

# ENGINEERING FOR ENERGY SUSTAINABILITY, CERTIFICATE

Equity and sustainability of energy resources in the face of increasing global population and economic development are key issues at the center of the public discourse today. The objective of this certificate program is to offer undergraduate students a suite of courses addressing energy sustainability. The courses span across the engineering curriculum, with firm roots in real-world design and engineering practices.

Students enrolled as degree-seeking undergraduates with a plan of study to fulfill the certificate requirements may enroll in the program. Applications may be submitted at any time, but students are encouraged to apply early in their undergraduate careers in order to ensure successful completion of the program; however, students may take courses that fulfill certificate requirements before submitting an application.

## HOW TO GET IN

### DECLARING THE CERTIFICATE

A student who is interested in declaring the certificate must complete an online application form ([https://uwmadison.co1.qualtrics.com/jfe/form/SV\\_e3cK4U4xkli9oLX/](https://uwmadison.co1.qualtrics.com/jfe/form/SV_e3cK4U4xkli9oLX/)). The application form requires students to fill out a tentative study plan for completing the certificate requirements.

- Certificate Application Form ([https://uwmadison.co1.qualtrics.com/jfe/form/SV\\_e3cK4U4xkli9oLX/](https://uwmadison.co1.qualtrics.com/jfe/form/SV_e3cK4U4xkli9oLX/))

Prior to completing the application form, students should either schedule a meeting with the certificate advisor/coordinator or complete an online orientation ([https://uwmadison.co1.qualtrics.com/jfe/form/SV\\_OVAuEcR28ZnTyB/](https://uwmadison.co1.qualtrics.com/jfe/form/SV_OVAuEcR28ZnTyB/)) involving a short series of videos and accompanying questions.

Applications may be submitted at any time, but students are encouraged to apply early in their undergraduate careers in order to ensure successful completion of the program. Engineering students must meet progression requirements in their selected major before the certificate can be added to their record.

## REQUIREMENTS

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#### TOTAL CREDITS REQUIRED FOR CERTIFICATE COMPLETION: MINIMUM OF 16

- Minimum of 6 credits required in Liberal Studies and Science category (including one foundational course option)
- Minimum of 6 credits required in Engineering category (including one foundational course option)

- Additional 3 credits from either category above, or students may substitute an applied course such as senior capstone or independent study (with approval). See note under the Capstone heading below.
- 1 credit required in Seminar category
- Grade point average of 2.5 or above for all coursework that counts for the certificate

#### Liberal Studies and Science (Minimum of 6 credits)

Code	Title	Credits
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#### Liberal Studies and Science Foundational Courses 3

A A E 246	Climate Change Economics and Policy	
A A E/ECON 371	Energy, Resources and Economics	
ENVIR ST 349	Climate Change Governance	
ENVIR ST/ GEOSCI 411	Energy Resources	
ENVIR ST/ A A E/ECON/ URB R PL 671	Energy Economics	
PHYSICS 115	Energy and Climate	

#### Any Liberal Studies and Science Foundational course from above or 3

#### Electives:

ENVIR ST 112	Environmental Studies: Social Science Perspectives	
ENVIR ST 113	Environmental Studies: Environmental Humanities	
ENVIR ST/ILS 126	Principles of Environmental Science	
ENVIR ST/ GEOG 139	Global Environmental Issues	
ENVIR ST/ A A E 244	The Environment and the Global Economy	
ENVIR ST/ GEOG 339	Environmental Conservation	
ENVIR ST/A A E/ ECON 343	Environmental Economics	
ENVIR ST/ ATM OCN 355	Introduction to Air Quality	
ENVIR ST/GEOG/ HISTORY 460	American Environmental History	

#### Engineering (Minimum of 6 credits)

Code	Title	Credits
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#### Engineering Foundational Courses 3

BSE/ ENVIR ST 367	Renewable Energy Systems	
CBE 512	Energy Technologies and Sustainability	
E C E 356	Electric Power Processing for Alternative Energy Systems	
M E/N E 565	Power Plant Technology	

#### Any Engineering Foundational course from above or 3

#### Electives:

BSE 460	Biorefining: Energy and Products from Renewable Resources	
CBE/M E 567	Solar Energy Technology	

CIV ENGR/ G L E 421	Environmental Sustainability Engineering
CIV ENGR/ G L E 535	Wind Energy Balance-of-Plant Design
E C E 427	Electric Power Systems
M E 461	Thermal Systems Modeling
M E 466	Air Pollution Effects, Measurements and Control
or CIV ENGR 42	Air Pollution Effects, Measurement and Control
N E 571	Economic and Environmental Aspects of Nuclear Energy

### Seminar (1 credit)

Code	Title	Credits
E P 418	Sustainable Energy Challenges and Solutions	1
CBE 555	Seminar-Chemical Engineering Connections	1

### Capstone (optional 3 credits)

Students may request to count no more than 3 credits of applied coursework toward the 16-credit total through an optional Capstone course. This course must be approved by the certificate's faculty chair in consultation with the certificate's oversight committee. Students must submit a description of their course project, demonstrating application of at least one of the certificate's learning outcomes. Details of the project will be verified with the course instructor. Courses that may qualify include:

- Senior Design Project or Capstone
- Independent Study
- Honors Thesis

To submit a Capstone course request, complete this online course substitution form ([https://uwmadison.co1.qualtrics.com/jfe/form/SV\\_9tYyECXdGTWBas5/](https://uwmadison.co1.qualtrics.com/jfe/form/SV_9tYyECXdGTWBas5/)). Course substitution requests may be submitted any time, but should be submitted as early as possible once there are sufficient details (such as a course syllabus or a project description) that demonstrate how the course or project aligns with the certificate's learning outcomes.

- COURSE SUBSTITUTION FORM ([HTTPS://UWMADISON.CO1.QUALTRICS.COM/JFE/FORM/SV\\_9TYECCXDGTWBAS5/](https://uwmadison.co1.qualtrics.com/jfe/form/SV_9tYyECXdGTWBas5/))

## CERTIFICATE COMPLETION REQUIREMENT

This undergraduate certificate must be completed concurrently with the student's undergraduate degree. Students cannot delay degree completion to complete the certificate.

## LEARNING OUTCOMES

1. Understand the physical properties and processes related to energy resources and the conversion technologies involved.

2. Understand how energy decisions are impacted by environmental, social, economic or political factors.
3. Synthesize knowledge of the technical/physical aspects of energy with the social/environmental factors to analyze how energy choices impact the sustainability of energy systems.
4. Apply interdisciplinary energy knowledge to analyze, design or solve a matter of real world significance related to sustainability of energy use.