94.305 Computer Architecture

Course ID: 30806
Course Details: Examines the basic functional components of a computer system including the CPU, memory systems, and I/O systems.
Each of these three areas will be developed in detail with a focus on the system design and component integration. Topics will include CPU control and ALU operation, computer timing, data address and I/O bus activity, addressing model, programmed and DMA I/O, and instruction sets and micro code. This course is for CS graduate students needing it to fulfill prerequisite requirements. It is not available to CS undergraduates without specific permission from the Undergraduate Coordinator.

Max Credits: 3
Min Credits: 3

**94.308 Introduction to Operating Systems**

**Course ID:** 30807

**Course Details:** Presents an introduction to major operating systems and their components. Topics include processes, concurrency and synchronization, deadlock, processor allocation, memory management, I/O devices and file management, and distributed processing. Techniques in operating system design, implementation, and evaluation will be examined. This course is for CS graduate students needing it to fulfill prerequisite requirements. It is not available to CS undergraduates without specific permission from the Undergraduate Coordinator.

Max Credits: 3
Min Credits: 3

**94.404 Analysis of Algorithms**

**Course ID:** 30808

**Course Details:** Development of more sophisticated ideas in data type and structure, with an introduction to the connection between data structures and the algorithms they support. Data abstraction. Controlled access structures. Trees, lists, graphs, arrays; algorithms design strategies; backtracking, greedy storage, divide and conquer, branch and bound. Elementary techniques for analysis; recursion equations, estimations methods, elementary combinatorial arguments. Examination of problem areas such as searching, sorting, shortest path, matrix and polynomial operations, and the indicated representations and algorithms. The student will use the techniques learned in this course and in previous courses to solve a number of logically complex programming problems. This course is for CS graduate students needing it to fulfill prerequisite requirements. It is not available to CS undergraduates without specific permission from the Undergraduate Coordinator.

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

**94.519 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, Zen 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 outsourcing. 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

94.560 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

**95.101 Introductory Physics**

Course ID: 8523

Course Details: A survey course for students majoring in sound recording technology. Topics covered include: one and two dimensional motion, Newton's Laws of dynamics, statics, circular motion, work and energy, linear and angular momentum, electrostatics, electric and potential fields, magnetic fields, vibrations, waves, sound, Faraday's Law and AC circuits.

Max Credits: 3
Min Credits: 3

**95.103 General Physics I**

Course ID: 8524

Course Details: Serves as the first semester of a one-year course which surveys the field of physics at a non-calculus level. Topics include force and motion, vectors, gravity, energy and momentum, heat and thermodynamics, and oscillations, waves and sound. Although the course emphasizes conceptual understanding, a functional knowledge of algebra and geometry is essential.

Max Credits: 3
Min Credits: 3

**95.104 General Physics II**

Course ID: 8525

Course Details: Provides a continuation of 95.103. Topics include electricity and magnetism, geometrical and physical optics, atoms, and nuclei.

Max Credits: 3
Min Credits: 3

**95.111 Undeclared Science Seminar**

Course ID: 8526

Course Details: Discussions will be conducted on a wide range of topics in the sciences to familiarize the student with the programs, procedures, research and educational opportunities at the University.
Max Credits: 1
Min Credits: 1

**95.112 Freshman Physics Seminar**

Course ID: 8527

Course Details: An introduction to the scientific methods of physics and the exploration of research opportunities for undergraduates.

Max Credits: 1
Min Credits: 1

**95.121 Exploring the Universe**

Course ID: 8528

Course Details: Addresses topics that include: Planet Earth, its structure, plate tectonics, greenhouse effect, ozone layer, craters and dinosaurs; our satellite Moon; other planets; our star Sun and its energy source; other stars, the HR diagram and stellar evolution, white dwarfs, neutron stars, supernovae, black holes; our galaxy, the Milky Way, its structure; other galaxies; the universe, its structures and expansion; evolution of galaxies, quasars, cosmology, the Big Bang and Unification of the forces of nature. Satisfies Gen Ed science requirements for non-science majors. Does not satisfy science requirements for Science majors but may be used as a free elective by Science majors.

Max Credits: 3
Min Credits: 3

**95.141 Physics I**

Course ID: 8529

Course Details: First semester of a two-semester sequence for science and engineering majors. Mechanics including vectors, kinematics in one and two dimensions, Newton's laws of dynamics, work and energy, energy conservation, linear momentum conservation, rotational kinematics and dynamics, Newton's Universal Law of Gravitation, oscillatory motion and mechanical waves.

Max Credits: 3
Min Credits: 3

**95.144 Physics II**

Course ID: 8531

Course Details: Continuation of 95.141. Optics including interference, and diffraction. Electricity and magnetism including Coulomb's Law, electric field, Gauss' Law, electric potential, Ohm's law, DC circuits with resistors, magnetic field, Ampere's Law, Faraday's Law, inductance, Maxwell's equations, and electromagnetic waves. Modern physics including deBroglie waves, uncertainty principle, photoelectric effect, hydrogen atom and the stability of the Bohr orbits, and atomic spectrum of hydrogen.

Max Credits: 3
Min Credits: 3

**95.161 Honors Physics I**

Course ID: 8535

Course Details: Introductory mechanics at a more challenging level and the first semester of a sequence for physics majors. Mechanics of particles in one dimension, kinematics, forces, dynamics; particles in two and three dimensions, vectors, curvilinear and oscillatory motion; conservation principles, work, energy, linear momentum, collisions; rotational mechanics, angular momentum, torque and static equilibrium; gravitation and planetary orbits; wave motion, transverse and longitudinal, standing waves.

Max Credits: 4
Min Credits: 4

**95.164 Honors Physics II**

Course ID: 8537
Course Details: Geometrical optics, reflection, refraction, flat and curved mirrors, thin lenses; physical optics, interference and diffraction; electrostatics, charge, electric forces, fields and flux, electric potential, capacitance and field energy; electric charge in motion, currents, DC and RC circuits; magnetic fields, forces on moving charges, magnetic field of an electric current, electromagnetic induction, inductance, changing currents, AC circuits; electromagnetic radiation; the limits of classical electromagnetic theory.

Max Credits: 4
Min Credits: 4

95.204 Introduction to Radiological Sciences

Course ID: 8542

Course Details: This course is designed to introduce students to the working practices encountered in health physics. This is accomplished through field trips to local facilities that use radioactive materials, laboratory exercises, and class discussions. This class exposes the student to basic health physics procedures, vocabulary, and equipment.

Max Credits: 3
Min Credits: 3

95.210 Introductory Modern Physics

Course ID: 8544

Course Details: Special theory of relativity, experimental basis of quantum theory, structure of the atom, wave properties of matter, quantum theory, hydrogen atom, atomic nucleus, nuclear interactions and applications, and semiconductors.

Max Credits: 3
Min Credits: 3

95.245 Physical Properties of Matter

Course ID: 8546

Course Details: Fluid statics, dynamics of fluids, properties of solids, advanced topics in waves and vibrations, temperature and heat flow, kinetic theory of gases, thermodynamics, and the limits of classical physics.

Max Credits: 3
Min Credits: 3

95.269 Honors Physics III

Course ID: 8547

Course Details: Statics and dynamics of fluids, pressure, viscosity, Archimedes and Bernoulli principles, mechanical properties of solids, stress and strain, shear, electric and magnetic properties of materials, para- dia- and ferromagnetism, electro-mechanical and magneto-mechanical effects, hysteresis, advanced topics in waves and vibrations, damping, resonance in mechanical and AC oscillators, thermodynamics, Maxwell's velocity distribution, blackbody radiation, and the limits of classical physics, introduction to special relativity.

Max Credits: 4
Min Credits: 4

95.300 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
95.304 Vibration and Sound

Course ID: 37507

Course Details: The course serves to integrate the various sub-topics of physics that undergraduate majors have experienced by exploring the physical processes of vibrations of lumped and continuous electrical mechanical and acoustic systems: the damped harmonic oscillator in electrical and mechanical form, the flexible string in tension and the coaxial cable with differing end conditions, vibrations of bars, membranes and plates, plane waves of sound, standing waves, radiation and scattering. Throughout reference is made to analogous process in the quantum mechanical domain. Closely coordinated with the recitations is the co-requisite laboratory course, which provides concrete experience with the phenomena discussed in the recitations.

Max Credits: 3
Min Credits: 3

95.308 Physics with Computers I

Course ID: 8549

Course Details:

Max Credits: 3
Min Credits: 3

95.316 Science and Technology in an Impoverished World

Course ID: 37509

Course Details: Intended for junior-level science and engineering majors, this is a one-semester 3-credit course focused of the impact of science and technology in poverty stricken regions of the world. Students will be challenged to consider the implementation of past and present technologies for solving resource shortages, evaluate and strengths and limitations of these solutions while developing alternatives to address future barriers to positive change. Encouraged to work toward these issues, students will; 1) Pursue and evaluate topics in science and technology through the skills of inquiry, research, critical thinking and problem solving. 2) Demonstrate the knowledge for quantitative and qualitative analysis of problems in science and technology. #0 Analyze and interpret issues in interdisciplinary areas of science and engineering developing a level of comfort with solving unfamiliar problems using acquired knowledge and skills.

Max Credits: 3
Min Credits: 3

95.338 Optics and Waves

Course ID: 8557

Course Details: Wave nature of light, mathematics of wave motion, electromagnetic theory of light propagation, reflection and refraction, Fresnel coefficients, polarization, interference, Young's experiment, fringe visibility and coherence, various interferometers, Newton's ring and applications, Fraunhofer diffraction by single and multiple apertures and diffraction gratings.

Max Credits: 3
Min Credits: 3

95.353 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

95.354 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

95.381 Mathematical Physics I

Course ID: 36219

Course Details: Intended for students having completed 2 full years of physics and math, this course is designed to develop competency in the applied mathematical skills required of junior and senior level physics majors. Covering topics involving infinite series, power series, complex numbers, and linear algebra along with vector and Fourier analysis, students will be trained with the rigor required to solve a wide range of applications in the physical sciences.

Max Credits: 3
Min Credits: 3

95.382 Mathematical Physics II

Course ID: 36220

Course Details: Expanding on the skills mastered in 95.381 Mathematical Physics I, this course is designed to continue developing competency in the applied mathematics required of junior and senior level physics majors. Intended for students having completed at least 2 years of physics and math, topics covered will involve ordinary, differential equations, calculus of variations, tensor analysis, special functions, series solutions of differential equations, partial differential equations, and complex variables as well as probability and statistics. Students will be trained with the rigor required to solve a wide range of applications in the physical sciences.

Max Credits: 3
Min Credits: 3

95.383 Astronomy and Astrophysics I

Course ID: 8560

Course Details: This course is designed for an interdisciplinary general undergraduate (upperclassmen) audience. Fundamentals of astronomy and astromechanics, introductory survey of astrophysics and the solar system (i.e. planetary astronomy).

Max Credits: 3
Min Credits: 3

95.401 Radiation Safety and Control I

Course ID: 8562

Course Details: Introduction to radiation protection, including radiation sources, radiation dose and dose measurement, radiation exposure, radiation protection techniques, monitoring methods and instruments, contamination control and waste storage, facility design, hazards analysis, and applied health physics techniques for the safe handling and control of radioactive material including laboratory. (offered as 98.501 for graduate credit)

Max Credits: 4
Min Credits: 4

95.402 Radiation Safety and Control II

Course ID: 8563

Course Details: A laboratory course giving students experience with equipment and practices of current use in the radiation protection field, and extension of 98.401 giving some of the practical aspects of radiation safety and control. (offered as 98.502 for graduate credit)

Max Credits: 4
Min Credits: 4

95.411 Physics Perspectives
Course ID: 8565
Course Details: Discussions on the role of the professional physicist in society.
Max Credits: 1
Min Credits: 1

95.413 Mechanics
Course ID: 1221
Max Credits: 3
Min Credits: 3

95.421 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

95.424 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

95.435 Introductory Quantum Mechanics I
Course ID: 1219
Course Details: De Broglie waves, the Schroedinger 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

95.436 Introductory Quantum Mechanics II
Course ID: 8567
Course Details: The three dimensional Schroedinger 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. (offered as 95.536 for graduate credit)

Max Credits: 3
Min Credits: 3
95.439 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

95.440 Image Processing

Course ID: 8568

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; laboratory exercises with an image processing system utilizing and Octec 2000 image analyzer and a Data General Nova 4/C Computer. Ability to program a computer is required. (offered as 95.540 for graduate credit)

Max Credits: 4
Min Credits: 4

95.441 Radiochemistry

Course ID: 8569

Course Details: This course stresses analytical techniques applicable to identification and quantification of radionuclides in various sample types. Considerable time will be spent on review of general chemistry and inorganic analytical chemistry. The theories and applications of various separation techniques including precipitation, solvent extraction, ion exchange chromatography, and electrodeposition will be discussed with emphasis on separation of radioactive species. Additional material to be covered includes instrumental techniques for analysis of radioactive species, radiotracer and isotope dilution techniques, neutron activation analysis, and sample preparation.

Max Credits: 3
Min Credits: 3

95.447 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

95.453 Health Physics Capstone

Course ID: 35837

Course Details: This course will provide the B.S. candidate in Physics (Radiological Health Physics option) with an undergraduate capstone experience through basic independent research, including critical thinking, problem solving, report writing, and presentation skills.

Max Credits: 3
Min Credits: 3

95.454 Physics Capstone

Course ID: 30755
Course Details: This course will provide the graduating physics major with a capstone experience through an exposure to the rudiments of independent research; incorporating critical thinking, problem-solving, report-writing, and presentation skills learnt in the course of the undergraduate curriculum. Prerequisite: Senior Status.

Max Credits: 3  
Min Credits: 3

95.461 Nuclear Physics I

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

95.462 Radiation Biology

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 95.562 for graduate credit)

Max Credits: 3  
Min Credits: 3

95.472 Solid State Physics

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

95.477 Solid State Electronic and Optoelectronic Devices

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

95.478 Integrated Optics: Wave Guides and Lasers

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
95.481 Mathematical Methods of Radiological Sciences

Course ID: 8574

Course Details: An applied course emphasizing the mathematical skills used in radiological sciences/health physics fields, including special techniques used in radiation physics, radiation dosimetry, and radiation shielding. Computer applications will be emphasized. (offered as 98.581 for graduate credit)

Max Credits: 3
Min Credits: 3

95.482 Numerical Methods of Radiological Sciences

Course ID: 8575

Course Details: Advanced mathematical treatment of topics covered in 98.481 with extensive application of computer techniques to problem solutions applicable to Radiological Sciences and Protection. (offered as 98.582 for graduate credit)

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


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 Schroedinger 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 Schrödinger 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

95.553 Electromagnetism I

Course ID: 1216

Course Details: The theory of electromagnetic fields using vector analysis: electrostatic fields and potentials in vacuum, conductors, and
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

95.561 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
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

95.605 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. Simplectic formulation, stochastic processes, and chaos theory.

Max Credits: 3
Min Credits: 3

95.615 Quantum Mechanics I

Course ID: 8613


Max Credits: 3
Min Credits: 3

95.616 Quantum Mechanics II

Course ID: 8614


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- l++ l - (2) e++e- e++e- (3) Compton scattering and (4) scattering of electrons by a laser 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 form 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

**95.709 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
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: 0

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

96.101 Introductory Experimental Physics

Course ID: 8666

Course Details: Experimental physics with topics correlated with the corequisite lecture course.
Max Credits: 1
Min Credits: 1

96.103 General Physics I Lab

Course ID: 8667

Course Details: Presents the first semester of a one-year course which surveys the field of experimental physics with topics correlated to the corequisite lecture course.
Max Credits: 1
Min Credits: 1

96.104 General Physics II Lab

Course ID: 8668

Course Details: Serves as a continuation of 96.103 with topics correlated with the corequisite lecture course.

Max Credits: 1

Min Credits: 1

96.105 Sounds of Music

Course ID: 35598

Course Details: Examines the physical process that makes musical sounds from acoustic instruments. Hands-on laboratory experiences explore how the vibrations of strings, air columns, membranes, plate and bars are transformed into musical sounds, how these propagate and are transformed by the listening space, and how these are received by ears and perceived by the brain. In addition harmonic series, the mean-tempered scale, the use of decibels, sonic interference and diffraction are explained.

Max Credits: 3

Min Credits: 3

96.141 Physics I Lab

Course ID: 8671

Course Details: Serves as an introductory course on methods and techniques of experimentation in physics with experiments in mechanics selected to support the concepts of the corequisite lecture course.

Max Credits: 1

Min Credits: 1

96.144 Physics II Lab

Course ID: 8673

Course Details: Serves as a continuation of 96.141 with experiments in optics, electricity and magnetism, and modern physics to support the concepts of the corequisite lecture course.

Max Credits: 1

Min Credits: 1

96.161 Honors Physics I Laboratory

Course ID: 8678

Course Details: An introductory laboratory course at the honors level on the methods and techniques of experimental physics. Lectures on measurement uncertainties and error analysis are included and experiments are selected principally in mechanics.

Max Credits: 2

Min Credits: 2

96.164 Honors Physics Lab II

Course ID: 8679

Course Details: A continuation of 96.161 with experiments selected principally in optics, electricity and magnetism.

Max Credits: 2

Min Credits: 2

96.201 Health Physics Internship I
Course ID: 8681
Course Details: Applied work experience as a health physics technician at a government laboratory or a radiation facility of some industry, hospital, or education and research institution.
Max Credits: 3
Min Credits: 3

96.245 Physics III Lab
Course ID: 8683
Course Details: Experiments are selected principally in properties of solids, vibrations, waves, heat, and thermodynamics.
Max Credits: 1
Min Credits: 1

96.261 The Physics of Materials and Devices
Course ID: 32070
Course Details: Investigating the phenomenology of materials involve sensing devices in which electrical signals must be evaluated. Observing physical phenomena with an electrical sensing device enables one to calibrate the dynamics of the electrical signal associated with the changes in the physical phenomenology observed with that device. Applications in these laboratory-based measurement techniques include the Wheatstone bridge, current/voltage device characterization, the operational amplifier as an active filter, stress & strain, Newton's law of cooling, Stefan/Boltzmann's law and the ideal gas law.
Max Credits: 3
Min Credits: 3

96.262 Principles in Laboratory Automation
Course ID: 8687
Course Details: This is an introduction to the principles of automating today's research laboratory. A foundation of the Labview-based software and hardware tools required to conduct computer-controlled experiments will be presented, demonstrated and then used to acquire, display and analyze data on some typical physical phenomena. Students will be fully involved in designing the control and acquisition software as well as setting up the experimental hardware. Applications of the automated acquisition environment include AC characterization of RC and LRC circuits, the use of thermistors and thermocouples along with acquiring the temperature dependent resistivity of high Tc super conductors.
Max Credits: 3
Min Credits: 3

96.301 Health Physics Internship II
Course ID: 8691
Course Details:
Max Credits: 3
Min Credits: 1

96.302 Health Physics Internship II
Course ID: 8692
Course Details:
Max Credits: 3
Min Credits: 3

96.304 Vibration and Sound Lab
Course ID: 37506
Course Details: A series of four directed four-hour experiments and one student directed experiment all of which are coordinated with Vibration and Sound 95.304. Emphasis is on non-intrusive measurement techniques; choosing, evaluating and applying appropriate transducers and structuring data processing and display in measurements of transfer functions. Impedances and modal structures for the system studied analytically in the companion course.

Max Credits: 1
Min Credits: 1

96.393 Advanced Experimental Physics Laboratory I

Course ID: 8699

Course Details:

Max Credits: 2
Min Credits: 2

96.394 Advanced Physics Lab II

Course ID: 8700

Course Details: A continuation of 96.393 with experiments selected mainly from condensed matter and nuclear physics. Opportunities for independent work by permission of the instructor.

Max Credits: 2
Min Credits: 2

96.401 Radiation Safety And Control I

Course ID: 8701

Course Details:

Max Credits: 0
Min Credits: 0

96.406 Nuclear Instrumentation

Course ID: 36046

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 (offered as 98.506 for graduate credit).

Max Credits: 4
Min Credits: 4

96.409 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

96.411 Senior Research In Radiological Sciences
Course ID: 8703

Course Details: A research problem related to the field of radiation protection is investigated by the student under the direction of faculty and staff of the Nuclear Center. The student will present a seminar on this research project. Areas of research may include radiation shielding, radiation detection and measurement, radiation survey and monitoring, radiation biology, radiation chemistry, radiobiology, radiochemistry, radioecology, natural radioactivity, fallout, analyses and measurement of radioactivity and radiation levels associated with the operation of reactors and accelerators, and radioactive aerosols.

Max Credits: 3
Min Credits: 3

96.445 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

96.453 Optics Project

Course ID: 8710

Course Details: Special problems in physics assigned to the individual student with emphasis on modern research methods and preparation of results for publication.

Max Credits: 3
Min Credits: 3

96.467 Automation Techniques

Course Details: Students explore the techniques and sensor technologies of automating measurement acquisition and analysis in a research laboratory. The Labview-based software and hardware tools required to conduct computer-controlled experiments will be presented, demonstrated and then used to acquire, display and analyze data for a number of sensors. Students will be expected to master the design of control and acquisition software as well as setting up the experimental hardware. Applications of the automated acquisition environment include AC characterization of operational amplifiers and active filters as well as the RC time characteristics of photoconductors and thermocouples. Advanced projects individualized to the student's field of interest are required.

Max Credits: 3
Min Credits: 3

96.495 Special Research Problems I

Course ID: 8713

Course Details: Special problems in physics assigned to the individual student with emphasis on modern research methods and preparation of results for publication.

Max Credits: 3
Min Credits: 3

96.496 Special Research Problems II

Course ID: 8714

Course Details: A continuation of 96.495 for a second semester.

Max Credits: 3
Min Credits: 3
96.497 Senior Thesis in Physics
Course ID: 8715
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  

**96.800 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

98.524 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 Shielding
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

98.631 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
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:

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
Course Details:
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
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
98.759 Doctoral Dissertation in Radiological Sciences and Protection

Course ID: 8902

Max Credits: 9
Min Credits: 9

98.769 Continued Graduate Research

Course ID: 8905

Max Credits: 9
Min Credits: 9

99.101 Radiation and Life

Course ID: 8906

Course Details: This course will provide students with an understanding of the nature, sources, uses, and biological effects of natural and man-made radiations. Radiations discussed include non-ionizing radiations such as ultraviolet and microwave as well as the ionizing radiations produced by radon in homes and radio nuclides released from nuclear power plants. Students will have a better understanding of the risks and benefits of radiation in the modern world. Satisfies Gen Ed science requirements for non-science majors. Does not satisfy science requirements for Science majors but may be used as a free elective by Science majors.

Max Credits: 3
Min Credits: 3

99.102 Radiation and Life Laboratory

Course ID: 8907

Course Details: This laboratory course which is suitable for non-science majors will provide the student with an opportunity for some hands-on experience with modern equipment used to identify and quantify levels of radioactivity in the environment. Students will measure radiation from a variety of sources and will determine concentrations of radionuclides in several environmental samples including making measurements of the radon levels in the air of their own homes. Students will also study the effects of ionizing radiation on the germination and growth rate of exposed seeds. Satisfies Gen Ed science requirements for non-science majors. Does not satisfy science requirements for Science majors but may be used as a free elective by Science majors.

Max Credits: 1
Min Credits: 1

99.131 Technical Physics I

Course ID: 8909

Course Details: Presents material in both the class and laboratory format. Topics include: vectors; one- and two-dimensional motion; Newton's laws of motion; translational and rotational equilibrium; work and energy; linear momentum; and circular motion and gravitation. Two additional Friday night classes are required.

Max Credits: 3
Min Credits: 3

99.132 Technical Physics II

Course ID: 8910

Course Details: Covers material in both the class and laboratory format. Rotational dynamics; mechanical vibrations and waves; sound; solids and fluids; thermal physics; heat and law of thermodynamics will be discussed. One session per week. Two additional Friday night classes are required.
Max Credits: 3
Min Credits: 3

99.133 Technical Physics III

Course ID: 8911

Course Details: Presents material in both the class and laboratory format. Reflection, refraction, mirrors, lenses, wave optics, optical instruments, Coulomb's law, magnetic force, quantum physics, atomic physics and nuclear physics will each be addressed. One session per week. Two additional Friday night classes are required.

Max Credits: 3
Min Credits: 3

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.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.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.
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.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.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.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.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.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

GNDR.240 Introduction to Gender Studies

Course ID: 36625

Course Details: This course is an interdisciplinary introduction to the field of Gender Studies that examines both commonalities and differences among diverse groups of women. A variety of topics are presented such as past and present stratification in work and family, sexual identities, medial representations of women, and violence against women. Social movements for women's equality and feminist theories and methods are also introduced.

Max Credits: 3
Min Credits: 3

GNDR.401 Gender Studies Practicum

Course ID: 36397

Course Details: This course provides a link between the UMASS Lowell campus and the community, offering students a unique learning experience. This Community Service-Learning course provides opportunities for students to learn through thoughtful engagement in community service, applying knowledge of gender issues gained in the classroom to the world outside the classroom. Students and their faculty supervisors together will determine the kind of service work students will engage in during the semester, choosing from a wide range of available placements. They will be using their hard-won knowledge from their years in the classroom and applying it to help meet urgent needs in the community. Students will have the opportunity to make lasting connections and effect positive change in our community. Ideally, this course will promote good citizenship through reflection on gender issues and testing of personal values, leading students toward a heightened sense of social responsibility and a lifelong commitment to their local, national, and global communities.

Max Credits: 3
Min Credits: 1

HON.110 First Year Seminar in Honors: Text in the City

Course ID: 35506

Course Details: The First Year Seminar in Honors (FYSH) uses Lowell as its text. Rich in history and culture, and the students' home for the next four years, the City of Lowell offers a perfect topic to promote connections while learning how to view the city through the lens of the Humanities. Students will develop library research skills, including facility with primary and secondary sources, and an appreciation for the narratives that lie in buildings, objects, and what people leave behind. Activities include field trips, readings, writing, and an artistic interpretation. As important, students will have the opportunity to form strong connections to each other, to the faculty, and to the community. Note: New course, but combination of current 59.102 and 59.103 in one semester.

Max Credits: 3
Min Credits: 3

HON.310 Honors Workshop

Course ID: 35508

Course Details: This course is designed to promote the application of interdisciplinary perspectives to problems, issues, concepts, and
creations, as well as an appreciation of the research methods that characterize a broad range of disciplines. It is a writing intensive class with active participation requirements to enhance students' oral and written expository communication skills in preparation for the Senior Honors Thesis. Students complete the NIH module on research ethics and discuss the role of the University Office for Compliance/IRB. Note: Formerly 59.258.

Max Credits: 3
Min Credits: 3

**HON.320 Seminar: Special Topics in Honors**

Course ID: 36909

Course Details: Seminar: Special Topics in Honors offers students the opportunity to engage in depth with a subject that is of special interest in an Honors-level seminar. The course will address an inquiry-based topic that spans or falls outside the boundaries of any individual major on campus, but integrates methodology, content, and/or approaches from two or more.

Max Credits: 3
Min Credits: 3

**HON.490 Honors Thesis Research**

Course ID: 35510

Course Details: This zero credit course is designed to facilitate tracking of Honors students' thesis progress. During the first semester of a two semester (6 credit) project, students will register for the appropriate 301 section in their department as well as HON.490, for which the Honors Program components are required. These components include a timely and complete thesis proposal as well as an end-of-the-semester progress report, both of which are to be signed by the faculty advisor and committee member and submitted for approval to the Honors Director.

Max Credits: 0
Min Credits: 0

**HON.491 Honors Thesis Research**

Course ID: 35511

Course Details: This zero credit course is designed to facilitate tracking of Honors students' thesis progress. During the final semester of their thesis research, students will register for the appropriate 301 section in their department as well as HON 491, for which the Honors Program components of the research are required. In a single semester (3 credit) project, these components include a timely and complete thesis proposal as well as an end-of-the-semester progress report, both of which are to be signed by the faculty advisor and committee member and submitted for approval to the Honors Director. In addition, both single semester projects and the second of two semester projects require public presentation of the work and submission of a written thesis and any relevant supporting materials (i.e., in the creative arts).

Max Credits: 0
Min Credits: 0

**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.516 Basic Principles 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.600 Capstone Project**

Course ID: 20112

Course Details:

Max Credits: 3
Min Credits: 3

**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

**PCS.125 Introduction to Peace and Conflict Studies**

Course ID: 36942

Course Details: This course will focus on the causes of conflict, conflict resolution methods, and ways to sustain peace. The course will explain and define each of those areas. A mid-term will be administered to examine the students’ grasp of the concepts and key terminology. The second part of the class will emphasize student participation and the application of concepts learned earlier in class. The final is a take home exam that will require the application of theory and praxis in the field of Peace and Conflict Studies.

Max Credits: 3
Min Credits: 3

**PCS.205 Restorative Justice**
Course ID: 37755
Course Details: This course will introduce students to the fundamental principles and practices of restorative justice as a method of building positive peace. Students will develop a working knowledge of the general theories of restorative justice, as well as practical hands-on experience with peacemaking circles. Traditional assumptions about justice and the adversarial legal process will be explored and challenged. The relationship between restorative justice, restorative practices, and other conflict resolution methods such as mediation will be discussed. Practical challenges in implementing restorative justice on the ground will also be examined.

Max Credits: 3
Min Credits: 3

PCS.420 Gender, Work and Peace
Course ID: 37452
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.453 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.458 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.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.
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.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.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.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
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

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

**THEA.230 Foundations of Theatrical Design**

Course ID: 37382

Course Details: Basic principles and techniques in scenic, lighting and costume design for theatre. Replaces 42.260 and 59.386; credits may not be earned for both 42.260 and THEA 230 or for 59.386 and THEA 230.

Max Credits: 3
Min Credits: 3

**UTL.202 Interactions and Equity**

Course ID: 37652

Course Details: This course examines the organization of instructional settings that maximize learning for all. Students will examine gender issues, cultural issues, bilingual education and learning disabilities as they impact learner success. A major portion of the course is a field experience in which students interview high school teachers, observe a high school classroom, then teach three lessons. The purpose of these experiences is to ensure that students recognize the diversity of students and their specific learning needs. This course is required for STEM TEACHING MINOR.

Max Credits: 3
Min Credits: 3

**UTL.204 Perspectives on Mathematics and Science**

Course ID: 37649

Course Details: This course examines the history and philosophy of mathematics and science. Students will explore a selection of topics and episodes in the history of science and mathematics recognizing that many gains in knowledge have emerged through struggle, and in spite of resistance from cultural, religious and social structures. Students will learn that ideas in science and mathematics are dynamic and that disagreement can often lead to major breakthroughs. Students must think critically about how K-12 STEM education texts portray the history and philosophy of science and mathematics. This course is required for the STEM TEACHING MINOR.

Max Credits: 3
Min Credits: 3

**01.384 Language, Literacy and Culture**

Course ID: 2312

Course Details: The course examines the role that socio-cultural and socio-political contexts play in children's literacy development, with particular focus on English Language Learners (ELLs). The course is designed to help students understand the complex and dynamic worlds of diverse learners represented in twenty-first century classrooms. Students will learn new and effective approaches to teaching and learning that provides struggling learners, especially English Language Learners a fair and equitable chance to succeed in the learning contexts.
01.600 Multiculturalism

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.

02.528 Teaching and Assessing Academic Reading and Writing I

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.

02.529 Teaching and Assessing Academic Reading and Writing II

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.

02.541 Teaching English Language Learners

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.

02.542 Methods of Early Childhood Education II: Social Studies, Arts, Health and Physical Education

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.
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

02.569 Tchng Middle Sch:English
Course ID: 2439
Course Details:
Max Credits: 12
Min Credits: 6

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

02.650 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

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 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

05.610 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

05.615 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 form 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
05.617 Seminar IV: Whole Class Discussion

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, 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

05.673 Advanced Research Seminar

Course Details:

Max Credits: 3
Min Credits: 3

06.729 Directed Study: Language and Literature

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

11.512 Adv Fiber Processing

Course Details:

Max Credits: 3
Min Credits: 3

11.563 Calculus II

Course Details:

Max Credits: 4
Min Credits: 4

14.409 Environment Engineering Geology

Course Details:

Max Credits: 3
Min Credits: 3

14.591 Capstone Practicum

Course Details:
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

14.653 Special Topics

Course ID: 3079

Course Details:

Max Credits: 3
Min Credits: 3

14.752 Independent Study in Civil Engineering

Course ID: 3089

Course Details:

Max Credits: 3
Min Credits: 3

16.485 Computer Aided Engineering I Lab

Course ID: 3250

Course Details:

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

16.580 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

16.601 Graduate Seminar
16.602 Graduate Seminar

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 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

16.656 Fault Tolerant System Design

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 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 spring semester.

Max Credits: 0
Min Credits: 0

18.626 Advanced Graduate HP Internship

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

19.301 Clinical Research Methods

Course Details: In this course, health science students learn to apply critical evaluation skills to quantitative data analysis and interpretation of research findings. The course reviews statistics and research methods, making students aware of the importance of the distribution of a range of types of quantitative data encountered in the health sciences. Sources of uncertainty (bias, confounding, and effect modification) and planning and analytical methods to minimize and summarize uncertainty will be summarized.

Max Credits: 3
Min Credits: 3

19.507 Environmental Health in Practice

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
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

19.630 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

19.679 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

19.701 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

19.703 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

19.711 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

**19.713 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

19.729 Selected Topics : Clean Production

Course ID: 3662
Course Details:
Max Credits: 3
Min Credits: 3

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

22.382 Heat Transfer

Course ID: 38230
Course Details: A calculus-based engineering course providing treatment of the fundamental modes of heat transfer. Topics include: steady-state and transient heat conduction in solids; forced and natural convection; the concept of thermal boundary layer; scale analysis and dimensionless number such as Reynolds, Prandtl, and Grashof numbers; Reynolds analogy; empirical engineering convection relations; thermal radiation involving heat exchange between black and non-black body surfaces.

Max Credits: 3
Min Credits: 3

22.442 Design of Thermofluid Systems

Course ID: 38231
Course Details: This is a comprehensive design course accompanied by periodic supplementary lectures, and builds on the concepts learned in Thermodynamics, Fluid Mechanics, Heat Transfer, and Analysis of Thermo/Fluid Processes. The course consists entirely of design projects on such topics as heat exchangers, pumps and blowers, piping systems, air conditioning and refrigeration systems, power plant cycles, and solar and wind energy systems. In addition to the appropriate technical aspects of the design, the projects will also consider such aspects as ergonomics, cost, environmental impact.

Max Credits: 3
Min Credits: 3

22.446Computational Thermal Fluids

Course ID: 33584
Course Details: Derivation of the partial differential equations of thermal fluids (heat conduction, Navier-Stokes, continuity, and thermal convection/diffusion equation). Introduction to the finite-difference, finite-volume, and finite-element techniques as applied to numerical solution of these equations. Use of a commercial CFD package to analyze common fluid flow and heat transfer configurations. Course also offered at the graduate level as 22.546.

Max Credits: 3
Min Credits: 3

22.580 Adv Grad Res Dev Proj
Course ID: 3915
Course Details:
Max Credits: 3
Min Credits: 3

22.622 Family Violence

Course ID: 3944
Course Details:
Max Credits: 3
Min Credits: 3

24.516 Radiation Shielding and Protection

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

26.522 Advanced Project in Plastics IV

Course ID: 4225
Course Details:
Max Credits: 3
Min Credits: 3

28.001 Independent Study (MSL IS I)

Course ID: 4412
Course Details: Advanced topics in leadership and management utilizing the military decision making process not covered in the regular curriculum. Content may vary from year to year. Due to the unique nature of this course, entrance into this course requires a permission number granted by the instructor.

Max Credits: 3
Min Credits: 3

28.002 Independent Study II (MSL IS II)

Course ID: 34682
Course Details: Advanced topics in leadership in a tactical environment with a focus on adventure training. Content may vary from year to year. Due to the unique nature of this course, entrance into this course requires a permission number granted by the instructor.

Max Credits: 3
Min Credits: 3

28.140 Leadership and Personal Development (MSL 101)

Course ID: 4413
Course Details: Leadership and personal development introduces students to the personal challenges and competencies that are critical for effective leadership. They will learn how the personal development of life skills such as goal setting, time management, physical fitness, and stress management relate to leadership, officership, and the Army profession. The focus is on developing basic knowledge and comprehension of Army leadership dimensions, attributes and core leader competencies while gaining a big picture understanding of the ROTC program, its purpose in the Army, and its advantages for the student.

Max Credits: 3
Min Credits: 3

28.170 Introduction to Tactical Leadership (MSL 102)

Course ID: 4416

Course Details: Introduction to tactical leadership overviews leadership fundamentals such as setting direction, problem-solving, listening, presenting briefs, providing feedback, and using effective writing skills. Students will explore dimensions of leadership attributes and core leader competencies in the context of practical, hands-on, and interactive exercises.

Max Credits: 3
Min Credits: 3

28.230 Foundations of Leadership (MSL 201)

Course ID: 4419

Course Details: Foundations of Leadership explores the dimensions of creative and innovative tactical leadership strategies and styles by examining team dynamics and two historical leadership theories that form the basis of the Army leadership framework. Aspects of personal motivation and team building are practiced planning, executing and assessing team exercises.

Max Credits: 3
Min Credits: 3

28.240 Foundations of Tactical Leadership (MSL 202)

Course ID: 4420

Course Details: Foundations of Tactical Leadership examines the challenges of leading tactical teams in the complex contemporary operating environment (COE). This course highlights dimensions of terrain analysis, patrolling, and operation orders. Further study of the theoretical basis of the Army Leadership Requirements Model explores the dynamics of adaptive leadership in the context of military operations. MSL 202 provides a smooth transition into MSL 301. Cadets develop greater self-awareness as they assess their own leadership styles and practice communication and team-building skills. COE case studies give insight into the importance and practice of teamwork and tactics in real-world scenarios.

Max Credits: 3
Min Credits: 3

28.330 Adaptive Team Leadership (MSL 301)

Course ID: 4422

Course Details: During this course students will study, practice, and apply the Fundamentals of Army Leadership, Officership, Army values and Ethics, personal development, and small unit tactics at the team and squad level. At the conclusion of this course, students will be capable of planning, coordinating, navigating, motivating and leading a team or squad in the execution of a tactical mission during a classroom PE, a Leadership Lab, or during a Situational Training Exercise (STX) in a field environment. Students will receive systematic and specific feedback on their leader attributes, values and core leader competencies using the ROTC Leader Development Program (LSP) model. Due to the unique nature of this course, entrance into this course requires a permission number granted by the Instructor.

Max Credits: 3
Min Credits: 3

28.340 Applied Team Leadership (MSL 302)

Course ID: 4423

Course Details: During this course students will study, practice, and apply the fundamentals of Army leadership, Officership, Army values
and ethics, personal development, and small unit tactics at the team and squad level. At the conclusion of this course, students will be capable of planning, coordinating, navigating, motivating and leading a team or squad in the execution of a tactical mission during a classroom PE, a Leadership Lab, or during a Situational Training Exercise (STX) in a field environment. Students will receive systematic and specific feedback on their leader attributes values and core leader competencies using the ROTC Leader Development Program (LDP) model. Due to the unique nature of this course, entrance into this course requires a permission number granted by the Instructor.

Max Credits: 3
Min Credits: 3

28.440 Adaptive Leadership (MSL 401)
Course Details: Adaptive Leadership is designed for students to apply their leadership techniques. Throughout the semester, students are assigned the duties and responsibilities of an Army staff officer and must apply the fundamentals of principles of training and the military decision making process to plan, execute and assess ROTC training. Students will be given numerous opportunities to train, mentor and evaluate underclass students enrolled in the ROTC Basic Course. Students will study how Army values and leader ethics are applied in the Contemporary Operating environment and how these values and ethics are relevant to everyday life. Students will study the Army officer’s role in the counseling of subordinates, administrative actions and the management of an Army Officer’s career. Due to the unique nature of this course, entrance into this course requires a permission number granted by the Instructor.

Max Credits: 3
Min Credits: 3

28.450 Leadership in a Complex World (MSL 402)
Course Details: Leadership in a Complex World explores the dynamics of leading in the complex situations of current military operations in the contemporary operating environment (COE). Students will examine differences in customs and courtesies, military law, principles of war, and rules of engagement in the face of international terrorism. This course places significant emphasis on preparing students for their careers in the military. It uses various case studies and scenarios to prepare students to face the complex ethical and practical demands of leading as a commissioned officer in the United States Army. Due to the unique nature of this course, entrance into this course requires a permission number granted by the Instructor.

Max Credits: 3
Min Credits: 3

29.001 AF ROTC Leadership Lab
Course Details:

Max Credits: 0
Min Credits: 0

29.101 Foundations of the United States Air Force - Part I
Course Details: Topics relating to the Air Force and defense. Structure and missions of Air Force organizations, officerhip and professionalism, and an introduction to communication skills.

Max Credits: 1
Min Credits: 1

29.102 Foundations of the United States Air Force - Part II
Course Details: Completion of the material described in 29.101.

Max Credits: 1
**29.201 Devel of United States Air Force Power**

Course ID: 4432

Course Details: Factors contributing to the development of air power from its earliest beginnings through two World Wars, the evolution of air power concepts and doctrine, and an assessment of communication skills (speaking and writing).

Max Credits: 1

Min Credits: 1

**29.202 Evolution of United States Air Force Power**

Course ID: 4433

Course Details: Completion of the material described in 29.201.

Max Credits: 1

Min Credits: 1

**29.301 Air Force Leadership Studies**

Course ID: 4434

Course Details: Emphasizing the individual as a leader/manager in a Fortune 500/Air Force setting. The individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the professional skills needed by Air Force officers and middle managers. The basic managerial processes involving decision making, utilization of analytic aids in planning, organizing, and controlling in a changing environment are emphasized as necessary professional concepts. Organizational and personal values, management of forces in change, organizational power, politics, and managerial strategy and tactics are discussed within the context of the military organization. Actual Air Force and corporate case studies are used to enhance the learning and communication processes.

Max Credits: 3

Min Credits: 3

**29.302 Air Force Leadership Studies II**

Course ID: 4435

Course Details: Continuation of the material described in 29.301.

Max Credits: 3

Min Credits: 3

**29.402 National Security**

Course ID: 4437

Course Details: Continuation of the material described in 29.401.

Max Credits: 3

Min Credits: 3

**29.759 Doctoral Research - Plastics Engineering**

Course ID: 4438

Course Details:

Max Credits: 3

Min Credits: 3

**30.219 Emergency Medical Technician**
Course ID: 4450
Course Details:
Max Credits: 3
Min Credits: 3

30.331 Exercise Physiology Laboratory

Course ID: 4463
Course Details:
Max Credits: 1
Min Credits: 1

30.406 Exercise Physiology II

Course ID: 1249
Course Details: This course provides a continuation of Exercise Physiology I and deals with the short and long effects of exercise on the skeletal and neuromuscular systems. This portion of the sequence also provides an integration of the physiological systems when considering the effect of exercise. All exercise physiology undergraduate courses (number 38) are restricted to EP majors only.
Max Credits: 4
Min Credits: 4

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

31.302 Applied Technology in Health Promotion

Course ID: 4480
Course Details: This course discusses the uses of information and media technology in health promotion such as mobile devices, GIS (global information systems) for health mapping, social media, and other emerging technologies. Students will explore the ethical considerations pertinent to the use of such technologies in health promotion. The course discusses the concepts of health literacy and the implications of electronic information related to health literacy. Juniors only.
Max Credits: 3
Min Credits: 3

32.502 Organizational Behavior in Health Care
Course ID: 33039

Course Details: Provides a systems overview of the organizational structure and behavior of individuals in healthcare institutions, along with an examination of the role of managers, clinicians and other leaders. The course applies organizational, behavioral and social science practice and theory to healthcare organizations.

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: The course teaches analytic methods that can be used to improve the decision making of healthcare managers, clinicians and others within the healthcare industry. Students learn the following: the conceptual foundations of quantitative analysis - e.g., what statistics is all about, how to think statistically and how to understand and interpret statistical findings; the importance of quantitative methods in supporting healthcare decision-making and developing evidence-based practices; bivariate and multivariate statistical methods for analyzing data and testing hypotheses; and how to use an industry-standard data analysis and statistical software in developing and reporting analytic findings.

Max Credits: 3
Min Credits: 3

32.511 Health Care Finance

Course ID: 33042

Course Details: Provides broad exposure to the concepts and practices of healthcare finance and healthcare financial management. Teaches a practical understanding of basic healthcare financial issues, financial reporting and analysis, and provider payment structures. The course enables students to read, analyze and use healthcare 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 teaches a multi-disciplinary approach to operations analysis, process redesign and quality improvement in healthcare. Students study the history, development and principles of quality improvement in healthcare; how quality improvement processes have been used in various healthcare settings; the tools and processes used in quality improvement; how to structure and implement a quality improvement program; and how to collect, analyze and interpret quality improvement data.

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: Students study basic economic concepts and how they are applied to healthcare and gain a broad familiarity with the health economics and related health services research literature, as well as experience using economics to analyze health policy issues.

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: The course provides healthcare professionals with a conceptual and practical understanding of information and communication systems, and how they are used. It also addresses the systems analysis, development and implementation challenges in optimizing today’s complex healthcare systems designs to improve both use and clinical outcomes. Students learn the theory, techniques and systems used for transforming clinical data into information useful for decision-making. The current and future role of the health care informatics professional is discussed.

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 is the introductory, first-recommended course in health informatics. It provides a broad-ranging overview of the healthcare information systems industry, its history, recent developments and continuing challenges, and a practical understanding of healthcare information systems acquisition and implementation. Topics include meaningful use, EMR, CPOE, and health information exchange.
Max Credits: 3  
Min Credits: 3

32.616 Law and Ethics in Healthcare

Course ID: 4513

Course Details: This course presents an overview of legal and ethical issues facing managers and providers in healthcare. It provides students with a foundation of health law and ethics and reviews healthcare legal and ethical situations and dilemmas. The goals are to provide students with practical knowledge of health law and ethics and their application to the real world of healthcare.

Max Credits: 3  
Min Credits: 3

32.625 Health Policy

Course ID: 4520

Course Details: This course provides students with a basic framework for health policy analysis and examines major aspects of U.S. health policy. Detailed consideration and discussion focus on the relationship of national policy to the planning, implementation, and funding of healthcare services. The course covers topics such as the healthcare policy environment in the U.S., government-funded healthcare through Medicaid and Medicare, and the Massachusetts healthcare reform.

Max Credits: 3  
Min Credits: 3

32.626 Leadership and Change

Course ID: 4521

Course Details: The strategic planning and management of healthcare 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 course examining contemporary healthcare information system requirements and focusing on the design, implementation, and modification of these systems. Actual or hypothetical health system related projects are used to support the theoretical framework.

Max Credits: 3  
Min Credits: 3

32.633 Healthcare Database Design
Course ID: 4528

Course Details: A practical approach to the design, and development of a relational database with an emphasis on healthcare. Analyzing the requirements of the database proceeds to the design of the structure of the relational database, which is then developed in a Relational Database Management System (RDBMS). Microsoft Access is used as the RDBMS platform.

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: A graduate level course providing a comprehensive foundation for project management as it applies to healthcare. Students will be introduced to the theory and concepts of project management, and the tools to manage projects with a specific focus on health information technology.

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. Skills learned in this course will enable the student to work effectively with and support the information systems planning effort and assure business alignment.

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 systems 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.
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: Near the end of one's 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. It involves research and development, and culminates in a substantial (20 pages or more) business-type report. Many working professionals develop projects related to work assignments. Students are also required to present their Capstone Projects to students, faculty and alumni at a semester-end student recognition event.

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

32.776 CPT Co-op

Course ID: 35276
Course Details:
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

33.718 Independent Study

Course ID: 36594

Course Details:

Max Credits: 1
Min Credits: 1

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

33.775 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

34.660 Directed Research

Course ID: 35040

Course Details: Directed Research toward the DPT degree.

Max Credits: 2

Min Credits: 2

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 polymorphism's 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

36.770 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

40.270 Women in American History

Course ID: 5238

Course Details: This course surveys the history of women in the British North American colonies and United States with a special focus on social and economic change. It examines women as a distinct group but also attends to divisions among them, particularly those based on class, ethnicity/race, and regional diversity. Course themes include concepts of womanhood, the development and transgression of gender roles, unpaid work and wage labor, social reform and women's rights activism, as well as changing ideas and practices with respect to the female body.

Max Credits: 3
Min Credits: 3

41.102 The Development of the American Legal System

Course ID: 37752

Course Details: This class will explore the American legal system, beginning with English common law and colonial rule through the American Revolution and establishment of our Constitution and federal system of government. We will examine how American law evolved through the "Golden Age" (1812 to 1860) and the rise of industrialization and corporations. We will look at how American law developed to favor the expansions of commerce and how the law evolved to support and the prohibit slavery. We will look at the
developed to favor the expansions of commerce and how the law evolved to support and prohibit slavery. We will look at the treatment of wives and paupers throughout our history. We will study the rise of legal liberalism, economic reform, and the New Deal (1900-1945). The end of the Second World War heralded changes in society that saw the growth of government, the civil rights movement, racial and gender equity, changes in criminal law and a changing legal culture. There are no prerequisites for this course. This is a web-enhanced, online course.

Max Credits: 3
Min Credits: 3

41.287 Legal Writing

Course ID: 4969
Course Details: Designed to train the student for effective legal writing as applied to client letters, memoranda of law, pleadings, briefs and other legal documents.

Max Credits: 3
Min Credits: 3

41.373 Consumer Law

Course ID: 31896
Course Details: Acquaints the student with current federal and state consumer protection statutes. Deals with individual consumer problems by discussing deceptive advertising and the legal effect of warranties. Delves into the law pertaining to consumer credit including unfair debt collection tactics. Investigates insurance law as it affects consumers and surveys the law protecting incompetent consumers. Examines the legal remedies available to consumers including the consumer class action.

Max Credits: 3
Min Credits: 3

41.378 Comparative European Community Law

Course ID: 31897
Course Details: This course deals with the relationship between European Community law and the law of the United States; the operation and impact of community law in the United States; and the role of the European courts in interpreting community law. International treaties, laws, and regulations affecting the free movement of people, goods and services are traced.

Max Credits: 3
Min Credits: 3

41.514 Engineering Law

Course ID: 5006
Course Details:

Max Credits: 3
Min Credits: 3

42.312 Literature of Colonial America

Course ID: 5102
Course Details: This course will explore the literatures (including some selections in translation) written during America's colonial era. The periods of exploration, first encounters, settlement, the rise of Anglo-America, the emergence of a national sensibility, and the years of transition in the new republic will be considered. The course will also treat a small selection of nineteenth century texts that present visions and re-visions of the colonial past.

Max Credits: 3
Min Credits: 3

42.344 Women in Theatre
Course ID: 38095
Course Details: A study of the significant contributions of woman to the literature and art of the theatre in various periods and cultures. Topics may include: plays written by women, the progress of women in theater, the evolution of female roles, and the portrayal of feminism on the stage.
Max Credits: 3
Min Credits: 3

42.359 Contemporary World Drama
Course ID: 31899
Course Details: A study of important recent works by playwrights from around the globe.
Max Credits: 3
Min Credits: 3

42.377 Theories of Rhetoric and Composition
Course ID: 36429
Course Details: This course will examine the history and theories of composition and rhetoric, studying the field from its inception to more recent developments and challenges. We will also explore our own writing processes and literary practices. The course is furthermore grounded on the idea that literary practices are shaped by our culture. The course introduces practical approaches to as well as theoretical frameworks beneficial for those interested in composition studies.
Max Credits: 3
Min Credits: 3

42.408 Analysis of Modern English
Course ID: 5098
Course Details: A study of English syntax examining traditional, structural, and transformational grammars. Attention to issues of dialect, usage, phonology, and morphology.
Max Credits: 3
Min Credits: 3

43.249 The Vietnam War
Course ID: 38202
Course Details: Covers the U.S. was in Vietnam from its origins in the French colonial era to its impact on contemporary culture and foreign policy.
Max Credits: 3
Min Credits: 3

43.262 The Twenties and the Thirties
Course ID: 5236
Course Details: An examination of the emergence of the corporate and governmental institutions of modern America set in two turbulent decades of cultural and political ferment that involved both booming prosperity and the economic collapse of the Great Depression.
Max Credits: 3
Min Credits: 3

43.327 England: The Middle Ages
Course ID: 1245
Course Details: The history of the English people and nation from the Roman conquest to the end of the fourteenth century with special...
emphasis on the development of political and social institutions.

Max Credits: 3
Min Credits: 3

43.401 History Writing and Community
Course ID: 34894
Course Details: Restricted to upper-level students and available only with permission of the instructor, this course offers a select number of students the opportunity to work for non-profit and governmental organizations within Lowell. Such organizations might include the National Park Service; Community Teamwork Inc.; Girls Club of Lowell; St. Athanasius Church; American Textile History Museum, and so forth. The course is primarily intended for History majors. Students will utilize their skills in research, writing, and analysis to assist an organization with its documented needs (e.g., conduct research on history of the organization; write a pamphlet or short article; organize oral history interviews; analyze the urban context in which the organization has developed). Students receive academic credit, along with invaluable work-related experience.

Max Credits: 3
Min Credits: 3

43.491 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

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

44.5CO-OP Curricula Practical Training
Course ID: 37989
Course Details: Curricula Practical Training
Max Credits: 1
Min Credits: 0

44.214 Security Management
Course ID: 37791
Course Details: Addresses the basic interdisciplinary principles of security management including planning, budgeting, organizing, staffing, directing, and controlling. This course will also cover marketing security services to management, risk management, civil and criminal liability, and labor relations. Each aspect of the course is designed to prepare security managers to face the new challenges as broader and more cost-effective protection is required with fewer resources. The course will also bring about greater awareness and understanding of the various options available in security and loss control. It will identify a number of risk areas and outline various deterrent and preventative methods.

Max Credits: 3
Min Credits: 3

44.340 Criminal Networks

Course ID: 37470

Course Details: This course examines various forms of decentralized criminal networks and activities, both domestic and international, with particular focus on trafficking in drugs, weapons, counterfeit goods and humans. Students will study money laundering and the intersections of terrorist and criminal networks, as well as the challenges faced by law enforcement in responding to these activities.

Max Credits: 3
Min Credits: 3

44.341 International Perspectives on Crime and Crime Control

Course ID: 5382

Course Details: This course provides an introduction to international perspectives on crime and crime control policy in Western countries. International developments and cross-national research on crime and victimization, criminal justice, and crime prevention policy, and current issues will be examined.

Max Credits: 3
Min Credits: 3

44.490 Criminal Justice Honors Seminar

Course ID: 5419

Course Details: Specific practice in the definition, design, and execution of a research project, and an analysis of the impact of contemporary criminal justice research on policy development.

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

44.576 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

44.588 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

44.642 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

44.689 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

44.697 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

44.746 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

45.308 Philosophy of Race and Gender
Course ID: 31900
Course Details: This course will focus on issues of identity and difference. We will discuss the ways in which group identities are formed and break down. We will discuss how differences are constituted and reconstituted. These issues are central to theories of race and gender, racism and sexism. Some of the questions which we will raise are these: What motivates forming group identities? How are they formed? How is identity used within oppressive social structures? How can it be used to transform society? Why do some differences make a difference and others don’t? Can we choose our group identities?
Max Credits: 3
Min Credits: 3

45.321 Theories of Ethics
Course ID: 5529
Course Details:
Max Credits: 3
Min Credits: 3

45.344 The Idea of Nature
Course ID: 31901
Course Details: The changing contents and the changing epistemological, social, aesthetic, economic, and religious implications of the concept of nature.
Max Credits: 3
Min Credits: 3

45.345 Rhetoric: History and Theory
Course ID: 5550
Course Details:
Max Credits: 3
Min Credits: 3

45.350 World Philosophies
Course ID: 5552
Course Details: This course will fuse the historical and the thematic approaches in order to undertake a comparative examination of the relations of the great philosophical traditions (Chinese, Indian, Western, Islamic, and Japanese) to the perennial issues of philosophy. The main focus will be the continuing vitality and heuristic fertility of these traditions and their ability to define how human
Max Credits: 3
Min Credits: 3

45.353 Contemporary European Philosophy
Course ID: 33500
Course Details: Explores European thought in the Twentieth and Twenty-first Centuries, including significant developments such as phenomenology, structuralism, hermeneutics, deconstruction, feminism, poststructuralism and post-modernism.

Max Credits: 3
Min Credits: 3

**45.378 Philosophy of Peace and Nonviolence**

Course ID: 38161

Course Details: This course examines philosophical theories of peace, pacifism, and nonviolence. We will study ancient and modern accounts, secular and religious traditions, as well as feminist perspectives in the philosophy of peace and nonviolence. We will explore philosophical applications of nonviolence toward nonhuman animals and the natural environment, along with specific cases of nonviolent resistance in contemporary global conflicts.

Max Credits: 3
Min Credits: 3

**46.301 Research Methods in Political Science**

Course ID: 5605

Course Details: This is a course in designing Quantitative Research and applying statistics for Political Scientific.

Max Credits: 3
Min Credits: 3

**46.309 Political Psychology**

Course ID: 5610

Course Details: An in-depth examination of the acquisition and role of political attitudes, values, belief systems, and other psychological mechanisms in shaping political behavior and conflict.

Max Credits: 3
Min Credits: 3

**46.319 Survey Research**

Course ID: 38119

Course Details: The techniques, methods and uses of Survey Research in contemporary Politics and Policy.

Max Credits: 3
Min Credits: 3

**46.339 Judicial Review Seminar**

Course ID: 5672

Course Details: An advanced examination of the contemporary controversy over judicial activism and constitutional interpretation.

Max Credits: 3
Min Credits: 3

**46.379 Reading in Political Theory**

Course ID: 37354

Course Details: Advanced exploration of the ways landmark political texts continue to influence present-day Political discourse; selections from Plato, Aristotle, Machiavelli, Locke, Smith, Wollstonecraft, Marx, Mill, Thoreau, DeBois and Behavior will be read.

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

47.572 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

47.661 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

47.692 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

47.744 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

48.270 Self and Society

Course ID: 5835

Course Details: An examination of the relationship between individuals and the social world around them. The course examines the underlying structures that pattern human interaction. Topics include the social construction of the self, the construction of social reality, and the sociology of emotions, among others.

Max Credits: 3
Min Credits: 3

48.325 Global Conflicts

Course ID: 5851

Course Details:

Max Credits: 3
Min Credits: 3
48.475 Seminar on Conflict Resolution  
Course ID: 5886  
Course Details:  
Max Credits: 3  
Min Credits: 3

49.306 Urban Economics  
Course ID: 5908  
Course Details:  
Max Credits: 3  
Min Credits: 3

49.415 Introduction to Environmental Economics  
Course ID: 5913  
Course Details: This is a renumbering of an existing course, 49.315. The renumbering to the 400 level is to allow Masters students in programs with environmental content to take this course for credit with their advisor's approval. This course introduces students to the economic and policy aspects of environmental quality and natural resource 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 or efficiency criteria will be applied to a wide variety of environmental issues.  
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

49.731 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
53.116 WAIVER Arabic 2 and Culture Waiver

Course ID: 36170

Course Details: This course meets the requirements for Spanish 2 and Culture (53.116). An exception form must be completed and approved by the Cultural Studies Chairperson.

Max Credits: 3
Min Credits: 3

53.118 Hebrew 2 and Culture

Course ID: 32047

Course Details: A continuation of 53.117 Hebrew 1 and Culture, which is a pre-requisite. Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 117, 118 and 215, 217 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.206 Chinese 4 and Culture

Course ID: 6050

Course Details: This course is a continuation of 53.205 Chinese 3 and Culture, which is a pre-requisite. Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 105, 106 and 205, 206 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3

53.493 Directed Study in Cambodian Culture

Course ID: 36697

Course Details: Students through regular and frequent consultation with their instructor develop a course of directed study in Cambodian (Kmer) culture, and define a problem for individual research. The student's findings are presented in a paper of significant proportions.

Max Credits: 6
Min Credits: 1

53.494 Directed Study in Arabic

Course ID: 36907

Course Details: Individual research projects on Arabic or Islamic culture. Students, through regular and frequent consultation with instructor, pursue a special topic of research.

Max Credits: 3
Min Credits: 3

54.204 Intensive Spanish 3 and 4

Course ID: 37492

Course Details: A continuation of 54.104, Intensive Spanish 1 and 2, this is a six credit blended (hybrid) course-taught partly in the classroom and partly online--intensive one-semester accelerated version of the third and fourth Spanish courses. Being a blended course, the online time will be dedicated to grammar review, and to the completion of various assignments and assessments. Class time will focus on communicative activities that combine grammatical concepts, relevant vocabulary, and cultural themes. An intensive
course that aims to develop an intermediate mid proficiency in Spanish and familiarity with Hispanic culture through practice in the use of the grammatical structures and acquisition of vocabulary stressing language skills. The purpose of instruction is to utilize previous language background to lay a solid foundation for further Spanish language study (advanced level). Satisfactory completion of this course fulfills the prerequisite for Spanish 300-400 level courses.

Max Credits: 6
Min Credits: 6

54.333 Advanced Spanish Grammar

Course ID: 6083

Course Details: A systematic study of complex grammatical structures in Spanish.

Max Credits: 3
Min Credits: 3

54.334 Advanced Spanish composition

Course ID: 6084

Course Details: The purpose of this course is to help students make their writing more accurate, organized and to develop students abilities in composition tasks. Specifically, students will learn how to approach the act of writing successfully by focusing on the interaction between writer, reader, purpose, and message. Students will also learn to manage important writing resources such as grammar, vocabulary, rhetorical techniques for organizing information, and strategies for writing through problems, reading critically, revising, and rewriting. Required for Spanish Majors.

Max Credits: 3
Min Credits: 3

54.456 Spanish Translation Seminar

Course ID: 6104

Course Details: A study of the theory and practice of translation aimed at developing translation skills. Material used is taken from literary works as well as newspapers and magazines. This course is intended for students with a good command of the language. Open to Spanish majors and others by permission of instructor.

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

57.605 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.
58.350 Post Modernism
Course ID: 6243
Course Details: Following the Second World War, artists transformed the avant-garde tradition of their European predecessors to establish a dialogue with the mass media and consumer culture that has resulted in a wide array of artistic movements. Issues ranging from multiculturalism and gender to modernism and postmodernism will be addressed through the movements of abstract expressionism, pop, minimalism, neo-expressionism and appropriate in the diverse media of video, performance and photography, as well as painting and sculpture.

59.110 Basic Music Theory for Nonmajors
Course ID: 6259
Course Details:

59.201 Technology & Human Values I
Course ID: 32198
Course Details:

59.210 Into Southeast Asian Cultures
Course ID: 37478
Course Details: This course focuses on the development of Southeast Asian art and culture from ancient times to the present. As a diverse region that is home to Muslims, Catholics and other Christians, Buddhists, Hindus and animists, examining arts and culture in Southeast Asia provides fascinating insight into the region’s societies. This course examines performance, architecture and material culture from a variety of Southeast Asia, its contacts with neighboring regions, and the breadth of societies in the region and their motivation for creating art. Students will be introduced to theater, dance puppetry, martial arts and music of Southeast Asia. We will examine artistic forms influenced by ancient Hindus, Chinese, Arabs, Europeans during the colonial era, and other influences on the arts in Southeast Asia. Students will also explore how various art forms have political, social and religious functions in such regions as Thailand, Indonesia (Bali and Java), Vietnam and Cambodia.

59.336 Early Modern Philosophy
Course ID: 5543
Course Details: Examines Early Modern European Philosophy and its religious and scientific context, including movements such as the Mechanical Philosophy, Rationalism, Empiricism, and Transcendental Philosophy. Topics include knowledge and scientific understanding, the human mind and personal identity, and the debate between faith and reason.

59.352 Existence & Anxiety
Course ID: 31936
Course Details: Explores basic questions of human existence in 19th and 20th Century philosophy and literature. Topics include anxiety and alienation; freedom and responsibility; authenticity and bad faith; individuality and mass society; rationality and the absurd; values and nihilism; and God and meaninglessness.

Max Credits: 3
Min Credits: 3

59.497 Directed Studies: Environment and Society

Course ID: 35783

Course Details: An individual supervised research project relative to issues of the environment and society. Thematic or methodological issues must result in a significant research paper.

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

60.641 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

60.650 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 it 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

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

61.801 Technology Adoption Finance

Course ID: 6424

Course Details: 

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

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

63.709 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

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

64.901 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

66.017 Introduction to Business

Course ID: 38128

Course Details:

Max Credits: 3
Min Credits: 3

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

66.607 Independent Study in MIS

Course ID: 6689

Course Details:
66.715 Managing Quality In Comp Or

Course Details:

66.730 Research Design Methods I

Course Details: Seminar will address study design, including but not limited to methods, hypothesis development and testing, reliability, and validity.

66.733 Research Design Methods II

Course Details: Expanding beyond Research Design Methods I Student will begin the design of a research project which considers the range of research methodologies and the implications of their use.

67.307 Systems Analysis & Design

Course Details:

70.108 Introduction to App Design and Mobile Computing

Course Details: This course is an introduction to design principles of applications ("apps") that run on mobile devices (smart phones and tablet computers). The course well focus on the elements of graphic communication, software interaction design, and computational thinking. Students will gain theoretical knowledge and design skills in these domains by building a series of apps that run on the Android platform using MIT App Inventor software. The course will also include discussion of societal impacts of computing.

70.225 History: Photography Studio

Course Details:

70.356 Drawing III

Course Details:
Course ID: 6856
Course Details:
Max Credits: 3
Min Credits: 3

70.382 Intermediate Video

Course ID: 36430
Course Details: This course will continue the exploration of video as an expressive medium. Students will explore video installation, interactivity, video compositing and streaming media to produce creative works.
Max Credits: 3
Min Credits: 3

70.485 Advanced Tutorial: Art History

Course ID: 6888
Course Details:
Max Credits: 3
Min Credits: 3

71.106 Freshman Chorus

Course ID: 35561
Course Details: A vocal ensemble consisting of all first-year music students, the Choir aims to build a community among those students by having them all share a common experience. Whether they have an extensive musical background or are novice musicians with little or no formal training, the First-Year Choir is intended to help students overcome the natural apprehensions that are associated with the first year of college. Additionally, the Choir will encourage ALL students to be comfortable singing in front of their peers and instructors, thereby making their experience in Aural Skills less daunting.
Max Credits: 0
Min Credits: 0

71.207 Aural Skills 3 - Supplement

Course ID: 35709
Course Details: Supplemental course to aural Skills 3, focusing on the development of sight singing, listening and musical dictation skills as they relate to music theory and analysis. Activities include singing (using movable "do"/tonic "do" solmization), listening and dictation (melodic, harmonic and rhythmic) of diatonic and chromatic music. Specifically, students will get extra practice in: a) performing (while conducting), identifying and notating more complex rhythms in simple and compound meter; b) singing, identifying, and notating diatonic and chromatic major-and minor-key melodies, in treble bass, alto and tenor clef, including arpeggiations of all diatonic triads and sevenths, and secondary dominants; c) identifying and notating chord progressions in major and minor keys consisting of all diatonic triads and dominant sevenths, non-dominant seventh chords, and secondary dominants.
Max Credits: 0
Min Credits: 0

71.208 Musicianship & Analysis 3

Course ID: 37728
Course Details: An intensive, critical and integrated study of musical concepts. Through applied experiences composing, improvising, writing, performing, listening, and analyzing, students will explore and develop competencies in hearing, understanding and applying concepts of pitch modes; syncopation; mixed meters; extended harmony; modulation; and large structural forms.
Max Credits: 4
Min Credits: 4
71.209 Musicianship & Analysis 4
Course ID: 37729
Course Details: An intensive, critical and integrated study of musical concepts. Through applied experiences composing, improvising, writing, performing, listening, and analyzing, students will explore and develop competencies in hearing, understanding and applying concepts of chromaticism; microtonal intonation polyrhythm; harmonic inversions; extended modulations; altered chords and extensions; polytonality; and atonality.
Max Credits: 4
Min Credits: 4

71.308 Instrumental Solfege
Course ID: 6910
Course Details:
Max Credits: 2
Min Credits: 2

71.336 Vocal Arranging
Course ID: 6916
Course Details:
Max Credits: 3
Min Credits: 3

71.403 Contemporary Technology
Course ID: 6919
Course Details:
Max Credits: 3
Min Credits: 3

71.407 Electronic Music
Course ID: 6921
Course Details:
Max Credits: 3
Min Credits: 3

72.213 Applied Brass And Percussion 2
Course ID: 6977
Course Details:
Max Credits: 2
Min Credits: 2

72.499 Senior Recital
Course ID: 7045
Course Details: Public performance to be presented, registered concurrently with Applied Music 8 or Performance Applied Music 7.
Max Credits: 1
**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: 1

**74.366 The Symphony**

Course ID: 7220

Course Details:
Max Credits: 3
Min Credits: 6

**74.403 Contemporary Techniques**

Course ID: 7224

Course Details:
Max Credits: 3
Min Credits: 3

**75.351 Jazz Improvisation I**

Course ID: 7277

Course Details:
Max Credits: 3
Min Credits: 3

**75.362 Jazz Improvisation 2**

Course ID: 7280

Course Details: A continuation of 75.361. Will emphasize the study and performance of more advanced levels of improvisation.
Max Credits: 3
Min Credits: 3

**75.374 Practical Intonation**

Course ID: 7282

Course Details:
Max Credits: 2
Min Credits: 2

**75.475 Performance Seminar I**

Course ID: 7291
Course Details: Max Credits: 3
Min Credits: 3

76.361 Jazz Improvisation I
Course ID: 7344

Course Details:
Max Credits: 3
Min Credits: 3

76.366 Jazz Improvisation
Course ID: 7345

Course Details:
Max Credits: 3
Min Credits: 3

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

77.465 Music Of The Romantic
Course ID: 7382

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
78.401 Music of The Beatles

Course ID: 35289

Course Details: This course will explore how technology shaped, enhanced and defined the music of The Beatles. In doing so their music will also be studied for its musical materials, stylistic content, the sound qualities of recordings, cultural impacts, and extra-musical aspects, as well as the music and cultural ideas that influenced the music of The Beatles. Selected solo recordings and compositions of the artists will also be examined to trace the growth of ideas and materials with their roots in The Beatles’ music.

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 in 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

78.695 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

81.205 Endocrinopathies

Course ID: 7476

Course Details:

Max Credits: 3
Min Credits: 3

81.244 Biodiversity & Conservation Australia's Tropics

Course ID: 38121

Course Details: The most diverse ecosystems in the world are Australia's Great Barrier Reef and Daintree Tropical rain forest. To explore the basic principles of biodiversity and conservation biology we will use the case studies of the coral reefs and tropical rainforest of Cairns, Australia. The course will start off at UML, studying three aspects of biodiversity: its origin, the threats, and its conservation. Next we will to go Australia where students will experience the wonders of these ecosystems, and learn first hand about the scientific research on the flora and fauna, and learn about the efforts to conserve these treasures. Students will participate in restoration projects of the tropical rainforest and coral reefs, and hear lectures on conservation from scientific researchers to the Aborigines.

Max Credits: 6
Min Credits: 6

81.406 Environment Microbiology Laboratory

Course ID: 7511

Course Details:
Max Credits: 1
Min Credits: 1

81.429 Recombinant Protein Production Techniques

Course ID: 38228

Course Details: This course introduces students to the principles and practice of recombinant protein expression and purification. 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

81.469 Molecular Biology

Course ID: 7525

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, PCR, and DNA sequencing. Students are introduced to computer software utilized for DNA sequence analysis and manipulation.
Max Credits: 4
Min Credits: 4

81.497 Directed Study: Biological Science

Course ID: 7534

Course Details:
Max Credits: 1
Min Credits: 1

81.499 Directed Study: Biology

Course ID: 7535

Course Details:
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

81.529 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

81.561 Electron Microscopy
Course ID: 7564
Course Details:
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

81.721 Special Problems In Biology
Course ID: 7584
Course Details:
Max Credits: 3
Min Credits: 1

82.354 Wildlife Management
Course ID: 7608
Course Details: Not suitable for credit towards any degree in the Division of Sciences.
Max Credits: 3
Min Credits: 3

83.327 Histology
Course ID: 7631
Course Details: Not suitable for credit towards any degree in the Division of Sciences.

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

85.430 Atmospheric Diffusion
Course ID: 7790
Course Details:
Max Credits: 3
Min Credits: 3

88.103 General Geology Laboratory
Course ID: 7874
Course Details:
Max Credits: 3
Min Credits: 3

89.5CO-OP Curricular Practical Training
Course ID: 38047
Course Details: Curricular Practical Training
Max Credits: 1
Min Credits: 0

89.198 Rocks
Course ID: 7893
Course Details:
Max Credits: 3
Min Credits: 3

89.307 Earth Materials I
Course ID: 38083
Course Details: An introduction to the basic principles that control the arrangement of atoms in crystalline solids (minerals) and their physical and chemical properties. Topics include crystal chemistry, crystal symmetry, macroscopic mineral identification, and the use of polarizing light microscopy and X-ray diffraction to identify and characterize minerals.

Max Credits: 3
Min Credits: 3

89.308 Earth Materials II

Course ID: 38072

Course Details: Origin and properties of igneous, metamorphic, and sedimentary rocks. The rock cycle is used as a unifying concept. The role of rock properties in environmental, economic, and engineering applications is considered.

Max Credits: 3
Min Credits: 3

89.309 Earth Materials I Laboratory

Course ID: 38084

Course Details: Laboratory to accompany Earth Materials I lecture. Topics include crystal structures, crystal symmetry, hand-specimen identification of minerals, X-ray diffraction, and polarizing light microscopy.

Max Credits: 1
Min Credits: 1

89.310 Earth Materials II Lab

Course ID: 38073

Course Details: Macroscopic and microscopic characterization and classification of rocks. Investigation of physical processes and spatial representation of rock and sediment distribution.

Max Credits: 1
Min Credits: 1

89.319 Earth Surface Processes

Course ID: 38074

Course Details: A study of the physical and chemical processes that create landforms on the Earth's surface. Emphasis is placed on physical and chemical weathering, fluvial erosion, glacial processes, soil formation, mass movements, slope stability and tectonic geomorphology.

Max Credits: 3
Min Credits: 3

89.321 Earth Surface Processes Laboratory

Course ID: 38075

Course Details: Hands-on investigation of landforms and surficial processes through interpretation and synthesis of maps, aerial photography and field data.

Max Credits: 1
Min Credits: 1

89.331 Earth History

Course ID: 38076

Course Details: An introduction to the history of the Earth and its life over the last 4.6 billion years. Applications include geologic principles, earth material, depositional environments, stratigraphy, the geological timescale, plate tectonics, and evolutionary theory.
89.333 Earth History Laboratory

Course ID: 38077
Course Details: This laboratory compliments Earth History lecture material. Exercises include stratigraphic methods, geologic maps and fossil identification.
Max Credits: 3
Min Credits: 3

89.341 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

89.491 Directed Study: Geoscience

Course ID: 7921
Course Details: The student, through regular and frequent consultation with the instructor, undertakes independent study of a particular area of the geosciences.
Max Credits: 3
Min Credits: 1

89.502 Quantitative Gemorphology

Course ID: 37733
Course Details: This course follows the path of material as it is weathered form 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
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

89.540 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

89.558 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

89.599 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

91.108 Intro to App Des & Mobile Comp

Course ID: 38246

Course Details: This course is an introduction to design principles of applications ("apps") that run on mobile devices (smart phones and tablet computers). The course will focus on the elements of graphic communication, software interaction design, and computational thinking. Students will gain theoretical knowledge and design skills in these domains by building a series of apps that run on the Android platform using MIT App Inventor software. The course will also include discussion of societal impacts of computing.

Max Credits: 3
Min Credits: 3

91.422 Machine Learning

Course ID: 8106

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

91.545 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

91.640 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

91.691 International Finance

Course ID: 8211

Course Details:

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

91.757 Doctoral Thesis Research

Course ID: 8232

Course Details:

Max Credits: 12
Min Credits: 12

92.122SI Management Calculus Supplemental Instruction

Course ID: 36827

Course Details: Taken simultaneously with 92.122, this 1-credit course offers students, who are either retaking 92.122 or have completed 92.121 with a D or D+ grade, supplemental instructions to foster a greater opportunity for successful completion of Management Calculus. The course credit cannot be used to satisfy the credits required for graduation, but may be used to satisfy credits required for full time student status.
92.129SI Calculus IB Supplemental Instruction

Course ID: 38196
Course Details:
Max Credits: 1
Min Credits: 1

92.139 Calculus for the Life Sciences II

Course ID: 38100
Max Credits: 4
Min Credits: 4

92.217 Diff Essentials For Chemical Engineers

Course ID: 8278
Course Details:
Max Credits: 4
Min Credits: 4

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

92.568 Approximation Theory

Course ID: 31893
Course Details:
Max Credits: 3
Min Credits: 3

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 vies 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

94.518 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

94.541 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
**94.566 Advanced Cloud Computing**

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

**95.373 Advanced Theory of Solids**

Course Details:

Max Credits: 3
Min Credits: 3

**95.385 MCNP for Radiological Sciences**

Course Details: This course provides the theory and application of the Monte Carlo N-Particle (MCNP) radiation transport computer code to radiogical sciences and protection, with emphasis on radiation dosimetry and shielding, and criticality problems (offered as 98.585 for graduate credit)

Max Credits: 3
Min Credits: 3

**95.465 Physics of Radiation Oncology**

Course Details: This course provides the theory and application of the physical concepts that pertain to radiation oncology, with emphasis on radiation treatment planning for linear accelerators and brachytherapy sources, photon and electron dose assessment, and recent experimental treatment modalities. (offered as 98.565 for graduate credit)

Max Credits: 3
Min Credits: 3

**95.552 Contemporary Physics**

Course Details:

Max Credits: 3
Min Credits: 3

**95.557 Electromagnetic Theory I**

Course Details:

Max Credits: 4
Min Credits: 4

**96.402 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

98.401 Radiological 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

98.462 Special Topics in Radiological Sciences

Course ID: 8799
Course Details:

Max Credits: 3
Min Credits: 3

98.481 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

98.522 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

98.616 Data Redn for RSP
Course ID: 8847
Course Details:
Max Credits: 3
Min Credits: 3

99.501 Biomedical Engineering and Biotechnology Seminar

Course ID: 8917
Course Details:
Max Credits: 1
Min Credits: 1

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.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.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.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
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.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.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.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.
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.

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.

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.

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.

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.

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.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 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 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, Feminism, and Liberalism

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 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 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

GNDR.200 Special Topics in Gender Studies (200-level)

Course ID: 36387

Course Details: "Special Topics in Gender Studies" (200-level) offers students the opportunity to study a topic of special interest in the field of Gender Studies from an interdisciplinary perspective. The content and approach will vary depending upon the research and teaching interests of the faculty member teaching the course.

Max Credits: 3
Min Credits: 3

GNDR.300 Special Topics in Gender Studies (300-level)

Course ID: 36388

Course Details: "Special Topics in Gender Studies" (300-level) offers students the opportunity to engage in depth with a special topic in the field of Gender Studies from an interdisciplinary perspective. The content and approach will vary depending upon the research and teaching interests of the faculty member teaching the course.

Max Credits: 3
Min Credits: 3

GNDR.301 Gay and Lesbian Studies

Course ID: 36389

Course Details: This seminar provides an introduction to the interdisciplinary field of lesbian, gay, bisexual, and transgender (LGBT) studies, incorporating perspectives from the sciences, social sciences and humanities. The general goal of the course is for students to explore the dynamic, interactive forces - biological, psychological, social, cultural, and political - that shape the experience of sexuality. Topics will include: methodological, epistemological and pedagogical issues in the study of sexuality; the biological foundations of gender and sexuality; the social construction of sex and gender; literary, artistic, and mass media representations of LGBT people; development of gender and sexual identities; relationships and families; LGBT communities and political movements; HIV/AIDS; intersecting identities (gender, race, class, disability, etc.), and queer theory.

Max Credits: 3
Min Credits: 3

GNDR.410 Directed Studies (400-level)

Course ID: 36243

Course Details: This course, taken for 1 or 3 credits, may serve as a capstone experience for advanced gender studies students, helping them to explore a gender-related topic of interest while working closely with a faculty member. Projects that students complete for the Directed Studies will vary in length, scope, and topic, depending on how many credits are taken and which faculty member the student agrees to work with the student. What all projects will have in common is (1) a topic clearly relevant to gender studies, (2) an
emphasis on achieving deep learning through advanced study, and (3) the integration of two or more distinct disciplines, integrating these disciplinary insights in order to solve a complex problem or analyze a complicated issue. This course allows for a student and professor to work closely together on a project of mutual interest. It is expected that the faculty member will be supporting and guiding the student’s work, and thus regular meetings will be necessary. In some cases the faculty member may not feel competent to oversee all aspects of a project in which an unfamiliar discipline is employed. In such cases, a second (and even third) faculty member may be asked to participate in the Directed Study as a consultant and final reader.

Max Credits: 3
Min Credits: 1

**GNDR.490 Seminar in Gender Studies**

Course Details: This course serves as a capstone experience for advanced students, helping them to make connections between the gender studies classes they have taken and their main course of study or some other area of interest. This seminar provides a framework for students to synthesize what they have learned, thus moving their experience in the program from a multi-perspectival examination of gender to a more cohesive and integrated approach encapsulated in a final project. This project will draw upon the methods, knowledge theory, end products, etc. of at least two distinct disciplines, integrating these disciplinary insights in order to solve a complex problem or analyze a complicated issue related to gender. Students will benefit from working with peers in small groups and as a whole class, learning how other students synthesize what they have learned about gender issues and how their lived experience influences their perspectives on such things as the intersection of gender with socio-economic position, race and ethnicity, sexual orientation, religion, and other factors. The professor who leads this seminar will be both a resource and a catalyst; students will learn about gender and advanced research, and they will be prompted to reach their academic potential.

Max Credits: 3
Min Credits: 3

**IB.400 Introduction to Biomedical Engineering**

Course Details: Provides exposure to cutting-edge biomedical technologies in a number of different areas with a balance between biomedical engineering and biotechnology areas.

Max Credits: 3
Min Credits: 3

**IB.500 Introduction to Biomedical Engineering & Biotechnology**

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**


Max Credits: 3
Min Credits: 3

**IB.511 Medical Diagnostic Imaging**

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.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 undergradate courses.

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.780 Thesis Review
Course ID: 36528
Course Details: Thesis Review
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
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
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.170 Community and Organizational Conflict
Course ID: 36944
Course Details: Using a systems approach, students will move from interpersonal conflict to addressing conflict in groups. Students will explore the uniqueness of conflict in various kinds of groups and will examine models for assessment, analysis, process design, intervention, and evaluation in such situations of conflict. Using case studies and real life situations of group conflict and systemic injustice from families, organizations and communities, students will learn practical strategies for group facilitation, dialogue, problem solving, decision-making, and system change.
Max Credits: 3
Min Credits: 3

PCS.455 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.473 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.491 Directed Study

Course ID: 37218

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 9 credits.

Max Credits: 3
Min Credits: 3

PCS.496 Practicum in Peace and Conflict Studies

Course ID: 37217

Course Details: Specific requirements vary, but the Practicum experience enables Junior and Senior level students to work and study 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. Practicum may be repeated for a maximum of nine credits.

Max Credits: 3
Min Credits: 1

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.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
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

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 of 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 pharmaceutics by applying modern analytical methods. Raw materials and completed dosage forms will also be analyzed in the laboratory.
**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
THEA.221 Stagecraft

Course ID: 37381

Course Details: Survey of the materials, skills, and techniques of technical theatre (including scenic construction, scene painting, lighting, and sound production) through reading, lecture, and hands-on experience. Replaces 42.252; credits may not be earned for both 42/59.252 and THEA 221.

Max Credits: 3
Min Credits: 3

THEA.301 Working with the Playscript

Course ID: 37387

Course Details: A hands-on introduction to a range of plays, studied as scripts intended for production. Conducted as a seminar/workshop with attention to both the critical interpretation and staging of various dramatic forms. Replaces 42.384 and 59.384; credits may not be earned for both 42/59.384 and THEA 301.

Max Credits: 3
Min Credits: 3

THEA.492 Technical Theatre Practicum

Course ID: 38097

Course Details: One-credit practicum in technical theatre (scenic construction, lighting, sound, costuming), consisting of work on a campus production under the supervision of Theatre Arts faculty.

Max Credits: 1
Min Credits: 1

THEA.494 Directed Study in Theatre

Course ID: 37390

Course Details: Supervised independent project in theatre. Instructor's permission required. Replaces 42.494 and 59.494; may be repeated for credit with permission.

Max Credits: 3
Min Credits: 3

UTL.203 Reading and Writing in Stem Fields

Course ID: 37654

Course Details: This course is designed to meet the Commonwealth of Massachusetts’ requirement for secondary content teaching. New teachers must help students become strategic readers of texts and research in STEM disciplines and to communicate their ideas effectively in writing. Students in the course will investigate the complex process of comprehension and design reading strategies for middle and high school students. They will explore the means to assist middle and high school students to be more effective writers both of laboratory type reports and expository passages. The use of technology as a tool to communicate instructional materials and expectation with students and parents will be explored. Throughout the course, students will recognize that academic language must be taught in a way that enables English language learners to master STEM content.

Max Credits: 2
Min Credits: 2

UTL.301 Project-Based Instruction

Course ID: 37650

Course Details: This is a key component of the Minor as it engages students in designing, implementing and employing a project-based curriculum. Students will observe project-based learning in high schools, before creating and leading their own field-based unit. The unit must incorporate major components of project-based learning, namely collaboration, formulating questions, making predictions, designing investigations, collecting and analyzing data, making products and sharing ideas. This course is required for the STEM
UTL.302 Research Methods

Course ID: 37651

Course Details: The goal of this course is to provide students with an understanding of and the ability to use tools that scientists use to solve problems. Students will also learn how scientists communicate their findings and engage in peer-review. Students design and carry out four independent inquiries, which they write up and present in the manner that is common in the scientific community. Students will work in multidisciplinary teams. The course is divided between class and lab sessions, but is primarily lab-based. The topics of the class sessions are: Curiosity and Scientific Inquiry, Experimental Design and Analysis, Statistics, Modeling, Presenting Scientific Information. Students conduct their inquiries, incorporate statistics to interpret their results and present their scientific work orally. This course is required for the STEM TEACHING MINOR.

Max Credits: 3
Min Credits: 3

UTL.401 Practicum

Course ID: 37653

Course Details: This is the culminating experience in the STEM Teaching Minor and must be taken in conjunction with the one-credit Practicum Seminar*. Students are required to spend 12 weeks (minimum) teaching a STEM subject in a middle or high school. Candidates are required to have (i) declared the STEM teaching minor, (ii) passed both MTEL examinations and (iii) maintained an overall GPA of 2.5.

Max Credits: 6
Min Credits: 6

UTL.402 Practicum Seminar

Course ID: 37655

Course Details: The Practicum Seminar provides a supportive environment where students share their experiences and work on solutions to problems they may be experiencing. Master teachers teach the weekly seminar, share their teaching experiences and facilitate discussions to help students develop their own successful teaching identities. The seminar is an effective forum for students to get the guidance they consistently want on classroom management. Additionally, students must fulfill the requirements determined by the Commonwealth of Massachusetts. The licensure documentation will be discussed, developed and submitted as a requirement of the 1 credit seminar.

Max Credits: 1
Min Credits: 1

WLS.401 Seminar: Advanced Topics in Work, Labor and Society

Course ID: 37050

Course Details: Advanced Topics in Work, Labor and Society offers students the opportunity to engage in depth with a special topic in the field from an interdisciplinary perspective. Then content and approach will vary depending upon the research and teaching interests of the faculty member teaching the course, but all will provide opportunities for an in-depth exploration of a topic beyond what is available in current course offerings.

Max Credits: 3
Min Credits: 3

WLS.402 Directed Studies in Work, Labor and Society

Course ID: 37052

Course Details: This course, taken for 1 or 3 credits, may serve as a capstone experience for advanced students in the Work, Labor and Society minor, helping them to explore a work-related topic of interest while working closely with a faculty member. Projects that students complete for the Directed Studies will vary in length, scope, and topic, depending on how many credits are taken and which faculty member agrees to work with the student. What all projects will have in common is (1) a topic clearly relevant to work, labor and society
(2) an emphasis on achieving deep learning through advanced study, and (3) the integration of two or more distinct disciplines, integrating these disciplinary insights in order to solve a complex problem or analyze a complicated issue.

Max Credits: 3
Min Credits: 1

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

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

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

22.597 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

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
26.550 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

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

46.410 Seminar Instructional Internship American Politics

Course ID: 5680

Course Details: Advanced reading and critical analysis in American Politics. Students selected will serve as group project leaders and tutors in association with a large introductory American politics course section.

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

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

10.490 Industrial Experience

Course ID: 35482

Course Details: This zero credit course is used for students in Chemical Engineering who receive special permission.

Max Credits: 0
Min Credits: 0

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

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

42.328 Writing About Women

Course ID: 30862
Course Details: Writing About Women
Max Credits: 3
Min Credits: 3

42.335 American Women Novelists

Course ID: 5119
Course Details: A study of selected novels by American women. Focus on the female voice within the American tradition. Treatment of such issues as domesticity, education, and authorship.
Max Credits: 3
Min Credits: 3

42.355 Literature of the Romantic Period

Course ID: 5130
Course Details: A study of English prose and poetry from 1798-1832.
Max Credits: 3
Min Credits: 3

42.421 Chaucer

Course ID: 5169
Course Details: A study of the major works of Chaucer in Middle English.
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

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

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

63.730 Advanced Data Management
Course ID: 36974
Course Details: This course provides students with in-depth 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 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 perceptive. 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

63.780 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

66.652 Human Resources Management

Course ID: 6696

Course Details:

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

66.734 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 economics, such as China and India. Significant emphasis will be placed on 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

78.583 Intro Music Technology Applications

Course ID: 30376
Course Details:
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

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

04.624 Assessment of Learning

Course ID: 2621
Course Details: Students examine 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

10.205 Fundamentals of Electricity

Course ID: 30313
Course Details: An introduction to direct current and alternating current of electric circuits with emphasis on practical application.

Max Credits: 3
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

16.424 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

16.426 Power Systems Stability and Control

Course ID: 3213


Max 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

16.526 Power Systems Stability and Control

Course ID: 3213

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

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

24.432 Nuclear Systems Design & Analysis

Course ID: 4052

Course Details: A design course that focuses on the use of modern computer analysis tools for the design and analysis of nuclear systems. Reactor physics and shielding codes and thermal and transient analysis of nuclear systems are completed by small design teams with individual responsibility for a particular aspect of the design. Oral and written communication skills are emphasized. (10.432 and 24.432 are the same)

Max Credits: 3
Min Credits: 3

26.212 Dynamics

Course ID: 4154

Course Details: This course covers the fundamentals of Newtonian mechanics, including kinematics, motion relative to accelerated reference frames, work and energy, impulse and momentum, 2D and 3D rigid body dynamics. The course pays special attention to applications in plastics engineering including introductory topics in material and energy balance.

Max Credits: 1
Min Credits: 1

26.415 Capstone Project I

Course ID: 4181

Course Details: A two-semester capstone laboratory project course. Student groups design, perform, analyze, report, and defend a research project which incorporates the processing and characterization of plastics materials. Supporting practicums on literature searches, plastics processing, basic plastics testing techniques, and data analysis are included in the course.

Max Credits: 1
Min Credits: 1

26.416 Capstone Project II

Course ID: 4182

Course Details: Continuation of 26.415.
26.417 Honors Capstone Project II

Course ID: 32560

Course Details: A section of capstone laboratory for honor students only. Honors student groups design, perform, analyze, report and defend a research project which incorporates the processing and characterization of plastics materials. Supporting practicum on literature searches, plastics processing, basic plastics testing techniques, and data analysis are included in the course.

33.101 Strategies for Acad Success

Course ID: 33747

Course Details: This introductory course will assist nursing students to learn strategies for creating greater academic, professional, and personal success. Specific attention will be given to exploring the profession of nursing, academic integrity, goal setting, time management, critical thinking and communicating with others. Consideration will be given to note taking skills, test reading and studying, writing, test-taking strategies, library use and research techniques, wellness and stress management, and campus resources.

33.103 Academic Strategies Portfolio Seminar

Course ID: 35273

Course Details: Nursing students with a diploma in nursing, associate degree in nursing, or second baccalaureate degree will submit a portfolio to demonstrate how they have met the course objectives. The portfolio will show evidence of goal setting and time management, UML library orientation for literature searches, understanding of academic integrity and writing and referencing using APA style. Students will participate in seminar(s) on communication, cultural sensitivity, and conflict resolution.

33.310 Health Promotion Risk Reduction Families I

Course ID: 4553

Course Details: This course focuses on health promotion and risk reduction with young individuals and families who are responding to potential or actual physical and psychosocial health problems. Content is centered on holistic nursing care from a lifespan perspective beginning in pregnancy and ending with adolescence.

33.314 Health Promotion Risk Reduction Families II

Course ID: 4557

Course Details: This course focuses on health promotion and risk reduction with adults and their families who are responding to potential or actual biopsychosocial health problems. Content is centered on holistic nursing care throughout the adult lifespan.

33.410 Acute Care Nursing

Course ID: 4567

Course Details: This course addresses the nursing care of adults with life threatening conditions. Particular attention is paid to nursing
care of clients with increasing complexity and acuity levels.

Max Credits: 5
Min Credits: 5

**33.411 Acute Care Nursing Practicum**

Course ID: 4568

Course Details: In this clinical course, students provide nursing care to adults in the acute care setting. The focus of the experience is the development of specifically tailored therapeutic interventions in providing care to adults with acute illness.

Max Credits: 4
Min Credits: 4

**33.414 Role Transition Practicum**

Course ID: 4571

Course Details: During this clinical experience the student works collaboratively with nurse preceptor and other members of the health team. The student becomes increasingly self-directed in carrying out the professional nursing role.

Max Credits: 6
Min Credits: 6

**33.415 Community Health Project**

Course ID: 4572

Course Details: The student applies the ANA Public Health Nursing Scope and Standards of Nursing Practice with community as client. Teams of students utilize community assessment data collected from previous semester to develop, implement and evaluate a community health promotion activity.

Max Credits: 2
Min Credits: 2

**42.111SI Supplemental Instruction for College Writing I ESL - Navitas only.**

Course ID: 38178

Course Details: Supplemental Instruction for College Writing I ESL for Navitas students only.

Max Credits: 1
Min Credits: 1

**42.112SI College Writing II ESL Supplemental Instruction - Navitas only.**

Course ID: 38209

Course Details: College Writing II ESL Supplemental Instruction for Navitas only.

Max Credits: 1
Min Credits: 1

**42.207 English Studies in a Digital Environment**

Course ID: 5024

Course Details: This course introduces students to the study of writing, literature, and culture in the digital environment and to skills necessary for courses in the English Studies option. The course will introduce students to the fundamentals of Digital literacy and citizenship, including tools and skills only made possible in the digital environment. Students will read a variety of texts and write in a variety of genres. The course also introduces students to literary and cultural criticism, including close reading skills, various critical approaches, and the practical application of these skills. Emphasis will be placed on the research and writing processes, using MLA-style documentation. The course will also introduce students to the fields of creative writing, journalism, and professional writing.
42.322 Creative Writing: Creative Non-fiction I
Course ID: 5109
Course Details: An intermediate level creative writing workshop in nonfiction (personal essay, memoir, literary journalism, etc.).
Max Credits: 3
Min Credits: 3

42.418 Creative Writing: Creative Non-fiction II
Course ID: 38333
Course Details: An advanced creative writing workshop in nonfiction (personal essay, memoir, literary journalism, etc.).
Max Credits: 3
Min Credits: 3

43.344 Revolutions in the Modern World
Course ID: 38334
Course Details: In this comparative history course, we look at the theories of Marx, Barrington Moore, Crane Brinton, Theda Skocpol, William Sewell, and others on the causes, dynamics, and outcomes of revolutions in the modern world. We then consider the history of the French, Russian, Vietnamese, and Iranian Revolutions (list may vary each semester) to see how well the theories fit the events. The course ends with a discussion of whether the pattern and analyses discussed in the course are helpful in understanding a contemporary revolution, such as that in Egypt.
Max Credits: 3
Min Credits: 3

44.291 Short Study Abroad: Selected Topics
Course ID: 38292
Course Details: This is a short study abroad course, usually 3 weeks in duration. Topic and location vary.
Max Credits: 6
Min Credits: 6

48.115 Social Problems
Course ID: 38335
Course Details: This entry level course uses the core concept of social problems to introduce basic social science reasoning-how social scientist define research questions, develop systematic methods to study them, gather evidence, search for pattern, in link findings to existent knowledge. Cases provide opportunities to discuss how private problems develop into public issue, illustrating sociology as a discipline that evolves in response to social conflicts and inequalities. The course also meets General Education requirements for Ethics and Diversity.
Max Credits: 3
Min Credits: 3

48.330 Fast Food, Hot Planet: Sociological Approaches
Course ID: 38308
Course Details: With an eye on climate change sustainability, this course maps the social and historical dimensions of crisis and inequalities of food production and distribution. In addition to exploring food security's relation to sustainable food production, students will strengthen critical thinking, writing, and library research skills.
Max Credits: 3
54.104 Intensive Spanish 1 and 2

Course ID: 37140

Course Details: This intensive course in Spanish is a six credit blended (hybrid) course taught partly in the classroom and partly online. This one-semester intensive review of Spanish 1 and 2 courses in restricted to students who have been placed into it by placement examination. Satisfactory completion of this course fulfills the prerequisite for Spanish 3.

Max Credits: 6
Min Credits: 6

54.495 Advanced Spanish Tutorial

Course ID: 6108

Course Details: A program of directed study which affords advanced students an additional opportunity to pursue a previously explored problem in greater depth or to initiate an additional problem. The purpose is to sharpen and refine techniques for scholarly research and presentation and for creative expression.

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

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

64.591 Independent Study

Course ID: 6566

Course Details:

Max Credits: 1
Min Credits: 1

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

78.741 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

78.744 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

78.746 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

81.513-I Invertebrate Zoology II

Course ID: 35512

Course Details: An in depth exploration of the deutorostome 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-I Invertebrate Zoology Lab II
Course ID: 35513
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

81.557-I Advanced Invertebrate Zoology
Course ID: 33457
Course Details: Comparative functional morphology, life histories, and phylogeny of a particular taxon (Crustacea, Molusca) of
invertebrates.
Max Credits: 3
Min Credits: 3

81.559-I Advanced Invertebrate Zoology Laboratory
Course ID: 33458
Course Details: Classification, identification, anatomy and physiology of selected invertebrates.
Max Credits: 1
Min Credits: 1

81.595-I Immunology Laboratory
Course ID: 36657
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

84.115 Principles of Chemistry
Course ID: 7638
Course Details: The course provides an introduction to the basic concepts of Chemistry with an emphasis on critical thinking, problem-
solving, and computational skills required for more advanced Chemistry courses. Topics include measurement, chemical calculations,
problem solving logic, units analysis, chemical reactions, the periodic table, basic bonding theory and solutions. No previous Chemistry
experience is assumed. There is no lab component to this course.
Max Credits: 3
Min Credits: 3

84.360 The Responsible Chemist
Course ID: 7684
Course Details: This course is required of chemistry majors and addresses ethical, regulatory, and environmental aspects of their
profession. Students are exposed to a wide range of research integrity issues that include TSCA (Toxic Substance Control Act), SOPs
(Standard Operating Procedures) and quality management. Compliance issues include an overview of OSHA (Occupational Safety and
Health Administration) and EPA (Environmental Protection Agency), as well as an introduction to patent law. The importance of
maintaining integrity in their discipline is emphasized, and case studies are presented for study and discussion.
Max Credits: 3
Min Credits: 3

84.652 Selected Topics: Chemistry
Course ID: 7747
Course Details:
Max Credits: 3
Min Credits: 3

91.103 Computing I Lab
Course ID: 38309
Course Details: This is the lab class for 91.101 Computing I. This class must be taken with 91.101 Computing I in the same semester.
Max Credits: 1
Min Credits: 1

91.104 Computing II Lab
Course ID: 38310
Course Details: This is a lab class for 91.102 Computing II. This class must be taken with 91.102 Computing II in the same semester.
Max Credits: 1
Min Credits: 1

91.480 Honors Project I
Course ID: 8128
Course Details: This course provides an undergraduate research experience for Computer Science majors enrolled in the Honors Program. Each student develops a project idea in consultation with the instructor. The student writes a proposal for the project, reads the relevant literature, performs the project, writes a project report or thesis, and makes an oral presentation about the project.
Max Credits: 3
Min Credits: 3

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

91.673 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

92.102 Freshman Seminar in Mathematics
Course ID: 38330
Course Details: This course is designed to orient undergraduate math majors to the university and to their chosen field. Students will learn about the mathematics program, the mathematics faculty and their research interests, careers in math-related areas, internship
opportunities, and university resources.

Max Credits: 1
Min Credits: 1

**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

**GNDR.199 GNDR 100 level elective**

Course ID: 38336

Course Details: GNDR 100 level elective

Max Credits: 3
Min Credits: 3

**GNDR.299 GNDR 200 level elective**

Course ID: 38338

Course Details: GNDR 200 level elective

Max Credits: 3
Min Credits: 3

**GNDR.399 GNDR 300 level elective**

Course ID: 38339

Course Details: GNDR 300 level elective

Max Credits: 3
Min Credits: 3

**GNDR.499 GNDR 400 level elective**

Course ID: 38340

Course Details: GNDR 400 level elective

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 study 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).
PCS.555-I Mediation: Theory and Practice

Course ID: 38200

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

UTL.441 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

02.568 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

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 form 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
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

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

19.770 Directed Readings: Epidemiology Biostatistics

Course ID: 3679

Course Details:

Max Credits: 3
Min Credits: 3

26.3CE Co-op Experience

Course ID: 37157

Course Details: This is a structured educational strategy integrating classroom studies with learning through productive work experiences in a field related to a student's academic or career goals. It provides progressive experiences in integrating theory and practice. Co-op is a partnership among students, educational institutions and employers, with specified responsibilities for each party.

Max Credits: 0
Min Credits: 0

45.340 Mysticism: East and West

Course ID: 5546

Course Details: This course explores the religious and psychological phenomenon known as the mystical experience, both within the context of organized religion and outside it. We will approach this subject from a comparative standpoint, considering examples from Christianity, Judaism, and Islam and also from Eastern religions such as Buddhism and Taoism. We will make use of philosophy, psychology, theology and literature in order to try to understand mysticism and its relation to religion. Readings include The Upanishads, the Tao Te Ching, the Bible, and Plato.

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

**63.490 Internship in Operations Management**

Course ID: 38456

Course Details: Opportunity for students to earn academic credit through the integration of professional work experience with related academic work in Operations Management. A project, jointly supervised by a faculty member and representative of the employing organization with mutually defined objective(s), will be completed by the Student. An approved report in written form will be submitted to the supervising faculty member.

Max Credits: 3

Min Credits: 3

**70.345 Sonic Arts**

Course ID: 30840

Course Details: Sonic Arts is an introductory course to hardware hacking for sculptural installation, audio composition and instrument invention. Assignments will include building piezo microphones, home-made speakers, exploring pickups used in performance and amplification of sculptural objects, manipulating tape head readers and building simple oscillation circuits for noise. Students will learn about electronics and soldering, including how to hack devices for audio and sculptural experiences and experiment with sound as an inspiration for sculpture and performance art.

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

**02.445 Teaching Reading/English Bilingual Student**

Course ID: 2379

Course Details:

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
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

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

07.706 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

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

14.756 Doctoral Dissertation/Civil Engineering
Course ID: 3091
Course Details:
Max Credits: 6
Min Credits: 6

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, IO 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

16.692 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

16.753 Doctoral Dissertation/EE

Course ID: 3403
Course Details: Doctoral Dissertation Research
Max Credits: 3
Min Credits: 3

16.756 Doctoral Dissertation/Electrical Engineering

Course ID: 3404
Course Details: Doctoral Dissertation Research
Max Credits: 6
Min Credits: 6

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

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

19.759 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

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

22.753 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

23.484 Introduction to Pro/ENGINEER
Course ID: 4026
Course Details: This course introduces the user to the principles of Pro/ENGINEER, solid modeling, and parametric design. It is a hands-on project and exercise-based course. Topics will include: feature-based parametric solid modeling, pick and place features, sketched features, the basics of creating parts and assemblies, and drawing creation. Advanced topics will include 3-D sweeps, helical sweeps, and blends
Max Credits: 3
Min Credits: 3

24.753 Doctoral Dissertation/Engergy 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
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

26.753 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

29.401 National Security/Active Duty Pre

Course ID: 4436

Course Details: An examination of the needs for national security, an analysis of the evolution and formulation of the American defense policy and strategy, aerospace doctrine; an examination of the methods for managing conflict, and an overview of alliances and regional security, arms control, and terrorism. Special topics of interest focus on the military as a profession, officership, the military justice system, and current issues affecting military professionals. Continued emphasis is given to the refinement of communication skills.

Max Credits: 3
Min Credits: 3

32.775 Capstone/Thesis Review

Course ID: 35254

Course Details:

Max Credits: 1
Min Credits: 1

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

33.689 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

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

34.609 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
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

34.639 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

36.415 Clinical Virology/Serology Lab

Course ID: 4806

Course Details: This course is designed to survey pathogenic viruses emphasizing diagnosis of disease. Evaluation of new technology and diagnostic tests with reference to diagnosis and prognosis of disease are examined. In addition, this course is designed to instruct students in the principles and techniques used in the clinical immunology/serology setting. Students will become proficient in laboratory techniques such as immunodiffusion, ELISA, hemagglutination, and neutralization techniques used for immunodiagnosis.

Max Credits: 2
Min Credits: 2

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

46.498 Research and Internship/Service Experience Politics/Law

Course ID: 5695

Course Details: Extensive Research/Writing undertaken in conjunction with an Internship/Service Experience in Politics and/or Law, by special arrangement and with permission of the instructor.

Max Credits: 3
Min Credits: 3

47.308 Industrial/Organizational Psychology
Course ID: 33658

Course Details: An introduction to the application of psychological principles and methods to the work domain. Students will develop an understanding of the individual, social, and environmental factors as they relate to organizational performance. Intended as an introduction to the field of Industrial/Organizational (I/O) Psychology, topics include personnel selection and evaluation, training and development, attitudes and motivation, leadership, group dynamics, diversity, organizational structure and climate, and job design and working conditions.

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

60.201 Accounting/Financial

Course ID: 6329

Course Details: Presents a comprehensive, detailed exposure to basic accounting theory. Beginning with the accounting equation, students are introduced to the accounting cycle, preparation of the statement of financial position and the income statement, accounting for assets, liabilities, and stockholders' equity of the firm, and cash flow and financial statement analysis.

Max Credits: 3
Min Credits: 3

60.202 Accounting/Managerial

Course ID: 6330

Course Details: Examines the use of accounting systems for managerial decision-making. Budgeting, forecasting, and cost accumulation systems, which relate to manufacturing systems, will be studied.

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

70.496 Practicum/Internship

Course ID: 6893

Course Details: The Practicum/Internship is an on-campus or off-campus learning experience. Specific requirements will vary depending on department policies and the nature of the program undertaken by the student. The practicum experience is to provide an occasion for practical experience in an area of particular interest to the student.

Max Credits: 3
Min Credits: 3
**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

**76.165 Jazz/Rock Big Band**

Course ID: 7334

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

**76.565 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

**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

**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

91.759 Doctoral Dissertation/Computer Science

Course ID: 8233

Course Details:
Max Credits: 9
Min Credits: 9

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

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

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
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

02.531 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

16.459 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

16.658 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

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

22.761 Continued Grad Research

Course ID: 38491

Course Details: Continued Grad Research

Max Credits: 1
Min Credits: 1

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

43.358 Amazing American Lives

Course ID: 5302

Course Details: Biography often has been used by historians as source material for representing the nature of the American experience. An examination of outstanding biographies of the lives of various Americans can yield insights into all levels and ranks of American society from colonial days to the late twentieth century.

Max Credits: 3
Min Credits: 3

54.375 Latin American and Spanish Cinema

Course ID: 6092

Course Details: An exploration of representative Spanish and latin American films from a variety of major directors. Areas of investigation include the cinematic representation of nationality, ethnicity, identity, gender, history and politics. This course will be taught in English. Knowledge of Spanish is desirable but not required. Spanish majors and minors will complete written assignments, reviews, quizzes, and exams in Spanish.

Max Credits: 3
Min Credits: 3

54.494 Independent Study in Spanish

Course ID: 31773

Course Details: Students, through regular and frequent consultation with their instructor, develop a course of independent study in Spanish culture and define a problem for individual research. The student's findings are presented in a paper of significant proportions.

Max Credits: 3
Min Credits: 3

81.420 Biochemistry II

Course ID: 7514
Course Details: This course will focus on protein dynamics where students will gain facility with thermodynamics of protein folding/misfolding, catalysis, kinetics and binding equilibria as they apply to proteins and other molecules in biological systems. The central theme of this course is that living systems can be understood in terms of the fundamental principles defining the structure and energetics of biological molecules. Attention will be given to quantitative aspects of enzyme kinetics and molecular binding. Examples of how these principles apply to the understanding and treatment of human disease will be discussed.

Max Credits: 3
Min Credits: 3

81.520 Biochemistry II

Course ID: 7548

Course Details: This course will focus on protein dynamics where students will gain facility with thermodynamics of protein folding/misfolding, catalysis, kinetics and binding equilibria as they apply to proteins and other molecules in biological systems. The central theme of this course is that living systems can be understood in terms of the fundamental principles defining the structure and energetics of biological molecules. Attention will be given to quantitative aspects of enzyme kinetics and molecular binding. Examples of how these principles apply to the understanding and treatment of human disease will be discussed.

Max Credits: 3
Min Credits: 3

91.493 Cooperative Education in Computer Science

Course ID: 38490

Course Details: Supervision of cooperative educational experiences in Computer Science.

Max Credits: 1
Min Credits: 1

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

95.141SI Supplemental Instruction for Physics I - Navitas Only

Course ID: 38492

Course Details: Supplemental Instruction for Physics I - Navitas Students Only.

Max Credits: 1
Min Credits: 1

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
GLS.791 Global Studies Directed Studies
Course ID: 38488
Course Details: Global Studies Directed Studies
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

58.352 Contemporary Art and Culture
Course ID: 6244
Course Details: Examination of issues of content, theory, and criticism in traditional, modern and contemporary art. Current exhibitions and criticism are integral to the course. Topics vary from year to year.
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

79.221 20th Century Art
Course ID: 7415
Course Details: A study of American and European movements in painting, sculpture, and architecture from 1900 to the present. Emphasis is placed on Fauvism, Cubism, Expressionism, Surrealism, International Style, Pop, Op Art, Minimal Art, Photorealism, and Post-Modernism.
Max Credits: 3
Min Credits: 3

79.231 Aesthetics and Critical Studies Seminar
Course ID: 1237
Course Details:
Max Credits: 3
Min Credits: 3

79.352 Contemporary Art and Culture
Course Details: Examination of issues of content, theory, and criticism in contemporary and traditional art and culture. Topics vary.
Max Credits: 3
Min Credits: 3

79.490 Aesthetics and Critical Studies Seminar
Course Details:
Max Credits: 3
Min Credits: 3

10.526 Advanced Kinetics and Reactor Design
Course Details: The course will cover advanced chemical reaction kinetics, rate laws and reactor design with an emphasis on heterogeneous and catalytic reaction systems involving interphase and mass transfer effects.
Max Credits: 3
Min Credits: 3

10.548 Engineering Process Analytics
Course Details: This course covers multivariate statistical data analysis and experimental design. Students will learn how to extract information by analyzing various engineering datasets, and how to generate information-rich datasets via minimum experiments. Software for data analysis and experimental design will be utilized during tutorial and practice.
Max Credits: 3
Min Credits: 3

10.555 Biopharmaceutical Regulatory Compliance
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

10.556 Materials for Aerospace and Energy Applications
Course Details: Material requirements for emerging applications in aerospace and energy sectors will be discussed. Mechanical, thermal and electrical and barrier properties of filled polymers and polymer nanocomposites will be studied. The effect of resin structure, filler additives, reactive diluents on the resulting properties will be reviewed. Scale-up issues will be studied using basic principles of chemical engineering.
Max Credits: 3
Min Credits: 3

14.542 Transportation Network Analysis
Course Details: This course is to introduce engineering students to basic transportation network analysis skills. Topics covered include fundamentals of linear and nonlinear programming, mathematical representations of transportation networks, various shortest path
algorithms, deterministic user equilibrium traffic assignment, stochastic user equilibrium traffic assignment, dynamic traffic assignment, heuristic algorithms for solving traffic assignment problems, and transportation network design.

Max Credits: 3
Min Credits: 3

26.552 Machine Design

Course ID: 4251
Course Details: Hydraulics, machine logic, drives, pumps, motors, heaters, barrel and screw combinations, mechanical design. Hydraulic and electrical control circuits development. A semester project is required.

Max Credits: 3
Min Credits: 3

36.483 Senior Research I

Course ID: 4825
Course Details: Students along with their faculty advisor will structure a research project commensurate with the students' areas of interest. A paper embodying the results of the research project will be prepared.

Max Credits: 2
Min Credits: 2

36.484 Senior Research II

Course ID: 4826
Course Details: Continuation of 36.483

Max Credits: 2
Min Credits: 2

41.237 Media, Law and Ethics

Course ID: 38516
Course Details: This course primarily is designed to explore key legal issues you are likely to confront as a journalist, mass media professional or student interested in learning more about the relationships between law, media and ethics in this global community. Nonetheless, you will be challenged to think critically about the applicability of those issues to individuals and to media institutions that transmit information via spoken communications, writing, traditional media, text messages, social network sites, or e-mail messages.

Max Credits: 3
Min Credits: 3

42.201 Classical Mythology

Course ID: 5019
Course Details: Literary approaches to Classical Greek and Roman mythology, examining its origins in near Eastern cultures as well as its encounters with Christian Europe. Includes works by Hesiod, Homer, Greek playwrights, Virgil, and Ovid.

Max Credits: 3
Min Credits: 3

42.277 American Ethnic Literature

Course ID: 31898
Course Details: The course addresses the literature of America's immigrant and cultural groups and how it contributes to defining our national character.

Max Credits: 3
42.408 Principles of Technical Writing

Course ID: 32118

Course Details: Provides the fundamental concepts and principles of technical writing, including technical description, audience analysis, editions, document specifications and outlines, graphics, definitions and revising documents. Writing assignments include preparing a document specification, editing and creating graphics.

Max Credits: 3

43.279 History of Lowell

Course ID: 5245

Course Details: This course will provide an overview of the growth, decline, and rebirth of the city of Lowell, Massachusetts. Topics will include the Industrial Revolution, role of women and unions in the workplace, immigration and the formation of ethnic neighborhoods, urban renewal, and historic preservation. The survey will also discuss notable personalities such as labor activist Sarah Bagley, Civil War general Benjamin Butler, writer Jack Kerouac, Senator Paul Tsongas and boxer Micky Ward. The foregoing names may differ over time.

Max Credits: 3

43.443 'Foreigners' of the Middle East

Course ID: 38524

Course Details: This class focuses on how societies organize difference, looking at the relationships between national, ethnic, religious, racial, gender and/or socio-economic affiliations in creating and concretizing foreignness and minorities in the Arab Middle East and today's Turkey and Iran during the late Ottoman and colonial eras. This class includes engagement with historical sources, movies, memoirs and more, and requires several short papers and one longer term paper and presentation.

Max Credits: 3

44.489 Capstone Seminar in Criminology & Criminal Justice

Course ID: 38519

Course Details: This course is designed to provide criminal justice majors with a capstone experience emphasizing integration of knowledge acquired in previous courses on the causes of criminal behavior and responses to it, particularly the institutions, policies and practices of the criminal justice system. Students engage in the development and production of a senior level research paper grounded in relevant criminology and criminal justice literature.

Max Credits: 3

44.526 Domestic Terrorism and Violent Extremism

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

45.335 Ethical Issues in Technology

Course ID: 5542
Course Details: This course will examine important ethical issues and value conflicts emerging in contemporary science and technology. Through readings and class discussions students will not only have an opportunity to explore the manner in which ethical and technical problems are related, but to develop insight into areas of ethical philosophy and modes of reasoning essential to an intelligent understanding of such issues.

Max Credits: 3
Min Credits: 3

45.339 Poetry and Philosophy After Plato

Course ID: 30406

Course Details: After defining "Neoplatonism" with reference to Plato's Phaedo, Symposium, and Phaedrus, the course will consider the relationships among Homer's Odyssey, Plotinus's Enneads, Virgil's Aeneid, Augustine's Confessions, and Dante's Divine Comedy. The focus will be on coming home to the "source and origin" after having been away and, as the philosopher Plotinus puts it, having been "a stranger in something strange". Students will be invited to work on other literary and philosophical treatments of this theme in English, Irish or American poetry and writing. A principal concern of the course is language "sung, spoken, and written". Accordingly, the course will applicable to, and count for the Philosophy and Communications track.

Max Credits: 3
Min Credits: 3

47.333 Psychology of Consciousness

Course ID: 5722

Course Details: Introduces students to psychological theories and studies of the mind-body dualism, mind-brain identity, and the emergence of mind. Studies of psychosomatic disease and healing imagery, sleep and hypnosis, "subconscious" perception and "extra sensory" perception, multiple personalities and "split brain" patients are discussed. The questions of animal awareness and computer consciousness are also considered.

Max Credits: 3
Min Credits: 3

48.205 Public Sociology

Course ID: 33259

Course Details: Public sociology includes sociological initiatives targeting non-university audiences and serving the public good. This course will 1) introduce and critique the various conceptualizations of public sociology linking them to broad schools of sociological theory; 2) explore alternative field models and methods, preparing students for field projects in future semesters; and 3) expose students to sociological practitioners and practices compatible with the mission of the university and department. From a liberal arts perspective, the course stresses critical thinking and communication skills.

Max Credits: 3
Min Credits: 3

48.320 Community Service

Course ID: 5830

Course Details: Course uses fieldwork approach to understand social problems and to discipline study and career pursuit in the area of public service.

Max Credits: 3
Min Credits: 3

53.237 Portuguese Literature in Translation

Course ID: 38518

Course Details: This course offers a broad overview of Portuguese literature, in English translation, from the Middle Ages to the contemporary period, placing literary movements and major authors in their historical and aesthetic context. It focuses on promoting a basic level of cultural literacy about Portugal based on representative reading drawn from the last seven centuries of the country's history situated in their social, cultural and historic contexts. Course assignments lead students to develop skills in textural interpretation, critical thinking, and academic writing.
Max Credits: 3  
Min Credits: 3

64.680 Capstone I - New Venture Planning  
Course ID: 35581  
Course Details: Capstone I-New Venture Planning (64.680) and Capstone II-New venture Implementation (64.681) focus on technology commercialization, business planning and initial incubation of an early-stage business by project teams, and the development of an investment proposal to launch a new business. In Capstone I students will be exploring, identifying and analyzing the path “from Idea to Market?” for technology and research projects. They will evaluate selected technology and research projects for commercial applications and explore different options available to productize and introduce these projects to market. Where appropriate, teams will complete a new venture business plan and launch a new business (Capstone II). These two courses together will comprise the M.S.I.T.E program Capstone experience and will require students to actually develop these commercialization projects. Each student team will be assigned to a faculty member(s) who will instruct and guide them throughout this process. In addition to M.S.I.T.E. students, Capstone I may be taken by M.B.A. students as an elective and students in the New Venture Certificate program.

Max Credits: 3  
Min Credits: 3

64.681 Capstone II - New Venture Implementation  
Course ID: 35582  
Course Details: Capstone I-New Venture Planning (64.680) and Capstone II-New Venture Implementation (64.681) focus on technology commercialization, business planning and initial incubation of an early-stage business by project teams, and the development of an investment proposal to launch a new business. In Capstone I students will be exploring, identifying and analyzing the path “from Idea to Market?” for technology and research projects. They will evaluate selected technology and research projects for commercial applications and explore different options available to productize and introduce these projects to market. Where appropriate, teams will complete a new venture business plan and launch a new business (Capstone II). These two courses together will comprise the M.S.I.T.E program Capstone experience and will require students to actually develop these commercialization projects. Each student team will be assigned to a faculty member(s) who will instruct and guide them throughout this process. Capstone II may only be taken by students in the M.S.I.T.E. program.

Max Credits: 3  
Min Credits: 3

75.550 Seminar In Instrumental Conducting Techniques  
Course ID: 7299  
Course Details: A study of analytical, rehearsal and baton technique in reference to the instrumental conductor. Program selection, performance practice and artistic interpretation are also included in an interactive seminar format.

Max Credits: 3  
Min Credits: 3

79.225 History Photography Studio  
Course ID: 6828  
Course Details:  
Max Credits: 3  
Min Credits: 3

89.325 Geology for Engineers  
Course ID: 38517  
Course Details: This course will introduce basic geological principles with an emphasis on engineering applications. Topics covered include minerals and rocks and their properties, surface processes, earthquakes and rock deformation, dynamic processes that affect the earth's surface, geological hazards and their mitigation, earth resources.

Max Credits: 3
Min Credits: 3

**92.496 Mathematics Practicum**

Course ID: 38533

Course Details: Unpaid internship in the Department of Mathematical Sciences. This allows students to receive up to 3 (free elective) credits while working on an approved project. Students who have a position and who wish to date advantage of this Practicum should complete and submit the attached form to the department Internship Coordinator.

Max Credits: 3
Min Credits: 1

**CRIM.571 Domestic Terrorism and Violent Extremism**

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

**22.530 Autonomous Robotic Systems**

Course ID: 38577

Course Details: This course covers concepts related to autonomous robotic systems, emphasizing the synthesis and design of control algorithms for autonomous robotic vehicles. Topics that will be covered in the course include: Linear and nonlinear systems analysis, stability in the sense of Lyapunov, linearization of nonlinear dynamic equations, rigid body equations of motion in three dimensions, dynamic model derivation of aerial, space, marine and ground vehicles, fundamentals of flight dynamics, feedback control design for autonomous robotic vehicles, guidance and navigation, description of components typically encountered to autonomous robotic vehicles, guidance and navigation, description of components typically encountered to autonomous robotic vehicles, cooperative control of multi-robot teams and state estimation.

Max Credits: 3
Min Credits: 3

**25.4ACE Cooperative Education Experience**

Course ID: 38649

Course Details: This zero credit course is specifically designated for College of Engineering students in Mechanical, Chemical and Electrical/Computer Engineering who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program, and have secured a third, full-time co-op employment experience. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.

Max Credits: 0
Min Credits: 0

**26.4ACE Cooperative Education Experience**

Course ID: 38650

Course Details: This zero credit course is specifically designated for Plastics Engineering students who have successfully completed the Professional Development Seminar, are participating in the professional Co-op program, and have secured a third, full-time co-op employment experience. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.

Max Credits: 0
Min Credits: 0
26.751 Doctoral Thesis Research
Course ID: 4338
Course Details:
Max Credits: 1
Min Credits: 1

30.222 Health and Disease Across the Lifespan
Course ID: 38578
Course Details: This course will introduce the basic principles that promote health of individuals throughout the lifespan. Physiological, socioeconomic, economic, and behavioral factors that impact health, disease, and quality of life across the lifespan will be examined. Health assessment tools will be reviewed. The course emphasizes the role of nutrition and physical activity for health promotion and disease prevention across different life stages and the impact of aging on health and disease. Major causes of morbidity and mortality in the United States will be discussed.
Max Credits: 3
Min Credits: 3

32.514 Healthcare Management
Course ID: 33130
Course Details: This course provides a framework for addressing management problems in healthcare organizations, providing an overview of how healthcare institutions are organized and governed, the role of the 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

32.527 Planning and Marketing in Healthcare
Course ID: 33041
Course Details: The course examines the history, principles and methodologies of health services planning and marketing. Students learn how to develop various types of health plans (e.g., community and regional, strategic, business and marketing plans). They also learn about the research process and data resources required to support health services planning and marketing. Practical approaches to health care problems are studied using case analysis of actual healthcare projects and programs.
Max Credits: 3
Min Credits: 3

32.626 Leadership in Healthcare
Course ID: 4521
Course Details: The purpose of this course is to encourage students to carefully analyze their leadership style and skills within the context of health care. The course includes the study and application of leadership theories, concepts, and skills. Students will also assess their own leadership potential through the completion of readings, personal and leadership self-assessments, values exploration, and leadership skill exercises.
Max Credits: 3
Min Credits: 3

32.776 Curricular Practical Training (CPT)
Course ID: 35276
Course Details: An internship, practicum or other type of employment that is either required by the students 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 students field of study and contain a curricular component.
33.739 Mentored Research Experience

Course ID: 4641

Course Details: In this course, students participate in a mentored research experience. Students actively contribute as a member of a research study that will contribute to scientific knowledge. Opportunities are provided for the application of research skills and the dissemination of research with an emphasis on an interdisciplinary approach. This course also includes a monthly seminar, which focuses on ethical underpinnings, cultural considerations and disparities in health research.

Max Credits: 3
Min Credits: 3

42.346 Homer’s Trojan Epics

Course ID: 38591

Course Details: This class will explore the story of the ancient city of Troy from its origins in Homeric epic and classical drama to some of its many European iterations beginning with Vergil's Aeneid. Students will examine how these Trojan texts encode narratives of gender, ethnicity, and welfare, and how they help create an occidental European identity.

Max Credits: 3
Min Credits: 3

42.437 Newspaper Editing

Course ID: 38592

Course Details: This course will explore the techniques of putting together a student newspaper, focusing on everything from brainstorming for coming up with stories, to writing and editing them, writing headlines and captions, and design and layout. The course also discusses the nature of journalism audiences. It also discusses the practicalities of applying for journalism jobs and writing query letters for freelance writing.

Max Credits: 3
Min Credits: 3

43.369 Russia 1796 to the Present

Course ID: 38594

Course Details: This course covers the history of Russia in its various incarnations-Imperial Russia from the end of Catherine the Great's reign the Soviet Union, and today's Russian Federation. We use both historical works and literature to get a better understanding of the Imperial state, the nature and the social bases of autocracy, the ideologies and actions of the movements that supported the Empire and those that opposed it. We cover the cataclysms of World War I, the Revolutions, Civil War, and the Soviet period (preparing the student for the course on "Stalin's Russia", 43.374). We examine the causes and events involved int he decline and collapse of the Soviet Union, and the rise and emerging patterns of behavior of the Russian Federation.

Max Credits: 3
Min Credits: 3

43.376 20th Century Irish History in Film

Course ID: 38595

Course Details: This course is on the representation of Irish history in narrative feature and documentary films made in or about Ireland. Starting with the revolutionary era, it covers the key events, issues, and debates that defined Irish politics, culture and society in the last hundred years. The course is divided into five thematic sections and proceeds chronologically through the 20th century, starting with the War of Independence against the Britain and the Civil War that followed; the American romanticism of Ireland in film; social issues that plagued the Irish Free State and Republic; the period of violence in the North known as The Troubles; and the issues raised by multiculturalism during the Celtic Tiger era.

Max Credits: 3
Min Credits: 3
43.421 The Age of European Global Expansion, 1400-1850

Course ID: 38593

Course Details: This course examines the history of European global expansion from 1400-1850. The course begins with the medieval roots of European expansion. We then focus our attention on the expansion of the seaborne empires of Portugal and Spain beginning in the fifteenth century and those of their later challengers- the Dutch, the French, and the British. This course emphasizes how European efforts at empire building in the early modern period were often limited, a process shaped by capacities of the many diverse local populations that Europeans encountered. In addition, European expansion aided in the processes of global integration as it promoted the exchanges of goods, people, germs, plants, diets, ideas, and cultures.

Max Credits: 3
Min Credits: 3

44.221 Criminology

Course ID: 5356

Course Details: The definition and nature of crime, criminal statistics, and theories of crime causation are included. Required of all CJ majors.

Max Credits: 3
Min Credits: 3

44.699 Security Studies Capstone Writing and Presentation

Course ID: 37113

Course Details: This course represents the culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.590, Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Masters level research paper of at least 50 pages on a topic of their choosing related to security studies. 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

46.302 Research and Writing for Political Science

Course ID: 38655

Course Details: This course provides political science majors with opportunities to hone their research and writing skills. Students analyze representative scholarly and popular sources, explore writing for various venues; and practice editing and revising their work. With prior arrangements students may use this course to complete an honors thesis, pursue and independent research project of revise and expand an especially promising research paper submitted in a previous course.

Max Credits: 3
Min Credits: 3

59.491 Directed Studies - Intercollegiate FAHSS

Course ID: 38609

Course Details: Directed Studies - Intercollegiate FAHSS

Max Credits: 3
Min Credits: 3

60.761 Empirical Financial Accounting Reasearch I

Course ID: 38567

Course Details: This is part I of a two part doctoral seminar in Empirical Financial Accounting Research. This course introduces and develops a broad understanding of empirical accounting research in financial reporting. The intent is to provide an overview of archival research and an in-depth analysis of current financial accounting research. This course will focus on the types of questions and
innovative methods accounting academics are currently pursuing and developing.

Max Credits: 3
Min Credits: 3

**63.708 Enterprise Systems**

Course ID: 38566

Course Details: The course will focus on implementation issues with Enterprise Systems (also called Enterprise Resource planning -- ERP) which integrate the informational and functional boundaries within organization. The goals of the course are to help students understand the underlying ERP components and technologies, change management, and process integration in organization. Conceptual models will be analyzed on topics such as business process management, customer relationship management, supply chain management, privacy and security, and outsourcing issues as related to the implementation of enterprise systems. Students will be assessed through case analysis, exams, and research paper proposals.

Max Credits: 3
Min Credits: 3

**63.737 Multivariate Statistical Methods**

Course ID: 38569

Course Details: This course introduces statistical methods and techniques for multivariate data analysis. The course studies basic ideas underlying multivariate statistical methods and covers various applications of multivariate statistical analysis. The course discusses the design of a multivariate study, the choice of a multivariate method, the procedure of multivariate statistical analysis, and the interpretation of the analysis results. Topics include multivariate normal distribution, multivariate analysis of variance and covariance (MANOVA and MACOVA), principal components, factor analysis, structure equation modeling, canonical correlation, discriminant analysis, and cluster analysis.

Max Credits: 3
Min Credits: 3

**64.300 Principles of Innovation and Entrepreneurship**

Course ID: 38589

Course Details: This course is designed to help non-business students understand the importance of innovation and entrepreneurship in today's global economy and cultivate an entrepreneurial mindset among students in the Manning School of Business entrepreneurship concentration. It will cover different forms of entrepreneurship such as small businesses, growth ventures, corporate entrepreneurship and social entrepreneurship. The course will focus on the types of innovation, turning innovation into an ongoing new venture and on the entrepreneurial process. Innovation and entrepreneurship theories and concepts will be discussed with real life examples and cases.

Max Credits: 3
Min Credits: 3

**66.730 Research Design 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

**69.4ACE Cooperative Education Experience**

Course ID: 38648

Course Details: This zero credit course is specifically designated for Manning School of Business students who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program, and have secured a third, full-time co-op employment experience. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.
Max Credits: 0
Min Credits: 0

70.155 Drawing I

Course ID: 6835

Course Details: Provides a foundation in basic drawing concepts using a variety of media and approaches. The emphasis is on building visual literacy and its application to the realm of ideas. A wide range of assignments are given to develop graphic expression.

Max Credits: 3
Min Credits: 3

70.156 Drawing II

Course ID: 6855

Course Details: The emphasis is on giving form to ideas through building a solid sense of visual literacy. Assignments include a wide range of color media, surface, and subject matter with the focus on the psychological and structural use of color, creative experimentation, and the development of personal style. Fall and spring.

Max Credits: 3
Min Credits: 3

70.220 Website Design I

Course ID: 6874

Course Details: This course will focus on the creation of visual content for the web and will explore what constitutes a visually exciting and engaging site. Other topics that will be covered are: file formats, compression, web color strategies, and platform standards. Basic familiarity with Mac OS and/or Windows platforms required.

Max Credits: 3
Min Credits: 3

70.221 Practicum/Internship

Course ID: 6893

Course Details: The Practicum/Internship is an on-campus or off-campus learning experience. Specific requirements will vary depending on department policies and the nature of the program undertaken by the student. The practicum experience is to provide an occasion for practical experience in an area of particular interest to the student.

Max Credits: 3
Min Credits: 3

70.256 Drawing III

Course ID: 6856

Course Details: This advanced course in drawing is designed to help students develop the expressive and conceptual concerns of their drawing practice while developing their ability to work in an independent manner. Designed for students in all disciplines, the course will emphasize the development of strong research skills through the exploration of historical and contemporary modes of drawing. The class will be a combination of studio work, presentations, and individual and group critiques. Critiques are designed to provide feedback and to encourage and nurture each student's vision. Exploring a variety of drawing media, the ultimate goal of the course is the development of a visually coherent and conceptually unified body of work.

Max Credits: 3
Min Credits: 3

70.257 Monotypes

Course ID: 6864
Course Details: Exploration of the one-of-a-kind "painter's print". Emphasis is on the development of personal expression through a variety of assignments and techniques. Three portfolios of prints are required, two with assigned topics, and one with a self-assigned theme. Fall, alternate years.

Max Credits: 3
Min Credits: 3

**70.268 Computer Art II**

Course ID: 6862

Course Details: Designed to focus on advanced projects using the Macintosh platform. Focus is on design, layout, animation and video.

Max Credits: 3
Min Credits: 3

**70.270 Figure Drawing**

Course ID: 6865

Course Details: The study of the draped and undraped figure from life, stressing both sound observation and the creative use of human form as a vehicle for personal expression. A variety of assignments, graphic media, and approaches will be given in order to help explore both philosophical and aesthetic issues. Fall, alternate years.

Max Credits: 3
Min Credits: 3

**70.272 2D Animation**

Course ID: 6867

Course Details: This course will provide students with the fundamental understanding about the process and the concepts in animation for narrative and experimental expression. Preproduction including scripting and storyboarding will be especially emphasized. Hybrid techniques in both traditional and digital animations including hand-drawing, stop-motion, rotoscoping, pixilation as well as tweening will be introduced. Static and kinetic aesthetics of moving images will be explored through the review of historic and contemporary animations, and through the production. Students from this course will make a much smoother transition to 3D animation courses, Language of Video, Interactive media as well as Web Design/Art. The course will also introduce the student to historical and contemporary perspectives related to the discipline.

Max Credits: 3
Min Credits: 3

**70.276 Introduction to 3D Modeling and Animation**

Course ID: 6869

Course Details: This course will focus mainly on the forms, materials, and composition of 3D computer graphics in the various environments. Students will explore the possibility of 3D computer graphics for creative expression as well as innovative visual communications such as animation, game, sculpture, print and design. Rendering, lighting and camera as well as material and texturing techniques will be also explored. The course will also introduce the student to historical and contemporary perspectives related to the discipline.

Max Credits: 3
Min Credits: 3

**70.278 Interactive Media**

Course ID: 6873

Course Details: This course provides students with the ability to create interactive motion graphics for Multimedia projects using Adobe Flash and Adobe After Effects. Students learn how to make sophisticated vector and pixel based graphics with basic action scripting and a variety of interactive graphic elements as well as compositing, editing, character rigging, effects for digital media and animation.

Max Credits: 3
Min Credits: 3
70.290 Illustration I

Course ID: 6879

Course Details: This course provides students with a variety of experiences involving skills and techniques including computer use related to the execution of illustrations for children's books, fashion drawings, record albums, book jackets, folders, posters, and magazines. Field trips, discussions related to job opportunities and preparation of portfolios are integral parts of the instruction. Fall.

Max Credits: 3

Min Credits: 3

70.320 Web Design II

Course ID: 6877

Course Details: This advanced-level course is designed for students who have completed Website Development (90.238) and Website Design (70.379). The course will cover advanced topics such as user-centered design, information architecture, testing, and usage analysis. Students will have the opportunity to further develop their design, development, and conceptualization skills.

Max Credits: 3

Min Credits: 3

70.330 Typography II

Course ID: 30372

Course Details: Continuation of 70.230

Max Credits: 3

Min Credits: 3

70.420 Web Design III

Course ID: 30373

Course Details: 

Max Credits: 3

Min Credits: 3

82.4ACE Cooperative Education Experience

Course ID: 38647

Course Details: This zero credit course is specifically designated for College of Science students who have successfully completed the Professional Development Seminar, are participating in the Professional Co-op program, and have secured a third, full-time co-op employment experience. The co-op is designed to provide students the opportunity to develop and enhance their hands on, technical and professional skills within an industry related to their academic program of study. During the co-op employment experience, students will, in conjunction with their employer, develop and submit written learning goals, participate in a performance evaluation and facilitate an on-site visit by Co-op Coordinator.

Max Credits: 0

Min Credits: 0

85.642 Special Topics in Meteorology

Course ID: 7810

Course Details: 

Max Credits: 3

Min Credits: 3

91.402 Software Project II

Course ID: 30371

Course Details: 

Max Credits: 3

Min Credits: 3
Course ID: 8094
Course Details: A continuation of 91.401. Students must submit a proposal to the directing faculty member, obtain his/her signed approval, and forward a copy of the signed proposal to the department chairperson.

Max Credits: 3
Min Credits: 3

91.481 Windows Practicum/Internship

Course ID: 8129
Course Details: In this course, students continue and complete the project started in 91.480 Honors Project I.

Max Credits: 3
Min Credits: 3

91.562 Computer Security II

Course ID: 8184
Course Details: Applied computer security topics such as a computer and network forensics, virtual private networks, denial of service, viruses and worms, intrusion detection systems, smart cards, biometrics, programming language security, web security and privacy, e-commerce; case studies of deployed systems; policy and legal considerations.

Max Credits: 3
Min Credits: 3

92.302 Introduction to Applied Mathematics II

Course ID: 8304

Max Credits: 3
Min Credits: 3

92.590 Statistical Quality Control

Course ID: 8462
Course Details: Overview of quality and managing quality, Define Measure Analyze Improve Control (DMAIC), the six sigma approach to quality, visual representation of data, Pareto charts, histograms, process capability vs specification (process) limits, t-tests, ANOVA, and other statistical hypothesis testing in quality, normal probability plots, control charts, measurement system analysis, application of regression analysis to manufacturing and/or design, Minitab.

Max Credits: 3
Min Credits: 3

92.743 Graduate Research/Math

Course ID: 8489
Course Details:
Max Credits: 3
Min Credits: 3

95.417 Space Science Mission Design

Course ID: 38608
Course Details: This one-semester, 3-credit course intended for junior level science and engineering majors, is centered around the conceptual design of a spaceflight mission. In this project-based and team-based class, students will apply their science and technical knowledge to develop a spacecraft and mission concept tailored to answer a specific science question. Students will perform quantitative trade studies consistent with real-life constraints such as cost, schedule, manufacturability, team-expertise, operational environment, mission lifetime, etc. Students will 1) learn the fundamentals of key subsystems involved in a space flight mission and 2) apply their skills of inquiry, research, critical thinking to design a complete space science mission to solve a real-world problem while working within a multidisciplinary team.

Max Credits: 3

Min Credits: 3

95.456 Radiative Processes in Astrophysics

Course Details: Our knowledge of the universe beyond the Solar System is derived almost entirely from our interpretation of the radiation we receive from the universe; Our knowledge of the Earth's upper atmosphere and the atmospheres of other solar system objects is heavily dependent on observations of electromagnetic radiation. To understand the atmospheres of Earth and other planets, stars, galaxies and the universe, we need to understand the processes which produce electromagnetic radiation, and how radiation interacts with matter and propagates through space. This course describes the basic processes which create and alter such electromagnetic radiation before it's detected here in the Solar System. The course will consist of a combination of lectures, problem sets and class discussion sessions. The lectures will be expanded from the material in the text and will include additional material on the astrophysical and planetary context of radiative processes, drawn primarily from the following list of references. The discussion sessions will often be based on recent problem sets - regular participation of students in class discussions is expected.

Max Credits: 3

Min Credits: 3

95.464 Particle Astrophysics


Max Credits: 3

Min Credits: 3

95.517 Space Science Mission Design

Course Details: This one-semester, 3-credit course intended for junior level science and engineering majors, is centered around the conceptual design of a spaceflight mission. In this project-based and team-based class, students will apply their science and technical knowledge to develop a spacecraft and mission concept tailored to answer a specific science question. Students will perform quantitative trade studies consistent with real-life constraints such as cost, schedule, manufacturability, team-expertise, operational environment, mission lifetime, etc. Students will 1) learn the fundamentals of key subsystems involved in a space flight mission and 2) apply their skills of inquiry, research, critical thinking to design a complete space science mission to solve a real-world problem while working within a multidisciplinary team.

Max Credits: 3

Min Credits: 3

95.556 Radiative Processes in Astrophysics

Course Details: Our knowledge of the universe beyond the Solar System is derived almost entirely from our interpretation of the
radiation we receive from the universe; Our knowledge of the Earth's upper atmosphere and the atmospheres of other solar system objects is heavily dependent on observations of electromagnetic radiation. To understand the atmospheres of Earth and other planets, stars, galaxies and the universe, we need to understand the processes which produce electromagnetic radiation, and how radiation interacts with matter and propagates through space. This course describes the basic processes which create and alter such electromagnetic radiation before it's detected here in the Solar System. The course will consist of a combination of lectures, problem sets and class discussion sessions. The lectures will be expanded from the material in the text and will include additional material on the astrophysical and planetary context of radiative processes, drawn primarily from the following list of references. The discussion sessions will often be based on recent problem sets - regular participation of students in class discussions is expected.

Max Credits: 3
Min Credits: 3

95.564 Particle Astrophysics


Max Credits: 3
Min Credits: 3

CRIM.699 Security Studies Capstone Writing and Presentation

Course Details: This course represents the culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.590, Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Masters level research paper of at least 50 pages on a topic of their choosing related to security studies. 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.716 Dissertation Seminar Accelerated

Course Details: This course is an accelerated version of the CRIM 701/702 sequence. It is suitable for students who have already acquired the data for their doctoral thesis research and thus can accomplish the plan and template for the conduct of the various stages of the doctoral dissertation in one semester. Topics include: theoretical foundations, hypothesis development, sampling design, construct measurement, data collection, and analysis of quantitative or qualitative data. Prerequisite: Doctoral Candidacy in Criminology.

Max Credits: 6
Min Credits: 6

IB.525 Introduction to Translational Science

Course Details: Introduction to Translational Science will introduce students to the elements of translational research and is targeted toward individuals who have no prior experience with clinical or translational research. This course will focus on the principles and practices of translational medicine as they apply to the development of a new drug (small molecules and/or biologics), device, or diagnostic. The course will cover the following topics: Defining translational research, pre-clinical development of novel targets and leads, clinical development, the regulatory process, the design of the first-in-human clinical trial, protecting human subjects and managing clinical data.
**PUBH.101 Public Health Seminar**

Course ID: 38616

Course Details: This course is designed to orient first year Public Health students to the College of Health Sciences and the University as a whole. The general purpose of the course is to help students identify their areas of interest in Public Health and teach students valuable skills that will maximize their likelihood of success in achieving their academic and professional goals. Areas of priority will be time management and study skills, critical thinking, and communication.

Max Credits: 3
Min Credits: 3

**PUBH.221 Health Policy**

Course ID: 38615

Course Details: This introductory course will provide students with an overview of the healthcare systems that are currently utilized to provide coverage to Americans with emphasis on existing disparities. Students will also review policies that are developed and implemented to enhance the current health care system. An analysis of how healthcare coverage and costs differs between the US and other developed nations will also be covered in this course.

Max Credits: 3
Min Credits: 3

**PUBH.310 Communicable Diseases and Environmental Health**

Course ID: 38611

Course Details: This course introduces students to the fundamentals of communicable diseases and how humans and the environment affect their distribution and impact. The course will provide an overview of infectious diseases including how they affect humans, their vectors and sources. Communicable disease investigation and tracking, as well as prevention planning and response will be discussed. The course covers the following aspects of communicable disease: the public health significance; overview of Immunology and disease development and transmission; sources and carriers of disease, outbreak investigation, and disease control and prevention.

Max Credits: 3
Min Credits: 3

**PUBH.311 Toxicology for Environmental Health**

Course ID: 38610

Course Details: This course introduces students to the principles of toxicology in the context of environmental health. The course will introduce basic principles and mechanisms of toxicology with review of necessary human biology. Toxicology of major organ systems (e.g. respiratory, neurological, immunological, cardiovascular) will be reviewed and presented in the context of major occupational and environmental diseases. The toxic responses of major workplace and environmental health hazards including toxic chemicals, physical agents, biological agents, and their mechanisms of action will be discussed. The course will focus on case examples of toxic agents and their impacts. New directions in toxicology and communicating toxicology will be explored.

Max Credits: 3
Min Credits: 3

**PUBH.331 Occupational Health and Safety I**

Course ID: 38617

Course Details: This is the first semester of a two-semester undergraduate course sequence that provides an overview of the field of occupational health and safety. This course focuses on safety and ergonomics. The identification and control of hazards in the workplace and the safety of consumer products will be explored. Students will discuss the detection and reduction of hazards in the workplace to prevent negative impacts on health.

Max Credits: 3
PUBH.332 Occupational Health and Safety II
Course ID: 38614
Course Details: This is the second semester of a two-semester undergraduate course that provides an overview of the field of occupational health and safety. This course focuses on occupational hygiene and includes the recognition and evaluation of health hazards, and the control of health hazards including the use of protective equipment and ventilation systems. A laboratory for the course (PUBH333) allows the student to apply course content in the laboratory setting.
Max Credits: 3
Min Credits: 3

PUBH.333 Occupational Health and Safety II Laboratory
Course ID: 38613
Course Details: This is the laboratory associated with Occupational Health and Safety II. It is designed to provide the students with practical hands-on experience in the various technical topics taught in Occupational Health and Safety I and II. Students will collect and measure noise, gas, vapor, and aerosol samples and evaluate performance of personal protective equipment. The laboratory meets for three hours once a week. Actual laboratory exercises will be held every other week, followed the next week by a discussion of the results from the previous week.
Max Credits: 1
Min Credits: 1

PUBH.410 Water, Sanitation, and Public Health
Course ID: 38612
Course Details: This course introduces students to the critical role of water and water sanitation in protection of public health. The course will provide an overview of the basics of water treatment systems and the role of local public health professionals in water preservation. Students will be introduced to the importance of water and the global water crisis; the basic principles of water hydrology and the connection between surface and ground water; water chemistry, microbiology and common contaminants in water supplies (nutrients, pathogens, and chemicals); water and waste water treatment and protection systems (including storm-water runoff, pools and beaches), their functioning, regulation, and testing; and the emerging issues in water protection, such as hydrofracking. The course is supplemented.
Max Credits: 4
Min Credits: 4

PUBH.501 Social and Behavioral Determinants of Health
Course ID: 38621
Course Details: This course provides a foundation for the analysis of social and behavioral influences on public health. Planning, implementation, and evaluation of initiatives designed to improve public health are discussed. The course reviews prominent concepts in the social and behavioral sciences and provides examples of their impact on public health. Psychosocial theories of health promotion and how they inform public health practice are analyzed. Public health competencies in social and behavioral sciences provide a foundation for the course content.
Max Credits: 3
Min Credits: 3

PUBH.601 Health Policy and Management
Course ID: 38618
Course Details: The course provides students with a foundation of public health practice and management. Topics include critical issues for the future of healthcare in the U.S., leadership and politics in public health, partnerships to improve public health, leading and managing change in public health organizations, and improvement in public health practice. The course also provides an overview of the U.S. healthcare system, its organization, management and financing, current policy issues (e.g., cost, quality and access) and healthcare reform activity.
Max Credits: 3
PUBH.603 Global Development and Health

Course ID: 38622

Course Details: This course discusses global health efforts in relationship to human health and quality of life. Using a case methodology, this course will enable students to analyze complex health and development challenges in the less-developed world, and propose and evaluate interventions that address challenges. Topics include maternal and child health, nutrition, infectious and noninfectious diseases, natural disasters, sanitation and health inequality. Access to health care in developing and developed countries will be analyzed. The concept of positive deviance will also be explored.

Max Credits: 3
Min Credits: 3

PUBH.604 Geographic Information Systems (GIS) for Health

Course ID: 38619

Course Details: Geographic information systems (GIS) are of growing importance for analyzing health and environmental data. GIS is a spatial analysis system for the organization, storage, retrieval, and analysis of public health and many other types of data. The course will provide an overview of spatial analysis of data of importance to environmental and public health issues and students will analyze implications of spatial data analysis for public health.

Max Credits: 2
Min Credits: 2

PUBH.604L Geographic Information Systems (GIS) for Health Lab

Course ID: 38628

Course Details:

Max Credits: 1
Min Credits: 1

PUBH.613 Environmental Epidemiology

Course ID: 38623

Course Details: An advanced course in modern epidemiologic methods as applied to physical and chemical hazards in the environment. Students read and critique some of the classic studies that have led to recognition of the effects of the environment on health, as well as some current topics of intense and active research. Major topics covered include: air pollution and lung disease, water pollution and infectious disease, ionizing radiation and cancer, outbreak investigation for foodborne infectious agents, lead poisoning, and endocrine disruption. Through reading the literature, students strengthen their skills in study design and analysis, while learning about important aspects of environmental health.

Max Credits: 3
Min Credits: 3

PUBH.614 Occupational Epidemiology

Course ID: 38620

Course Details: An advanced course in modern epidemiologic methods as applied to occupational health risks and interventions. Students read and critique numerous studies in the field, and learn the particular methods and difficulties of conducting epidemiologic studies in the work environment. Major topics covered include: causal inference in epidemiology, point and interval estimation for cohort and case control studies, exposure assessment for epidemiology, multivariate linear and logistic models for control of confounding.

Max Credits: 3
Min Credits: 3

01.403 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

**01.405 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 and Language Learning**

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

**02.520 Teaching Reading and Writing in English**

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

**05.593 Principalship Practicum II**

Course ID: 30304

Course Details: The practicum is a two-semester (1+2=3 credits) 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

**06.511 Reading Theory & Instr. in Young Adult Literature**

Course ID: 2746

Course Details: The purpose of this course is to introduce graduate students who are preparing to teach to the reading theory and instruction appropriate for the teaching of young adult literature. There is an overview of theoretical views, a general study of what constitutes young adult literature, approaches to using the books, and finally developing the ability for critical analysis of this body of work. The course emphasizes the theme of identity in the development of young adults and the books that they read.
Max Credits: 3
Min Credits: 3

06.610 Teaching Reading in Content Area

Course ID: 38725

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

14.503 Computer Based Analysis of Structures

Course ID: 38785

Course Details: The course is an introduction to the finite element displacement method for framed structures. It identifies the basic steps involved in applying the displacement method that can be represented as computer procedures. The course covers the modeling and analysis of 2-dimensional and 3-dimensional structures, such as cable-stayed structures, arches, and space trusses, space frames, shear walls, and so on. The analysis is done for both static and dynamic loading. The study is done by using MATLAB, GTSTRUDL, and Mathcad software.

Max Credits: 3
Min Credits: 3

14.585 Transportation Safety

Course ID: 30816

Course Details: Transportation Safety goes beyond the accepted standards for highway design. Providing a safe and efficient transportation system for all users is the primary objective of federal, state, and local transportation agencies throughout the nation. This class addresses fundamentals of highway design and operation, human factors, accident investigation, vehicle characteristics and highway safety analysis.

Max Credits: 3
Min Credits: 3

22.510 Dynamics and Diagnostics of Rotating Machinery

Course ID: 38784

Course Details: Course provides the theoretical and practical background in the fundamentals of dynamics and diagnostics of rotating machinery. The course starts with an overview of rotating machinery components and systems with emphasis on their designs, and then builds and in-depth understanding of the dynamics of rotating systems by analyzing the design and dynamics of their component. Diagnostics, health monitoring, and associated signal processing theories regarding rotating machinery are emphasized, with applied examples such as aircraft engines, gas turbines, rotorcrafts, wind turbines, and automotive drivetrains, along with other turbomachines.

Max Credits: 3
Min Credits: 3

23.301 Manufacturing Technology Laboratory

Course ID: 3989

Course Details: Students will develop an understanding of precision metrology and the machine tools, related equipment, and systems used in manufacturing. Students will learn the inter-relationships between machine tools, various machining methods, engineering design considerations, and manufacturing techniques studied in the MET program. Lecture, case studies, and laboratory work are supported by a comprehensive text with supplemental materials provided by the instructor to enhance student learning. Students will work with lathes, drill presses, vertical milling machines, and abrasive finishing methods during laboratory sessions to manufacture several precision finished parts from engineering drawings. Course grades will be determined from student performance on examinations and laboratory projects.

Max Credits: 2
23.444 Mechanical Vibrations

Course ID: 38761

Course Details: The course will teach students methods to analyze single and two degree of freedom systems considering free vibration, harmonically excited motion, and transient vibration. Concepts of two degree of freedom systems generalized to multi-degree of freedom systems will be introduced. Various analytical approaches to vibration analysis will be taught. Solutions for continuous systems will be solved by the finite difference, finite element, and mode summation methods. Dynamic systems excited by random forces of displacements (random vibrations) will be covered. Additional mathematical content beyond Calculus C will be introduced within this course as required.

Max Credits: 3
Min Credits: 2

34.637 Integrating Clinical Practice

Course ID: 4720

Course Details: This course will focus on integrating clinical reasoning skills in physical therapy with an emphasis on evidence-based research and current concepts of disablement. Students will share clinical experiences focusing on utilization of best practices and Clinical Practice Guidelines. Students will evaluate the use of diagnostic imaging in making clinical decisions based on evidence. Finally, students will utilize knowledge of functional movement deficits in developing effective patient evaluation and management strategies.

Max Credits: 3
Min Credits: 3

34.640 Professional Prep in PT

Course ID: 4723

Course Details: This course will focus on facilitating the students transition into the Physical Therapy Profession including successful completion of the professional licensure examination, the National Physical Therapy Exam: Student groups will outline and present review materials for the exam to each other including a list of sources for further study. The faculty facilitator will oversee the development and content of the presentations and supervise practice examinations. Students are guided through reflection in practice, development of a personal professional development plan, a Vision and Mission Statement including continuing education, pro bono and community service and participation in the American Physical Therapy Association. Other topics will include strategies for successful interviewing.

Max Credits: 3
Min Credits: 3

34.642 Health Policy & Admin

Course ID: 4725

Course Details: This course explores the social, political, and economic policies that impact the delivery of physical therapy services and health. The course underscores the issues of professionalism, leadership, management, and the advocacy to foster excellence in autonomous practice for the benefit of members and society. The course emphasizes leadership in promoting cultural competence, global health initiatives, social responsibility, effective application of technology, and health services research.

Max Credits: 3
Min Credits: 3

34.646 Complex Cases in Physical Therapy

Course ID: 4729

Course Details: This online course which runs concurrently with Clinical Education Experience III (34.653) is designed to promote evidence based practice, professional correspondence, and further socialization into the profession of physical therapy through sharing of complex clinical cases encountered during the clinical experience. Students will describe their clinical placement setting as well as several complex cases through Blackboard while following the confidentiality guidelines as set forth in the Health Insurance Portability and Accountability Act (HIPAA).

Max Credits: 3
34.653 Clinical Education Experience III

Course ID: 4734

Course Details: The final, full time, twelve-week clinical experience is designed to promote full socialization into the profession of physical therapy. Students are expected to function as independently as possible utilizing 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.

Max Credits: 3
Min Credits: 3

43.200 Early Christianity: The First Centuries

Course ID: 34822

Course Details: This course serves as an introduction to the first 800 years of Christian history. It will begin with an introduction to the Apostolic Church of the first century (and its Jewish/Greco-Roman background) and conclude with an introduction to the Eastern Orthodox Church of Late Antiquity. The course will also cover popular topics like "Gnosticism," "Women in Early Christianity," and "Early Christian Worship and Art."

Max Credits: 3
Min Credits: 3

44.699 Security Studies Capstone Research Paper

Course ID: 37113

Course Details: This course represents the culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.590, Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Masters level research paper of at least 50 pages on a topic of their choosing related to security studies. Students will provide drafts of their paper to their faculty supervisor periodically during the semester, and the final version will be submitter for grading on the basis of quality research and writing.

Max Credits: 3
Min Credits: 3

45.311 Philosophy and Literature

Course ID: 5519

Course Details: This course examines the intersection between philosophy and literature. Course content includes detailed study of philosophical works of literature and works of philosophy about Literature. Featured Topics include competing definitions of Literature, silent and performative reading, models for acquiring literary status, Literature and morality, censorship, the role of truth in literary experience, and the relationship between authors, works, fictional characters, readers, and critics.

Max Credits: 3
Min Credits: 3

45.385 Philosophy of Popular Culture

Course ID: 38726

Course Details: This course analyzes those forms of art/entertainment commonly referred to under the umbrella term "popular culture" through a variety of philosophical lenses. After seeking to establish a categorization of "popular culture," students will examine the mediums of music, film, television, advertisements and sports. Throughout the course, students will read/listen/watch various examples of the mediums listed above and attempt to answer various questions about them such as: what societal values make these examples popular at a current moment? What cultural assumptions do these examples reflect? What is the artistic/aesthetic merit of these examples?

Max Credits: 3
Min Credits: 3
46.372 Crime, Security, and Democracy in Latin America

Course ID: 5658

Course Details: In the past two decades, different forms of organized crime have besieged democratic stability and security in Latin America. The explosion of violence in Mexico in 2006, problems with postconflict criminality in Central America, and complex relations between criminality and political violence in Colombia are only some prominent expressions of a problem that seems to be exacerbated by globalization, but that has clear historic roots and local expressions. The main objective of this class is to provide students with analytic, conceptual and factual tools that will allow them to critically evaluate the impact of criminality on distinct aspects of Latin American politics and society.

Max Credits: 3
Min Credits: 3

46.398 The War on Drugs

Course ID: 5671

Course Details: The war against drugs stands as both a major foreign policy priority for the US and the International community in general, and as a constant source of debate and contention. The aim of this course is to provide students with analytical tools, concepts, and information, which will enable them to critically evaluate the war on drugs beyond the common myths and misconceptions that often surround this highly controversial topic. By analyzing a wide range of countries around the world, students would gain an in depth and nuanced perspective of the relation between drug trade, violence, corruption, development, and democracy. Students will also gauge arguments and possible impacts on different drug policy options.

Max Credits: 3
Min Credits: 3

46.406 The Politics of Identity in the Middle East

Course ID: 5676

Course Details: The course will examine the ethnic, political, religious and social changes in the modern Middle East. The course will start with an introduction to the diverse identities all over the Middle East and then it will comparatively examine a number of those identities.

Max Credits: 3
Min Credits: 3

46.447 Theories of Political and Criminal Violence

Course ID: 38759

Course Details: The study of violence has been a central piece of debates in comparative politics that range from the causes of revolution to the analysis of civil wars. This course aims to provide a broad overview of different bodies of research on violence. The class will also revisit crucial debates in the study of violence, such as the problems of separating criminal and political violence (such as interstate wars). By the end of the class, students will be able to identify major theoretical and methodological approaches to violence, major debates and concepts, as well as key cases across the world.

Max Credits: 3
Min Credits: 3

46.490 War and Peace in the Sovereign State System

Course ID: 5687

Course Details: Despite much effort to limit the occurrence of interstate and intrastate war, such violence is still prevalent in the sovereign state system. This course will focus on the causes, dynamics, and outcomes of interstate and intrastate conflict and ways to sustain peace. We will examine the foundational works in the area of conflict before moving quickly into more recent research. The class will emphasize student participation and the application of concepts we learn in class. Students are asked to write a final paper exploring a concept of war and peace in the sovereign state system.

Max Credits: 3
Min Credits: 3
48.210 Sociology of Food

Course Details: This course is about Sociology of food exploring the connection between food, society and culture. Our food choices are influenced by age, gender, ethnicity, class and religion. History of food and methods of food production contribute to understanding of social relations among individuals and social changes in society. This course will examine 1. role of food in society, culture and change, 2. changes in food production from simple to complex societies and 3. problems associated with new systems of food production locally and globally.

Max Credits: 3
Min Credits: 3

48.311 Sociological Perspectives on Communication and Social Change (Last Term 2009 Fall)

Course Details: Most social interactions and interventions involve communication. Thus, communication patterns present critical issues for sociological inquiry. This course introduces communication as a central yet often ignored element of social life. It surveys existing communication theories, then focuses on models used by marginalized populations in efforts to democratize communication systems. Finally, it introduces tools for communication strategizing. As a final product students will conduct a frame analysis of a current social topic. From a general liberal arts perspective, the course will stress critical thinking and writing skills.

Max Credits: 3
Min Credits: 3

48.484 Internship I

Course Details:

Max Credits: 3
Min Credits: 1

52.245 Advanced Italian Conversation

Course Details:

Max Credits: 3
Min Credits: 3

52.345 Advanced Italian Conversation

Course Details:

Max Credits: 3
Min Credits: 3

53.113 Portuguese 1 and Culture

Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 113, 114 and 213, 214 levels must be elected in the prescribed sequence.

Max Credits: 3
Min Credits: 3
53.213 Portuguese 3 and Culture
Course ID: 6055
Course Details: Development of fundamental skills in oral expression, aural comprehension, reading and writing is required in language courses. Beginning and intermediate language courses at the 113, 114 and 213, 214 levels must be elected in the prescribed sequence.
Max Credits: 3
Min Credits: 3

54.352 Hispanic Perspectives
Course ID: 38742
Course Details: In this course we will explore some of the foundational texts of Hispanic literature while discussing the intersections of political, literary, and cultural traditions that connect the United States with Spain and Latin America.
Max Credits: 3
Min Credits: 3

58.302 Studies In World Art
Course ID: 6223
Course Details: Historical and critical examination of regions works of art from China, Asia, the Islamic world, India, Africa, North America, Latin America, Native American Art and Mexico. Topics vary from year to year. Course may be repeated.
Max Credits: 3
Min Credits: 3

59.302 Studies In World Art
Course ID: 6223
Course Details: Historical and critical examination of regions works of art from China, Asia, the Islamic world, India, Africa, North America, Latin America, Native American Art and Mexico. Topics vary from year to year. Course may be repeated.
Max Credits: 3
Min Credits: 3

60.605 Government and Non-Profit Accounting
Course ID: 38799
Course Details: This course introduces students to financial accounting and reporting issues related to stat and local government and non-profit organizations. Students will learn how to prepare, analyze, and interpret these entities financial statements.
Max Credits: 3
Min Credits: 3

60.699 Accounting Internship
Course ID: 6369
Course Details:
Max Credits: 3
Min Credits: 3

62.315 New Product & Service Management
Course ID: 6431
Course Details: Course number was formerly 62.311. Focuses on the process of new product & service development and marketing. Emphasis is given on market opportunity identification, R&D-marketing interface, business model development, market potential estimation, and market entry timing.

Max Credits: 3
Min Credits: 3

62.411 Marketing Analytics

Course ID: 6432

Course Details: Course number was formerly 62.312. Focuses on marketing strategies and tactics. Emphasis is given on research methods and applications for strategy building and implementation.

Max Credits: 3
Min Credits: 3

62.412 Global Marketing

Course ID: 6429

Course Details: Course number was formerly 62.303. Focuses on the marketing aspect of global business. Emphasis is given on cultural dynamics and economics as well as political, social and regulatory constraints as they affect the global marketing practice and strategy implementation.

Max Credits: 3
Min Credits: 3

63.707 Electronic Commerce

Course ID: 38716

Course Details: This course provides a foundation on digital commerce and e-business research for PhD. students. It will cover both technological and managerial aspects of managing e-business operations in either a pure (Dot.Com) organization or traditional organization (bricks-and-click). 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. Students will be conducting literature review in each of these key e-business areas and identify potential future research directions.

Max Credits: 3
Min Credits: 3

64.360 Principles of Innovation and Entrepreneurship

Course ID: 38589

Course Details: Course number was formerly 64.300. This course is designed to help non-business students understand the importance of innovation and entrepreneurship in today’s global economy and cultivate an entrepreneurial mindset among students in the Manning School of Business entrepreneurship concentration. It will cover different forms of entrepreneurship such as small businesses, growth ventures, corporate entrepreneurship and social entrepreneurship. The course will focus on the types of innovation, turning innovation into an ongoing new venture and on the entrepreneurial process. Innovation and entrepreneurship theories and concepts will be discussed with real life examples and cases.

Max Credits: 3
Min Credits: 3

64.496 Entrepreneurship Strategy Implementation

Course ID: 38814

Course Details: The Course focuses on innovation and entrepreneurship utilizing experiential learning and venturing projects. It will deal with ideation methods and tools, technology commercialization, business planning and potential initial incubation of an early-stage business by project teams, and the development of an investment proposal to launch a new business. Students will be exploring, identifying and analyzing the path from Idea to Market for technology projects.

Max Credits: 3
**64.499 Independent Studies**

Course ID: 6565

Course Details:

Max Credits: 3

Min Credits: 3

**64.670 Global Entrepreneurship**

Course ID: 38768

Course Details: This course discusses state of global entrepreneurship and the opportunities for it. It will cover different forms of global entrepreneurship, influences of macro forces and factors for global entrepreneurs consideration. The course will offer a structured approach to thinking and creating entrepreneurship beyond domestic markets and operations. It will present entrepreneurship framework, case studies, group projects and connections with global entrepreneurs to understand real-life global entrepreneurship.

Max Credits: 3

Min Credits: 3

**66.150 Introduction to Business**

Course ID: 38128

Course Details:

Max Credits: 3

Min Credits: 3

**66.455 Compensation Management**

Course ID: 6658

Course Details:

Max Credits: 3

Min Credits: 3

**66.491 Independent Study in Management**

Course ID: 38747

Course Details: An opportunity for the student to carry out individualized study relating to the field of management under the supervision of a member of the faculty.

Max Credits: 6

Min Credits: 1

**66.625 Negotiations**

Course ID: 6716

Course Details: Pre-Requisite: MBA Foundation Core.

Max Credits: 3

Min Credits: 3

**70.101 Art Concepts I**

Course ID: 6823
Course Details: Art Concepts I will focus on learning the visual language of the creative process through an examination of the principles of two-dimensional visual organization. These fundamental basics form the underlying structure of all studio and communication arts. Through slide lecture, guest lectures, field trips, and studio projects, students will begin to understand the many forms that visual expression takes. The course will develop creative problem solving skills and students will learn to respond to personal challenge. Students will also be instructed in the principles of professional execution and be introduced to diverse modes of thought, media, and aesthetic expression.

Max Credits: 3
Min Credits: 3

**70.210 Graphic Design I**

Course ID: 6849

Course Details: Exercises, lectures and projects will introduce students to graphic design principles and techniques. Course will begin with a fundamental study of image, form, and space relations, then cover such topics as working with grids, typography basics, page layout, the introduction of color, rendering techniques, history, and more. Students will be assigned a series of projects to enhance their visual communication skills.

Max Credits: 3
Min Credits: 3

**70.230 Typography I**

Course ID: 6830

Course Details: The study of lettering concepts and techniques, including the history of letters, styles and families of type, letter design, hand-drawn to computer-based lettering approaches and their effect and uses in communication. Emphasis will be on creative and aesthetic communication. Fall, alternate years.

Max Credits: 3
Min Credits: 3

**70.232 Ceramics I**

Course ID: 6848

Course Details: Introduces the student to the basic hand-building techniques, wheel throwing, and ceramic sculpture. The course will also examine clay, the material, glaze techniques, and firing processes.

Max Credits: 3
Min Credits: 3

**70.235 Sculpture I**

Course ID: 6846

Course Details: The exploration of three-dimensional form through the use of basic materials, methods and approaches. Assignments will include expressive problems based on human and non-objective form relationships. Spring.

Max Credits: 3
Min Credits: 3

**70.242 Language of Video**

Course ID: 6870

Course Details: An introductory course in video camera principles and editing functions. Utilizing writing and still photography, students will explore the language of video in both images and sound as they produce factual documents and/or personal fiction.

Max Credits: 3
Min Credits: 3

**70.272 2D Animation I**
Course ID: 6867

Course Details: This course will provide students with the fundamental understanding about the process and the concepts in animation for narrative and experimental expression. Preproduction including scripting and storyboarding will be especially emphasized. Hybrid techniques in both traditional and digital animations including hand-drawing, stop-motion, rotoscoping, pixilation as well as tweening will be introduced. Static and kinetic aesthetics of moving images will be explored through the review of historic and contemporary animations, and through the production. Students from this course will make a much smoother transition to 3D animation courses, Language of Video, Interactive media as well as Web Design/Art. The course will also introduce the student to historical and contemporary perspectives related to the discipline.

Max Credits: 3
Min Credits: 3

70.310 Graphic Design II

Course ID: 6880

Course Details: Students will be assigned a variety of advanced-level projects dealing with areas such as logo design, publication design, interactive screen design, direct mail projects, corporate identity systems, poster design, and more. Projects in this class are designed to better develop the students’ ability to take a project to its final stage and render it as a professional portfolio piece.

Max Credits: 3
Min Credits: 3

70.332 Ceramics II

Course ID: 35291

Course Details: Building on Ceramics I as an introductory course, Ceramics II will ask the student to explore functional and nonfunctional ceramic form. Students will be expected to challenge themselves with scale, advanced glaze methods and they will become familiar with kiln firings. Historical and contemporary issues in ceramics will be covered through lectures, slide presentations and critiques.

Max Credits: 3
Min Credits: 3

70.335 Sculpture II

Course ID: 6858

Course Details: A course allowing the student to further develop his or her techniques and understanding of sculptural form, leading to a more personal vocabulary. Conventional techniques will be extended to cover more contemporary materials and methods. Spring, alternate years.

Max Credits: 3
Min Credits: 3

70.342 Intermediate Video

Course ID: 36430

Course Details: This course will continue the exploration of video as an expressive medium. Students will explore video installation, interactivity, video compositing and streaming media to produce creative works.

Max Credits: 3
Min Credits: 3

70.377 2D Animation II

Course ID: 6872

Course Details: This course focuses on applying industry-standard storyboarding, character and layout design and scripting techniques to animation. Contents to be covered include the various purposes and formats of storyboards, the basic terminology and concepts used in production, and the application of production techniques to the creation of animated films with or without a written script and the production process of an animated film from idea to execution of complete film.

Max Credits: 3
70.410 Graphic Design III
Course ID: 31971
Course Details:
Max Credits: 3
Min Credits: 3

70.432 Ceramics III
Course ID: 35288
Course Details: Ceramics III will require students to develop a personal visual voice in clay, resulting in a focused coherent body of work. Students will be expected to develop productive studio habits, continue to explore advanced glaze methods and participate in kiln firings.
Max Credits: 3
Min Credits: 3

70.435 Sculpture III
Course ID: 30834
Course Details: Sculpture III will allow students with a continued, special interest in three-dimensional media and installation art to find their personal visual voice and begin to develop a structured studio practice. Students will be asked to identify a conceptual theme for the semester that they will explore through research, development and execution in a series of installation works. The course will introduce and expand on contemporary media and methods not covered in Sculpture I and II. Verbal analysis and articulation of the final sculptural works will continue to be stressed.
Max Credits: 3
Min Credits: 3

79.225 History of Photography
Course ID: 6828
Course Details: Less than 200 years old, photography seems to span millennia. With 1839 as the invention's launch date, there is no photograph of George Washington, but very soon we are flooded with the faces of composers, painters, and presidents: we know and are reminded of the ravages of civil and world wars, industrial progress and social injustice, or the beauty of pristine landscapes and their ecological demise. In this course, students will become familiar with some 100 notable photographers, from the beginning years of its invention to contemporary times with works by major artists and forgotten visionaries, all serving as a foundation for inspiration and understanding of the art world's most visible medium. Grading in the course is based on a mid-term and final exam along with a major research paper.
Max Credits: 3
Min Credits: 3

81.342 Comp Vertebrate Anatomy
Course ID: 7501
Course Details: This course is designed to provide students a broad understanding of the anatomy of vertebrates with an emphasis on comparison between taxa and their evolutionary significance. Students will acquire knowledge and understanding of anatomical structure and terminology of vertebrates and an understanding of how these structures have evolved from ancestral forms. There will also be some reference to the fields of embryology, histology and paleontology in the course. This course may interest students who might want to go into various animal/human focused fields (e.g. veterinary science, medicine or graduate studies with more organismal focus), and students who simply want a course focused on vertebrates. However, students should note that this course does not focus on human nor veterinary anatomy. This course could also help undergraduates in the General Biology and Ecology Option satisfy free elective requirements.
Max Credits: 3
Min Credits: 3
81.759 PhD Dissertation Biochemistry

Course ID: 7599

Course Details:
Max Credits: 9
Min Credits: 9

85.301 Atmospheric Thermodynamics

Course ID: 7774

Max Credits: 3
Min Credits: 3

85.495 Honors Research: Atmospheric Science

Course ID: 7794

Course Details: An individual or team research project carried out by qualified students with the approval of and supervision by a faculty member.
Max Credits: 3
Min Credits: 3

87.495 Honors Research: Environmental Studies

Course ID: 38727

Course Details: An individual or team research project carried out by qualified students with the approval of and supervision by a faculty member.
Max Credits: 3
Min Credits: 3

89.495 Honors Research: Geoscience

Course ID: 7922

Course Details: An independent scientific research project carried out by a qualified senior under the supervision of a faculty member.
Max Credits: 3
Min Credits: 3

91.423 Computer Vision I

Course ID: 38743

Course Details: Computer vision has seen remarkable progress in the last decade, fueled by the ready availability of large online image collections, rapid growth of computational power, and advances in representations and algorithms. Applications range from 3-D scene reconstruction, to visual Simultaneous Localization and Mapping (SLAM) for robotics, to real-time human body pose estimation. This introductory computer vision course explores various fundamental topics in the area, including the principles of image formation, local feature analysis, segmentation, multi-view geometry, image warping and stitching, structure from motion, and object recognition.
Max Credits: 3
Min Credits: 3

91.523 Software Engineering I
Course ID: 8152
Course Details: Continuation of 91.522; a team-based project course that applies object-oriented methods to designing, implementing, and maintaining interactive and distributed software systems with emphasis on quality and reusability. (Undergraduates may substitute this course for 91.412.)
Max Credits: 3
Min Credits: 3

92.587 Measure and Probability Theory
Course ID: 8459
Course Details: This course presents the mathematical foundations of Probability Theory, including the concepts of Probability Space and random variable. Various types of convergence of sequences and measurable functions will be introduced, and precise statements and proofs of the probability limit theorems (Law of Large Numbers, Central Limit Theorems, etc.) will be given. Theory of measure and Lebesgue integration will be introduced. If time permits, conditional probabilities will be discussed.
Max Credits: 3
Min Credits: 3

CRIM.699 Security Studies Capstone Research Paper
Course ID: 37113
Course Details: This course represents the culminating capstone experience for students in the MA in Security Studies program at UMass Lowell. Incorporating the tools learned in 44.590, Research Design and Methods, students are required to design a research question, gather and analyze information, and write a Masters level research paper of at least 50 pages on a topic of their choosing related to security studies. Students will provide drafts of their paper to their faculty supervisor periodically during the semester, and the final version will be submitted for grading on the basis of quality research and writing.
Max Credits: 3
Min Credits: 3

PCS.761 Continued Graduate Research
Course ID: 38715
Course Details: 
Max Credits: 1
Min Credits: 1

PSM.510 Professional Development for Internship.
Course ID: 37166
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

10.315 Unit Operations Laboratory
Course ID: 2869
Course Details: Students perform laboratory base experimental analyses in fluid flow and heat transfer and fluid flow and heat transfer unit operations processes common in Chemical Engineering practice. The course is team-based and students are expected to develop and improve in their ability to work and interact in a group environment. Written and oral reports are required. Safety in both lab and industrial practice are emphasized.
Max Credits: 3
Min Credits: 3
17.322 Signals and Systems I

Course ID: 38851

Course Details: Introduction to signals and systems. Signal classification, Normalized energy and power. Signal families, time-domain representation by differential equations, linear time invariance, classical solution to various signal families, frequency domain representation, total solution of system with initial conditions. Impulse and pulse response of LTI systems. Convolution methods, Fourier series analysis, Fourier transforms, properties and use, inversion by partial fractions, residues with s-plane vectors, application to LTI systems with initial conditions and sources. Introductions to digital elements and equations.

Max Credits: 3
Min Credits: 3

19.510 Fundamentals of Occupational Health

Course ID: 3549

Course Details: This course provides an overview of key topics in the field of occupational health and safety including physical agents and biological and chemical hazards. The measurement and control of various physical agents are covered, including noise, radiation and extreme environments. The course provides an in-depth understanding of indoor air quality problems that may result in health risks as well as prevention and remediation options. Students will understand the health risks from blood borne pathogens, as well as the regulations and methods of prevention. They will also gain knowledge of hazard communication regulations, material safety data sheets and how to research chemical hazards.

Max Credits: 3
Min Credits: 3

22.569 Fracture Mechanics

Course ID: 38881

Course Details: The application of fracture mechanics and approaches for exploring the impact of cracks on engineering structures. Topics will be chosen from a range of mathematical techniques, applied mechanics, and materials science, e.g. theoretical strength, stress concentration, linear and nonlinear fracture mechanics, stress singularity, fracture modes, energy methods, stable and unstable crack growth thermal cracks, crack tip plastic zone, Dugdale and Irwin models, the R-curve, power-law materials, and the J-integral. Students should have a good understanding of the principles of strengths of materials and be able to apply these principles to the solution of problems in solid mechanics. The associated knowledge in complex variables and partial differential equations will be reviewed as needed.

Max Credits: 3
Min Credits: 3

22.650 Nano. Transport Phen. for Manufacturing Nanodevice

Course ID: 38883

Course Details: This 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.

Max Credits: 3
Min Credits: 3

34.643 Evidence Directed Care

Course ID: 4726

Course Details: This course presents the role of evidence in the development and critical analysis of physical therapy clinical practice guidelines and practice recommendations. Students are guided through the process of analyzing, weighting, comparing and integrating sources of evidence. Methods of integrating various forms of evidence that will be specifically covered include literature reviews, meta-analyses, systematic reviews, clinical prediction rules and clinical practice guidelines.
Max Credits: 3
Min Credits: 3

42.215 The Essay
Course ID: 5032
Course Details: Studies the essay as the literature of ideas, and presents selections from Montaigne to the present.
Max Credits: 3
Min Credits: 3

42.336 From Beowulf to Tolkien
Course ID: 38856
Course Details: We will read Beowulf in translation, and discuss contemporary approaches as well as engage with critical traditional questions. We will also read other Anglo-Saxon poetry and Old Norse-Icelandic sagas in translation in order to gain a cultural context for the Beowulf poem. Class will conclude with a look at how Tolkien's books were inspired and influenced by these works.
Max Credits: 3
Min Credits: 3

42.338 Medieval Women Writers
Course ID: 38857
Course Details: Woman have always written and read and participated in culture. This class will explore writings on literary and non-literary genres by woman in the European Middle Ages (600-1500). Students will learn how different pre-modern cultural conditions affected the possibilities for women's authorship, readership, and patronage. We will also examine how women writers interacted with literary traditions and constructions of gender.
Max Credits: 3
Min Credits: 3

42.392 Visual Rhetoric
Course ID: 38869
Course Details: This course introduces students to the theory and practice of visual communication. Students will explore what scholars mean by terms such as visual rhetoric and visual literacy in order to think concretely about how these concepts apply to the communication practices they will engage in their academic, professional, and everyday life. Special attention will be paid to the ways in which visual representations communicate culturally-specific meanings about race, gender, class, sexuality, age, nationality, and difference. Assignments include contributions to a course blog, rhetorical analyses of visual texts, design modules, and a multimodal project.
Max Credits: 3
Min Credits: 3

42.435 Writing About Culture
Course ID: 38882
Course Details: In this course, students will write about local culture, using a mix of first-hand observation, archival research, and/or contextual or geographic readings of culture of literature produced in the region. This course is designed to serve as a course in a study abroad program or one that focuses on regional authors such as Jack Kerouac or Henry David Thoreau.
Max Credits: 3
Min Credits: 3

44.141 Introduction to Policing
Course ID: 5350
Course Details: This course provides an examination of the historical development of police work with special emphasis on the
conflicting role expectations facing police officer.

Max Credits: 3
Min Credits: 3

44.497 Terrorism Internship

Course ID: 5425

Course Details: This course is a semester long internship with the Center for Terrorism & Security Studies (CTSS) where students will work on one or more of the center's research projects. After an initial period of training in data collection and coding, CTSS interns will then work under the supervision of Center faculty and staff.

Max Credits: 6
Min Credits: 3

45.386 Ancient Philosophy

Course ID: 5506

Course Details: A survey of the beginnings of philosophy, mainly western, from the Presocratics to Augustine. Studies the emergence of philosophy out of mythical forms of thinking and the development of rational thought in the work of Plato, Aristotle, the Stoics, the Epicureans, and the Neoplatonists.

Max Credits: 3
Min Credits: 3

46.175 Introduction to Environmental Politics

Course ID: 31964

Course Details: This course introduces major concepts in environmental politics to provide a comprehensive understanding of the formation of environmental policy in the United States. Throughout the course, particular attention is paid to the role of government and markets in creating environmental crises and shaping policy responses.

Max Credits: 3
Min Credits: 3

47.269 Research I: Methods

Course ID: 5710

Course Details: An introductory course on the fundamentals of empirical research in psychological science. Instruction will promote understanding and competence in the basic vocabulary of psychological research, addressing information literacy, measurement, reliability, and validity in observed variables and unobserved constructs. Students will learn critical components of experimental, quasi-experimental, and correlational designs, as well as the basics of descriptive statistics, hypothesis and statistical testing, and matching design to analysis strategies. Students will demonstrate this knowledge through the preparation of a research proposal. Finally, this course will provide students a strong basis from which to pursue advanced coursework in a variety of methodological approaches to psychological research.

Max Credits: 3
Min Credits: 3

47.375 Research III: Statistics

Course ID: 5738

Course Details: An advanced course in which students design and carry out an empirical research project from start to finish, resulting in an individually written research report using APA style and an oral presentation. The primary goal is for students to experience discovery by completing an original study that reasonably extends the prior research literature. Topics may vary, reflecting the interests of the instructor. Students will perform literature reviews; formulate a research question; operationalize variables; develop research designs; obtained ethical review and approval; and collect, analyze, and interpret data. Students will also demonstrate knowledge of the research process in assessments that may include assignments, quizzes, or exams.

Max Credits: 3
Min Credits: 3

50.303 Special Topics: in Fancophone Studies

Course ID: 38870

Course Details: An in-depth study of a specific topic in literature, culture, civilization or cinema from the French-speaking world. Class discussions, readings, oral and written work all in French. May be repeated once for credit, if content changes, and with written consent of the Instructor.

Max Credits: 3

Min Credits: 3

53.110 Portuguese for Spanish Speakers I

Course ID: 38871

Course Details: Taught at a faster pace than a regular beginning course in Portuguese, is an introduction to the foundations of the Portuguese language and the cultural diversity of the Lusophone world for speakers of Spanish. Specific attention is devoted to the advantages and challenges that Portuguese presents to native or near-native speakers of Spanish. The course acknowledges that, in spite of the similarities between the two languages, there are important differences in pronunciation, vocabulary and grammatical structures. The course gives emphasis to all four language skill-listening, speaking, reading, writing-in order to achieve communicative goals. Portuguese is the language of instruction.

Max Credits: 3

Min Credits: 3

53.200 Introduction to Southeast Asian Cultures

Course ID: 38872

Course Details: This course focuses on the development of the arts and cultures in Southeast Asia from ancient times to the present. As a diverse region that is home to Muslims, Catholics and other Christian, Buddhists, Hindus and animists, examining the arts and cultures in Southeast Asia provides fascinating insight into the region's societies. This course examines performance, architecture and material culture from a variety of Southeast Asian cultures. Students will gain an understanding of the geography and demography of Southeast Asia, its contacts with neighboring regions, and how these diverse influences are reflected in the production of art. Students will be introduced to theater, dance, puppetry, martial arts and music of Southeast Asia.

Max Credits: 3

Min Credits: 3

53.301 Special Topics: in Lusophone Studies

Course ID: 38873

Course Details: An in-depth study of a specific topic in literature, culture, civilization from the Lusophone world. Class discussions, readings, oral and written work all in Portuguese or in English. May be repeated once for credit, if content changes, and with written consent of the Instructor.

Max Credits: 3

Min Credits: 3

53.302 Special Topics: in Portuguese Studies

Course ID: 38874

Course Details: An in-depth study of a specific topic in literature, culture, civilization or cinema from Portugal. Class discussions, readings, oral and written work all in Portuguese or in English. May be repeated once for credit, if content changes, and with written consent of the Instructor.

Max Credits: 3

Min Credits: 3

53.400 Special Topics: in Southeast Asian Studies
Course ID: 38875

Course Details: An in-depth study of a specific topic dealing with the literature, culture, civilization, cinema etc., of southeast Asia. Class discussions, readings, oral and written work all in English. May be repeated once for credit, if content changes, and with written consent of the Instructor.

Max Credits: 3

Min Credits: 3

54.300 Special Topics in Hispanic Studies

Course ID: 38876

Course Details: An in-depth study of a specific topic in literature, culture, civilization or cinema from the Hispanic world. Class discussions, readings, oral and written work all in Spanish. May be repeated once for credit, if content changes, and with written consent of the Instructor.

Max Credits: 3

Min Credits: 3

54.304 Special Topics: in Latin American Studies

Course ID: 38879

Course Details: An in-depth study of a specific topic in literature, culture, civilization or cinema from Latin American countries. Class discussions, reading, oral and written work all in Spanish. May be repeated once for credit, if content changes, and with written consent of the Instructor.

Max Credits: 3

Min Credits: 3

63.635 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

64.742 Seminar in Corporate Entrepreneurship

Course ID: 36954

Course Details: In this course, students will become familiar with and develop an in-depth understanding of the concepts, models, and paradigms that collectively form the foundation for corporate entrepreneurship. The purpose is to develop a keen awareness of major gaps that exist in the literature. Students will develop the ability to critically integrate findings from the literature and strengthen the skills needed to conduct original research in the related areas.

Max Credits: 3

Min Credits: 3

70.430 Typography III

Course ID: 38878

Course Details: This course is a continuation of Typography II. Students will expand on their understanding of typography including applications for print and web design. The course covers organization, systems, grids and form. Through readings, lectures and projects/critiques, students will be introduced to various theoretical approaches to the typographic page. They will study the different interactive structures and systems (book, web page/site) that hold and present typographic content.

Max Credits: 3
79.241 Art Serving Political, Religious, & Social Needs

Course ID: 7417

Course Details: This course studies cultural and artistic production for political, religious and social education aims. The objectives are to study the production of meaning in paintings and frescos, sculpture, stained glass, architecture and other art forms that were commissioned through the church and state patronage system; to analyze how these images are used to represent and define social order; how these images support the recording and interpretation of history and support the educational, inspirational, and propagandistic aims of church and state; and to introduce students to the visual and critical language of art produced at this time.

Max Credits: 3
Min Credits: 3

79.280 From Collective to Personal Aesthetics

Course ID: 38880

Course Details: This course is an exploration in aesthetics and culture. The seminar examines a variety of works by contemporary artists and designers; and also introduces important texts by philosophers, art theorists, and critics. Throughout the semester, student will study current trends in visual studies. They will examine a range of works form popular culture to high art and respond to various readings through class discussions and papers. In addition, the course will facilitate intellectual engagement with ones own visual work. Through their research, student will explore the connections between their work and that of other artists and designers. They will situate their artwork within the field of criticism, creating a bridge across the traditional divide between theory and practice.

Max Credits: 3
Min Credits: 3

81.769 Continued Graduate Research

Course ID: 7602

Course Details:

Max Credits: 9
Min Credits: 9

84.223 Organic Chemistry II B

Course ID: 7657

Course Details: The course covers the chemical and mechanistic principles of organic reactions utilized in biological systems. Spectroscopy, organic reactions and related mechanisms of bio-molecules or small molecules in biological systems will be discussed from a functional group perspective. Multiple examples from medicinal chemistry, chemical biology and biochemistry will be used to illustrate the concepts. Knowledge of organic mechanistic arrow-pushing formalism is required.

Max Credits: 3
Min Credits: 3

85.325 Weather Communications

Course ID: 38852

Course Details: An introduction to the field of weather communication. Topics will include the basic principles of communicating weather forecasts, television and radio broadcasting, written communication of weather, the use of social media applications, and applied forecasting techniques. Individual and group projects utilizing commercial broadcast facilities.

Max Credits: 3
Min Credits: 3

85.493 Internship: Atmospheric Science

Course ID: 38853
Course Details: Work experience with private or public employer. Written report and supervisor evaluation required.

Max Credits: 3
Min Credits: 1

**85.641 Special Topics in Meteorology**

Course ID: 7809

Course Details: Work experience with private or public employer. Written report and supervisor evaluation required.

Max Credits: 3
Min Credits: 3

**87.493 Internship: Environmental Studies**

Course ID: 38854

Course Details: Work experience with private or public employer. Written report and supervisor evaluation required.

Max Credits: 3
Min Credits: 1

**89.493 Internship: Environmental Geoscience**

Course ID: 38855

Course Details: Work experience with private or public employer. Written report and supervisor evaluation required.

Max Credits: 3
Min Credits: 1

**91.442 Natural Language Processing**

Course ID: 38884

Course Details: This course introduces principles and techniques behind natural language processing (NLP), and covers a large selection of important automatic text processing tasks. Selected topics include n-gram language models, part-of-speech tagging, statistical parsing, word sense disambiguation, discourse segmentation, information extraction, sentiment analysis, machine translation. Quantitative techniques are emphasized, with a focus on applying statistical models to large collections of text. The course provides students with a hands-on experience in building a substantial NLP application of their choice.

Max Credits: 3
Min Credits: 3

**92.232 Math Lab I**

Course ID: 31891

Course Details: An introduction to mathematics related software. Topics from Calculus & Differential Equations will be explored using a symbolic package like Maple. The course will also introduce LaTeX, the standard for typesetting mathematics.

Max Credits: 1
Min Credits: 1

**92.272 Introduction to Programming with MATLAB**

Course ID: 38929

Course Details: This course will introduce basic programming concepts using MATLAB as the programming environment. Topics include an introduction to MATLAB, array manipulation, graphics, script files, data input and output, relational and logical operators, conditional statements, loops, and iterative procedures. Additional topics will be discussed as time permits. Additional topics will be chosen from the following: finding roots of nonlinear equations, random number generation, Markov processes, simple statistics, interpolation, and the basics of Fourier analysis.
DGMD.100 Introduction to Digital Media

Course ID: 37736

Course Details: This foundational course is an introductory survey of the theory, history, structure, and function of mass communication in the United States.

DGMD.102 Introduction to Telecommunications

Course ID: 38656

Course Details: This is an introductory course in the field of journalism designed to introduce students to a survey of the radio and television industries, with an emphasis on their formation, growth, and change. The course examines the historical development of broadcasting as a vital component of American cultural identity, looking at the development of U.S. radio, television, and new media in the context of social and cultural change.

DGMD.231 Media, Law and Ethics

Course ID: 38516

Course Details: This course primarily is designed to explore key legal issues you are likely to confront as a journalist, mass media professional or student interested in learning more about the relationships between law, media and ethics in this global community. Nonetheless, you will be challenged to think critically about the applicability of those issues to individuals and to media institutions that transmit information via spoken communications, writing, traditional media, text messages, social network sites, or e-mail messages.

DGMD.300 Multimedia Storytelling

Course ID: 38225

Course Details: This course will facilitate a deeper understanding of the uses of online and multimedia communication technologies in a democratic society and the impact of such technologies on the way we communicate. The course will provide students with the opportunity to develop professional knowledge and skills with the tools used in online and multimedia creation. Students will develop a critical understanding of multiplatform and multimedia technologies and will learn how to use video, digital photography, audio, video, social networking and other new technologies.

DGMD.320 Documentary Photography

Course ID: 38227

Course Details: In a world of increasing manipulation, documentary photographs still astound us with their visual truths. In this course, students will utilize words and images "the primary tools of the photojournalist" to explore the significant issues of our time. Works by Fenton, O'Sullivan, Gardner, Riis, Hine, Bourke-White, Lang, Smith, Davidson, Salgado, Mark and others are studied for content, style, and inspiration.

DGMD.340 Lighting Principles
Course ID: 38877

Course Details: In this course students are going to understand the principles of lighting, its nature, its physical Characteristics, and its artistic role in media production. Class will have significant hands-on assignments and demonstrations beside theoretical background lectures. The concept will be developed based on a one-camera setting only. Students will work with light meters to guide their lighting schemes.

Max Credits: 3

Min Credits: 3

**DGMD.400 Directed Study in Journalism and Media Studies**

Course ID: 38224

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

**DGMD.410 TV Studio Production**

Course ID: 38651

Course Details: This course will offer you the opportunity to produce different types of live programs using digital technology. Plan, organise and direct TV studio-based broadcasting. Work effectively as part of a group. It provides a working knowledge of compositional, personal and organizational production skills in relation to the making of a live broadcast program using at least three cameras having in mind that you will cut/edit from a camera to another without stopping. It requires collaboration, teamwork and strict, organized structures. In most cases, it requires leadership. But for everybody, personal qualities such as determination, enthusiasm and persistence are almost essential. So too is engaged participation.

Max Credits: 3

Min Credits: 3

**05.592 Principalship: Practicum I**

Course ID: 30303

Course Details: The practicum is a two-semester (1+2=3 credits) 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), the Massachusetts Administrative Leadership Standards.

Max Credits: 1

Min Credits: 1

**22.542 Convective Heat/Mass Transfer**

Course ID: 3888


Max Credits: 3

Min Credits: 3

**42.435 Literary Journalism**

Course ID: 38582

Course Details: This course that looks at the genre of Literary Journalism, a largely American Innovation in literature that developed in the late 19th and 20th centuries. Students will closely read and discuss books and articles by literary journalists, seeking to understand the genesis and shifts of this hybridized form (literary techniques applied to true or fact-based stories), and the contributions literary journalism is making to literature, to documentary and witness narratives, to historical records, and to the notions of truth reportage.
Max Credits: 3
Min Credits: 3

47.375 Research III: Laboratory

Course ID: 5738
Course Details: An advanced course in which students design and carry out an empirical research project from start to finish, resulting in an individually written research report using APA style and an oral presentation. The primary goal is for students to experience discovery by completing an original study that reasonably extends the prior research literature. Topics may vary, reflecting the interests of the instructor. Students will perform literature reviews; formulate a research question; operationalize variables; develop research designs; obtained ethical review and approval; and collect, analyze, and interpret data. Students will also demonstrate knowledge of the research process in assessments that may include assignments, quizzes, or exams.

Max Credits: 3
Min Credits: 3

60.761 Empirical Financial Accounting Research I

Course ID: 38567
Course Details: This is part I of a two part doctoral seminar in Empirical Financial Accounting Research. This course introduces and develops a broad understanding of empirical accounting research in financial reporting. The intent is to provide an overview of archival research and an in-depth analysis of current financial accounting research. This course will focus on the types of questions and innovative methods accounting academics are currently pursuing and developing.

Max Credits: 3
Min Credits: 3

60.762 Empirical Financial Accounting Research II

Course ID: 39045
Course Details: This is part II of a two part doctoral seminar in Empirical Financial Accounting Research. This course introduces and develops a broad understanding of empirical accounting research in financial reporting. The intent is to provide an overview of archival research and an in-depth analysis of current financial accounting research. This course will focus on the types of questions and innovative methods accounting academics are currently pursuing and developing.

Max Credits: 3
Min Credits: 3

64.743 Seminar in Innovation and New Product Development

Course ID: 39044
Course Details: This seminar is on the progress of the scholarly research on innovation and new product development. Topics include: types, drivers, and outcomes of innovation; new product development processes, how innovations and new products can help an organization develop a sustainable competitive advantage.

Max Credits: 3
Min Credits: 3

66.745 Seminar in Organization Theory

Course ID: 39043
Course Details: This course focuses on the theories that explain the manner in which organizations form, behave, thrive, and decline. The course will draw from the contemporary literature in organization theory. Specific attention will be paid to the major school of thought including but not limited to classical management theory, bureaucracy, behavioral decision theory, contingency theory, resource dependence theory, population ecology theory, organizational economic theory, institutional theory, and network theory.

Max Credits: 3
Min Credits: 3
DGMD.400 Directed Study in Digital Media

Course ID: 38224

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