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 minimum GPA of 2.5 and 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 interested in completing the certificate program must contact a designated faculty member in the major department to apply. The student and faculty member must complete a Declaration of Intent and Study Plan to enter the certificate program.


See the People (http://guide.wisc.edu/undergraduate/engineering/engineering-physics/engineering-energy-sustainability-certificate/#peopletext) tab to find your designated faculty contact.

When the student and faculty member have filled out and signed the Declaration of Intent and Study Plan, the student must hand them in to Room 2150 Wisconsin Energy Institute.

### REQUIREMENTS

#### REQUIREMENTS

Students must select 16 “sustainability credits” from a suite of available courses that are divided into the following categories:

- Liberal Studies and Science (Minimum of 3, maximum of 6 sustainability credits)
- Engineering (Minimum of 3, maximum of 6 sustainability credits)
- Capstone (Minimum of 3, maximum of 6 sustainability credits)
- Seminar (1 sustainability credit required)

The seminar requirement is fulfilled through the course CBE 555 Seminar-Chemical Engineering Connections, or E P 602 Special Topics in Engineering Physics (Sustainable Energy Challenges and Solutions), both of which are open to all engineering majors.

Not all courses have the same number of sustainability credits as academic credits; some courses have fewer sustainability credits depending on how closely related they are to energy and sustainability. Students should review the sustainability credits associated with each course while filling out their study plan.

#### PRE-APPROVED COURSES

**Liberal Studies and Science**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A A E 246</td>
<td>Climate Change Economics and Policy</td>
<td>3</td>
</tr>
<tr>
<td>ENVR ST 112</td>
<td>Environmental Studies: The Social Perspective</td>
<td>3</td>
</tr>
<tr>
<td>ENVR ST 113</td>
<td>Environmental Studies: The Humanistic Perspective</td>
<td>3</td>
</tr>
<tr>
<td>ENVR ST/GEOG 139</td>
<td>Global Environmental Issues</td>
<td>3</td>
</tr>
<tr>
<td>ENVR ST/A A E 244</td>
<td>The Environment and the Global Economy</td>
<td>4</td>
</tr>
<tr>
<td>ENVR ST 250</td>
<td>Introduction to Sustainability Science</td>
<td>3</td>
</tr>
<tr>
<td>ENVR ST/GEOG 339</td>
<td>Environmental Conservation</td>
<td>4</td>
</tr>
<tr>
<td>ENVR ST/A A E/ ECON 343</td>
<td>Environmental Economics</td>
<td>3-4</td>
</tr>
<tr>
<td>ENVR ST/ GEOSCI 411</td>
<td>Energy Resources</td>
<td>3</td>
</tr>
<tr>
<td>ENVR ST/GEOSCI/HISTORY 460</td>
<td>American Environmental History</td>
<td>4</td>
</tr>
<tr>
<td>ENVR ST/A A E/CIV ENGR/URB R PL 561</td>
<td>Energy Markets</td>
<td>3</td>
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</tbody>
</table>

**Engineering**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BSE/DS/LAND ARC 356</td>
<td>Sustainable Residential Construction</td>
<td>3</td>
</tr>
<tr>
<td>BSE/ENVR ST 367</td>
<td>Renewable Energy Systems</td>
<td>3</td>
</tr>
<tr>
<td>BSE 460</td>
<td>Biorefining: Energy and Products from Renewable Resources</td>
<td>3</td>
</tr>
<tr>
<td>BSE 461</td>
<td>Food and Bioprocessing Operations</td>
<td>3</td>
</tr>
<tr>
<td>CBE 250</td>
<td>Process Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>CBE 310</td>
<td>Chemical Process Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CBE 311</td>
<td>Thermodynamics of Mixtures</td>
<td>3</td>
</tr>
<tr>
<td>CBE 326</td>
<td>Momentum and Heat Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>CBE 430</td>
<td>Chemical Kinetics and Reactor Design</td>
<td>3</td>
</tr>
<tr>
<td>CBE 450</td>
<td>Process Design</td>
<td>3</td>
</tr>
</tbody>
</table>
COURSE AUTHORIZATION

Some courses may require additional approval to appear in students’ DARS reports as having fulfilled part of the certificate requirements. Students who are taking a course for the capstone requirement must fill out this DARS Authorization Form (https://uwmadison.co1.qualtrics.com/jfe/form/SV_bpFYQVNCk4OuOgl) to receive the proper number of sustainability credits. For more information on obtaining credits for capstone courses, see Capstone Course Guidelines (http://energy.wisc.edu/education/energy-certificate/capstone-guidelines).

In addition, students who wish to receive sustainability credits for courses that are not currently on the pre-approved list may also complete the DARS Authorization Form (https://uwmadison.co1.qualtrics.com/jfe/form/SV_bpFYQVNCk4OuOgl) and explain why the course should receive sustainability credits.

Once a form is filled out, it will be sent to the certificate faculty committee for approval. To expedite the approval process, students should submit their DARS Authorization Form (https://uwmadison.co1.qualtrics.com/jfe/form/SV_bpFYQVNCk4OuOgl) before or near the beginning of the semester in which they plan to take the course.

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.

PEOPLE

The following faculty members have been designated as a point of contact for each department:

- Troy Runge (https://energy.wisc.edu/about/energy-experts/troy-runge), Biological Systems Engineering
- Robert G. Radwin (http://www.engr.wisc.edu/bme/faculty/radwin_robert.html), Biomedical Engineering
- Thatcher Root (https://energy.wisc.edu/about/energy-experts/thatcher-root), Chemical and Biological Engineering
- Andrea Hicks (https://energy.wisc.edu/about/energy-experts/andrea-hicks), Civil and Environmental Engineering
- Giri Venkataramanan (https://energy.wisc.edu/about/energy-experts/giri-venkataramanan), Electrical and Computer Engineering
- James Tinjum (https://energy.wisc.edu/about/energy-experts/james-tinjum), Geological Engineering
- Amanda Smith (https://directory.engr.wisc.edu/ie/Faculty/Smith_Amanda), Industrial and Systems Engineering
• Dane Morgan (https://energy.wisc.edu/about/energy-experts/dane-morgan), Materials Science and Engineering
• Sage Kokjohn (https://energy.wisc.edu/about/energy-experts/sage-kokjohn), Mechanical Engineering
• P (https://directory.engr.wisc.edu/ep/Faculty/Wilson_Paul)aul Wilson (https://energy.wisc.edu/about/energy-experts/paul-wilson), Nuclear Engineering, Engineering Mechanics, and Engineering Physics

Students who are not engineering majors should contact Scott Williams (spwilliams@wisc.edu) to discuss options for completing the certificate or alternative programs.

ENGINEERING PHYSICS DEPARTMENT

PROFESSORS
Henderson (chair)
Blanchard
Bonazza
Bronkhorst
Crone
Fonck
Hegna
Lakes
Schmitz
Smith (also Mathematics)
Sovinec
Waleffe (also Mathematics)
Wilson

ASSOCIATE PROFESSORS
M. Allen
Witt

ASSISTANT PROFESSORS
Choy
Couet
Franck
Geiger
Notbohm
Thevamaran

See department website (https://directory.engr.wisc.edu/display.php?faculty/?page=ep&search=faculty) for list.