Research

Research is an important part of learning. The Solar Energy Engineering program offers exciting research in many areas:

- Solar coffee drying in Central America
- Building thermal efficiency test development; green building assessment
- First battery electric bus in the Northeast
- Fuel cell and electolyzer, hydrogen and oxygen storage systems development
- Fuel cell vehicle hydrogen storage comparisons
- Complex solar system design tool for reliability
- Solar lantern development
- Data acquisition systems for remote PV systems
- Thermoelectric, Phase-change vaccine refrigerator development
- Solar water purification
- Field testing of dye-sensitized solar modules
- Energy efficient aquaculture
- Remote sustainable infrastructure development

Service

Community service is also an important part of learning. Service-learning projects meeting local and interna-tional community needs are integrated into all the solar engineering courses, another unique feature of the program.

UMASS LOWELL

Francis College of
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Solar Energy Engineering

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Introduction

The graduate program in Solar Energy Engineering is designed to prepare students to perform state-of-the-art work on energy systems. It is one of the few solar engineering programs in the country, and is unique in its balance between hands-on experience and academics.

Most graduates of the program work for utilities, manufacturers, designers, research labs and government agencies.

Energy engineering involves subject matter and draws students from all branches of engineering, physics, mathematics, and economics.

The universal nature of the subject matter brings students to the program from all over the world.

Degrees Conferred

The program offers a Master of Science in Solar Energy Engineering.

Students wishing to earn a doctorate have two choices.

A Doctor of Engineering degree with Energy Concentration is available through the Mechanical Engineering Department.

A Doctor of Philosophy degree in Applied Physics with Energy Concentration is available through the Physics Department.

A Graduate Certificate in Energy Conservation is available through the Continuing Education Program.

Required Courses

The following courses are required for completion of the program:

Solar Energy Fundamentals (web-based, online)

Solar radiation in space and on the surface of the earth. Sunshape, intensity and flux: effect of location and orientation. Review of heat transfer. Opaque and transparent bodies. Characterization of solar collectors.

System Dynamics

Mathematics 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 thermo-fluid systems.

Energy Engineering Workshop

A group/individual design project. The design effort will integrate many aspect of the student's engineering background including design concepts, technical analyses, economics, etc. A formal report and oral presentation are required.

Solar Systems Engineering (web-based, online)

Thermal network modeling, passive design tools, photovoltaic system design, solar cooling, daylighting, fuel cells, and economics.

Advanced Transport Phenomena

An advanced study of the mechanism of momentum, heat and mass transfer. The equations of continuity, motion and energy are used to examine steady and unsteady state processes. Considerable emphasis is placed upon solutions to problems.

Related technical electives can be taken to supplement these required courses.

Some courses commonly taken by energy engineering students:

- Mathematical Methods of Engineering
- Energy and the Environment
- Environmental Laws
- Environmental Policy
- Convective Heat and Mass Transfer
- Conduction and Radiative Heat Transfer
- Manufacturing Systems
- Advanced Fluid Mechanics
- Control Systems
- Power Electronics
- Alternative Energy Systems
- Power Systems Analysis

Thesis

Participants in the program may elect to follow a thesis or non-thesis option.

The thesis option requires a minimum of 30 credit hours: 24 credit hours of course work plus six credit hours of thesis research.

The non-thesis option requires a minimum of 33 credit hours: 30 credit hours of course work plus three credit hours of project work.