

# ENERGY, MINOR

## Energy Minor

Energy touches all aspects of the human experience and is central to nearly every global challenge the world faces today, from raising the standards of living around the world to the existential threat of climate change. The scientific basis of energy is inherently multidisciplinary, and social and behavioral sciences are also crucial to understanding the economics and policy driving technology adoption. The Energy minor program addresses the growing need for trained engineers and scientists in the many sectors that develop, manage, and propagate these technologies.

The Energy minor is jointly administered by the Department of Earth and Planetary Sciences in the Krieger School of Arts and Sciences and the Department of Electrical and Computer Engineering in the Whiting School of Engineering and is affiliated with the Ralph O'Connor Sustainable Energy Institute (ROSEI, <https://energyinstitute.jhu.edu/>) which provides additional support and co-curricular opportunities to students in the program. If you have questions regarding the minor, please direct them to Professor Susanna Thon at [susanna.thon@jhu.edu](mailto:susanna.thon@jhu.edu).

## Energy Minor Requirements

The Energy minor is designed to allow students majoring in a diverse set of disciplines to develop additional expertise in energy and to position them to become leaders in the energy field, either directly as entering professionals in industry, government laboratories, and other organizations, or as students in the best graduate programs. It consists of 26-29 credits of energy-related courses in four areas: (a) pre-requisite courses, (b) fundamentals, (c) science and policy context, and (d) technical energy electives. There are two options for completing the fundamentals. Option I is recommended for students completing a major that does not require a thermodynamics course. Option II is recommended for students completing a major that requires a thermodynamics course. Students are encouraged to select electives to fit their particular interests and career goals.

Elective courses that can count toward the minor are those focused on science and policy issues related to energy and relevant technical skills and knowledge areas. The joint KSAS and WSE Directors of Undergraduate Studies (DUS) distribute a list of approved courses for the minor each semester, and these courses are denoted with the POS tags ENGY-SCIPOLE and ENGY-TECH in the Schedule of Classes. Approval for other appropriate courses can be sought by emailing one of the DUS's. All courses must be taken for a letter grade, and students must earn a grade of C- or better to apply the course to the minor. Consult the Energy minor's website for additional information: <https://energyinstitute.jhu.edu/energy-minor/> ([https://energyinstitute.jhu.edu/?page\\_id=5385&preview=true](https://energyinstitute.jhu.edu/?page_id=5385&preview=true)).

### Minor Requirements

Code	Title	Credits
<b>Pre-Requisites</b>		
AS.110.106	Calculus I (Biology and Social Sciences)	4
or AS.110.108	Calculus I (Physical Sciences & Engineering)	
AS.171.101	General Physics: Physical Science Major I	4
or AS.171.103	General Physics I for Biological Science Majors	
or AS.171.105	Classical Mechanics I	
or AS.171.107	General Physics for Physical Sciences Majors (AL)	

AS.173.111	General Physics Laboratory I	1
or AS.173.115	Classical Mechanics Laboratory	

### Fundamentals: Option I \*

EN.520.370	Introduction to Renewable Energy Engineering	3
AS.171.102	General Physics: Physical Science Major II **	4
or AS.171.104	General Physics/Biology Majors II	
or AS.171.106	Electricity and Magnetism I	
or AS.171.108	General Physics for Physical Science Majors (AL)	

AS.173.112	General Physics Laboratory II **	1
or EN.560.112	Electromagnetism & Sensors Lab	

### Fundamentals: Option II \*

EN.520.370	Introduction to Renewable Energy Engineering	3
AS.030.301	Physical Chemistry I	2-4
or AS.171.312	Statistical Physics/Thermodynamics	
or AS.250.372	Biophysical Chemistry	
or EN.510.312	Thermodynamics/Materials	
or EN.530.231	Mechanical Engineering Thermodynamics	
or EN.540.203	Engineering Thermodynamics	
or EN.580.241	Statistical Physics	

### Science and Policy Context Electives

Complete a minimum of 6 credits of approved electives with the ENGY-SCIPOLE POS-Tag	6
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### Technical Energy Electives

Complete a minimum of 6 credits of approved electives with the ENGY-TECH POS-Tag	6
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<b>Total Credits</b>	<b>27-29</b>
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\* Students complete either (1) Fundamentals: Option I or (2) Fundamentals: Option II.

\*\* Courses must be taken at Johns Hopkins. Exam credits and waivers cannot be used to satisfy the requirements.

### Sample Programs of Study

Students majoring in a natural science discipline who do Option I of the fundamentals may follow a curriculum similar to the following:

Course	Title	Credits
<b>First Year</b>		
<b>Fall</b>		
AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.171.101	General Physics: Physical Science Major I	4
AS.173.111	General Physics Laboratory I	1
<b>Credits</b>		<b>9</b>
<b>Spring</b>		
AS.171.102	General Physics: Physical Science Major II	4
AS.173.112	General Physics Laboratory II	1
<b>Credits</b>		<b>5</b>
<b>Second Year</b>		
<b>Fall</b>		
EN.520.370	Introduction to Renewable Energy Engineering	3
<b>Credits</b>		<b>3</b>

**Third Year****Fall**

Policy elective (ENGY-SCIPOL)	3
<b>Credits</b>	<b>3</b>

**Spring**

Policy elective (ENGY-SCIPOL)	3
<b>Credits</b>	<b>3</b>

**Fourth Year****Fall**

Technical elective (ENGY-TECH)	3
<b>Credits</b>	<b>3</b>

**Spring**

Technical elective (ENGY-TECH)	3
<b>Credits</b>	<b>3</b>

<b>Total Credits</b>	<b>29</b>
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Students majoring in an engineering field who do Option II of the fundamentals may follow a curriculum similar to the following:

<b>Course</b>	<b>Title</b>	<b>Credits</b>
<b>First Year</b>		
<b>Fall</b>		
AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.171.101	General Physics: Physical Science Major I	4
AS.173.111	General Physics Laboratory I	1
	<b>Credits</b>	<b>9</b>
<b>Second Year</b>		
<b>Fall</b>		
EN.520.370	Introduction to Renewable Energy Engineering	3
	<b>Credits</b>	<b>3</b>
<b>Spring</b>		
EN.510.312	Thermodynamics/Materials	3
	<b>Credits</b>	<b>3</b>
<b>Third Year</b>		
<b>Fall</b>		
Policy elective (ENGY-SCIPOL)		3
	<b>Credits</b>	<b>3</b>
<b>Spring</b>		
Technical elective (ENGY-TECH)		3
	<b>Credits</b>	<b>3</b>
<b>Fourth Year</b>		
<b>Fall</b>		
Policy elective (ENGY-SCIPOL)		3
	<b>Credits</b>	<b>3</b>
<b>Spring</b>		
Technical elective (ENGY-TECH)		3
	<b>Credits</b>	<b>3</b>
	<b>Total Credits</b>	<b>27</b>