

SUSTAINABLE ENERGY SYSTEMS MINOR

College of Engineering

Program Website (<https://www.engineering.cornell.edu/cbe/minor/>)

Program Description

Providing affordable energy to meet the demands of both developed and developing nations without further damaging the natural environment and the Earth's climate system is a grand challenge for the 21st century. Our quality of life and the stability of nations ultimately depend on having accessible energy resources and an equitable and sustainable energy supply and distribution system. Achievement of these goals requires the participation, ingenuity, and hard work of people with a range of specialized backgrounds, working collaboratively. The minor is intended to emphasize the importance of viewing the challenge of meeting the world's energy needs as a system of interacting themes. The requirements of the minor are designed to provide breadth across a range of energy resource types and conversion, transmission and storage technologies along with coverage of the environmental, economic, political, and social consequences of various options.

Individual faculty members in most units in the College of Engineering are involved in research and education intended to move society toward more sustainable solutions to our energy needs and are sources of guidance to students interested in the Energy minor. Many of these faculty members are in the College of Engineering. The minor is open to all undergraduate students.

Academic Standards

- At least C– in each course or, for S–U only courses, S.

Minor Requirements

- Six courses and a minimum of 18 credits; at least 2 credits in each category, category 2 requires 3 credits
- At least two courses (together totaling no less than 3 credits) in category 2: Energy Sources and Technologies for a Transition to Sustainability
- At most two courses may be specific requirements in the student's major; not a course decided on, like an elective, this restriction applies when everyone in the major must complete the course
- At least one course from each of the breadth categories

Breadth Categories

Courses satisfying each of the breadth categories:

Energy Systems Analysis

Code	Title	Hours
CEE 4210	Renewable Energy Systems	3
CHEME 6660	Analysis of Sustainable Energy Systems	2
MAE 5010	Future Energy Systems	3

Energy Sources and Technologies for a Transition to Sustainability

Code	Title	Hours
AEP 5500	Applied Solid State: Physics of Renewable Energy	3
BEE 2510	Engineering Processes for Environmental Sustainability (crosslisted)	3
or ENGRD 2510	Engineering Processes for Environmental Sustainability	
BEE 4880	Applied Modeling and Simulation for Renewable Energy Systems (crosslisted)	3
CEE 3410	Introduction to Geotechnical Engineering	4
CEE 5420	Energy Technologies and Subsurface Resources	3
CEE 6200	Managing Water Resources in a Changing World	3
CHEME 6661	Bioenergy and Biofuels Module	1
CHEME 6662	Solar Energy Module	1
CHEME 6663	Geothermal Energy Module	1
CHEME 6664	Hydrokinetic and Aerodynamic Energy Module (crosslisted)	1
or CEE 6364	Hydrokinetic and Aerodynamic Energy Module	
CHEME 6667	Transportation Energy Systems Module (crosslisted)	1
or CEE 6667	Transportation Energy Systems Module	
CHEME 6670	Fossil Fuels Module	1
CHEME 6671	Nuclear Energy Module	1
CHEME 6679	Energy Storage Module	1
CHEME 6681	Energy Analysis Project	1
EAS 4010	Fundamentals of Energy and Mineral Resources	3
EAS 3450	Environmental Geophysics	3
EAS 4370	Field Geophysics	3
ECE 4130	Introduction to Nuclear Science and Engineering (crosslisted)	3
or AEP 4130	Introduction to Nuclear Science and Engineering	
or CHEME 4130	Introduction to Nuclear Science and Engineering	
or MAE 4580	Introduction to Nuclear Science and Engineering	
ECE 4840	Introduction to Controlled Fusion: Principles and Technology (crosslisted)	3
or MAE 4590	Introduction to Controlled Fusion: Principles and Technology	
ECE 4510	Electric Power Systems I	3
ECE 4520	Power Systems and Market Operations	3
Select one of the following:		1
ECE 5870	Energy Seminar I (crosslisted)	1
or CHEME 5870	Energy Seminar I	
or MAE 5459	Energy Seminar I	
ECE 5880	Energy Seminar II (crosslisted)	1
or BEE 5469	Energy Seminar II	
or CHEME 5880	Energy Seminar II	
or MAE 5469	Energy Seminar II	
MAE 4020	Wind Power	3
MAE 4120	(crosslisted)	3
or EAS 4120		
MAE 5430	Combustion Processes	3
MAE 6350	Wave Interactions with Offshore Systems	4

SYSEN 5100	Model Based Systems Engineering (crosslisted)	4
SYSEN 5200	Systems Analysis Behavior and Optimization	3
or CEE 5252	Systems Analysis Behavior and Optimization	
or ECE 5130	Systems Analysis Behavior and Optimization	
or MAE 5920	Systems Analysis Behavior and Optimization	
or ORIE 5142	Systems Analysis Behavior and Optimization	

NTRES 2320		3
SYSEN 5170	Energy Policies for Systems Transition	3

Natural Systems Impacted by Energy Production and Use

Code	Title	Hours
BEE 3710	Physical Hydrology for Ecosystems	3
BEE 4800	Atmospheric Chemistry: From Air Pollution to Global Change (crosslisted)	3
BEE 6740	Ecohydrology	3
BIOEE/NTRES 4560	Stream Ecology	4
CEE 1165	Climate Change and You, the Engineer	3
EAS 2250	The Earth System (crosslisted)	4
EAS/NTRES 3030	Introduction to Biogeochemistry	4
EAS 3050	Climate Dynamics	3
EAS 3530	Physical Oceanography	3
EAS 3880	Global Geophysics	3
EAS 4443	Global Climate Change Science and Policy (crosslisted)	3
EAS 4570	Atmospheric Air Pollution	3
EAS 6480	(crosslisted)	3
MAE 6480	(crosslisted)	3
PLSCI 2400	Green World, Blue Planet	3

Policy/Economics/Business/History/Ethics/Risk Analysis

Code	Title	Hours
AEM 2770	Excursions in Computational Sustainability (crosslisted)	3
AEM 4510	Environmental Economics (crosslisted)	3
AEM 4515	(crosslisted)	3
BEE 2510	Engineering Processes for Environmental Sustainability (crosslisted)	3
BEE 3299	Sustainable Development	3
BSOC 2061	Ethics and the Environment (crosslisted)	4
BSOC 3181	Living in an Uncertain World: Science, Technology, and Risk (crosslisted)	4
CEE 3230	Engineering Economics and Management (crosslisted)	3
CEE 5970	Risk Analysis and Management (crosslisted)	3
CHEME 6667	Transportation Energy Systems Module (crosslisted)	1
CHEME 6676	Energy Markets and Regulations Module	1
GDEV 3240	Environmental Sociology (crosslisted)	3
EAS 4443	Global Climate Change Science and Policy (crosslisted)	3
ENGRG 3600	Ethical Issues in Engineering Practice (crosslisted)	3

Graduation Requirements for Engineering Minor Degree Programs

Requirements

Students may pursue minors in any department in any college that offers them, subject to limitations placed by the department offering the minor or by the students' major. Completed minors will appear on the student's transcript. Not all departments offer minors. Additional information on specific minors can be found above, in the *Engineering Undergraduate Handbook*, in the undergraduate major office of the department or school offering the minor, and in Engineering Advising.

An engineering minor recognizes formal study of a particular subject area in engineering normally outside the major. Students undertaking a minor are expected to complete the requirements during the time of their continuous undergraduate enrollment at Cornell. Completing the requirements for an engineering minor (along with a major) may require more than the traditional eight semesters at Cornell. However, courses that fulfill minor requirements may also satisfy other degree requirements (e.g., distribution courses, advisor-approved, or major-approved electives), and completion within eight semesters is possible.

An engineering minor requires:

- successful completion of all requirements for an undergraduate degree.
- enrollment in a major that approves participation in the minor.
- satisfactory completion of six courses (at least 18 credits) in a college-approved minor.

Students may apply for certification of a minor at any time after the required course work has been completed in accordance with published standards. An official notation of certification of a minor appears on the Cornell transcript following graduation.