Energy Systems Engineering

MASTER OF ENGINEERING IN ENERGY SYSTEMS ENGINEERING

For students with B.S. degrees in engineering, physics, computer science, mathematics, business, finance and related fields, Lehigh's 30-credit professional Master's program in Energy Systems Engineering helps students develop into organizational and technical leaders in the energy and power industries. Full-time students complete the program in 10 months, part-time students will complete in up to 3 years. 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:

ESE Core Courses	18
ESE Technical Electives	6
ESE Industry Project	6
Total credits	30

Full-time 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:
https://ese.lehigh.edu

Program Director
Energy Systems Engineering
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Recommended sequence of courses in the ESE M.Eng. program

Summer Session II (Late June/August)

Summer		Credits
ESE 403	Energy and the Environment	3
ESE 405	Energy Systems Project Management	3
Total Credits: 6		

Fall Semester

Fall		Credits
ESE 401	Energy Generation	3
ESE 460	Energy Systems Engineering Project	3
Technical Electives (2)		**6**
Total Credits: 12		

Spring Semester

Spring		Credits
ESE 402	Transmission and Distribution	3
ESE 460	Energy Systems Engineering Project *	3
Technical Electives (2)*		**6**
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 (http://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 energy systems over 2 semesters on an industry-sponsored project worth 6 credits. The selected project consider themes of current interest: the use of renewable energy, and efficient planning and development of energy communities to reduce carbon footprint. The student applies principles of energy project management in the planning, execution and completion. The student presents their results at the end of each semester to an audience of peers, faculty & industry personnel.
Repeat Status: Course may be repeated.

ESE 461 Energy Seminars and Field Trips 3 Credits
This course provides a rich mix of presentations and field trips from industry experts in current energy technologies and challenges as the industry strives to decarbonize. The topics include the role of central generation facilities—the bulwark and working horse for over a century—over the next decade, how climate change targets would require decarbonizing some key industries and exploration of alternative clean fuels, and the role of the utility customer who is increasingly a partner of the modern grid.