Energy Systems Engineering

MASTER OF ENGINEERING IN ENERGY SYSTEMS ENGINEERING

For students with B.S. degrees in engineering, physics, computer science, mathematics, and related fields, Lehigh’s 10-month, 30-credit professional Master’s program in energy systems engineering helps students develop into organizational and technical leaders in the energy and power industries. Learning takes place in an environment where potential employers actively guide curricular development and student research endeavors. Graduates of this program emerge with the skills and confidence to tackle the grand challenges facing the global energy infrastructure and its associated effect on the environment.

The hallmark of the program is student immersion in hands-on, industry-driven projects. Each student will apply advanced technical knowledge and skills and work collaboratively with a team of faculty, fellow students, and representatives from sponsor firms to complete a project of impact and significance in the field — a real project as conceptualized by the project’s sponsoring researcher or industry concern. The development of targeted research projects serves as an entry point into the field for talented young innovators, and a source for firms to explore new skill sets and solutions required for success with emerging technologies and approaches.

The basic 30 credit hour course sequence consists of:

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESE Core Courses</td>
<td>12</td>
</tr>
<tr>
<td>ESE Technical Electives</td>
<td>12-15</td>
</tr>
<tr>
<td>ESE Industry Project</td>
<td>3-6</td>
</tr>
<tr>
<td>Total credits</td>
<td>30</td>
</tr>
</tbody>
</table>

Students typically begin this 10 month program in Summer Session II and will graduate spring of the following year with a Master of Engineering degree in energy systems engineering.

Further information can be obtained from:
www.lehigh.edu/esei
Program Director
Energy Systems Engineering Institute
P.C. Rossin College of Engineering & Applied Science
(610) 758-3529

Program Coordinator
Energy Systems Engineering Institute
P.C. Rossin College of Engineering and Applied Science
(610) 758-3650

Recommended sequence of courses in the ESE M.Eng. program
Summer Session II (Late June/August)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESE 403</td>
<td>3</td>
<td>Energy and Environment</td>
</tr>
<tr>
<td>ESE 405</td>
<td>3</td>
<td>Energy Systems Project Management</td>
</tr>
</tbody>
</table>

Total Credits: 6

Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESE 401</td>
<td>3</td>
<td>Energy Generation</td>
</tr>
<tr>
<td>ESE 460</td>
<td>3</td>
<td>Energy Systems Engineering Project</td>
</tr>
<tr>
<td>Electives (2)</td>
<td>6</td>
<td>Technical</td>
</tr>
</tbody>
</table>

Total Credits: 12

Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESE 402</td>
<td>3</td>
<td>Transmission and Distribution</td>
</tr>
<tr>
<td>ESE 460</td>
<td>3</td>
<td>Energy Systems Engineering Project</td>
</tr>
<tr>
<td>Electives (2)*</td>
<td>6</td>
<td>Technical</td>
</tr>
</tbody>
</table>

Total Credits: 12

*Student may choose to take a third technical elective instead of ESE 460 in the Spring semester with the approval of the program Director.

Students acquire a level of specialized knowledge and experience through the completion of four to five technical electives courses. The electives should reflect the student's career interest. Below is the list of departments from which the technical electives are drawn from. The full list of technical electives for each department listed below is available online at: www.lehigh.edu/esei/electives. Other electives may be considered with the approval of the program Director.

- Two (2) electives must be 400 level courses and
- Three (3) electives must be in the P.C. Rossin College of Engineering and Applied Science.

Technical Elective Department List:

**Engineering**
- Chemical Engineering
- Civil & Environmental Engineering
- Computer Science & Engineering
- Electrical & Computer Engineering
- Industrial & Systems Engineering
- Materials Science & Engineering
- Mechanical Engineering & Mechanics

**Business and Science**
- Chemistry
- Earth & Environmental Science
- Economics
- Environmental Studies
- International Relations
- Physics
- Political Science

**Courses**

**ESE 401 Energy Generation 3 Credits**
This course provides an overview of the different methods of generating electricity, such as turbine driven electrochemical generators, fuel cells, photovoltaics, and thermoelectric devices. Topics include the combustion of fossil fuels (coal, natural gas, and oil), nuclear fission and fusion, and renewable resources (solar, wind, hydro, tidal, and geothermal sources). Sustainability, energy efficiency issues, as well as public interest and policy drivers are also addressed.

**ESE 402 Transmission & Distribution: Smart Grid 3 Credits**
This course provides an overview of modern power transmission and distribution systems. Topics include transformer technology, transmission grids, load management, distribution optimization, power supply reliability, and infrastructure systems. Security and deregulation issues are also addressed.

**ESE 403 Energy And The Environment 3 Credits**
This course provides an overview of the direct and indirect impact of energy generation and transmission technologies on the environment. Topics include global climate change, clean energy technologies, energy conservation, air pollution, water resources, and nuclear waste issues.
ESE 405 Energy Systems Project Management 3 Credits
This course introduces students to the basics of project management in the field of energy systems, which includes the broad spectrum of empirical, theoretical and policy issues of managing the electric power grid, its generation facilities and equipment. This focuses on the key elements of case studies in engineering that focus on the effective project management of tomorrow's intelligent energy system.

ESE 460 Energy Systems Engineering Project 3-6 Credits
A collaborative and intensive study in an area of energysystems engineering, with an emphasis on direct industrial applications. A written report plus a poster presentation or oral presentation is required. Students typically begin this 10 month program in SummerSession II and will graduate spring of the following year with a Master of Engineering degree in energy systems engineering.