

# ENERGY & SUSTAINABILITY, MINOR

The minor in Energy and Sustainability provides students with broad coverage of technical and societal issues in energy and sustainability. It is designed to help students become leaders in developing technologies for a more sustainable energy future.

**For more information:** <http://www.seas.upenn.edu/undergraduate/degrees/minor-energy.php>

## SEAS Second Major or Minor Option

Students interested in a second major (College students only) or minor with SEAS are required to meet with the Undergraduate Curriculum Chair from the major/minor department you wish to declare to discuss requirements and obtain approval on the Second Major or Minor form. The approved form must be returned to the SEAS Research and Academic Services Office, 109 Towne Building.

**For more information:** <http://www.seas.upenn.edu/undergraduate/degrees/minors.php>

## Energy and Sustainability Minor (ENSU)

Students participating in the minor are expected to have taken at least one semester of intro chemistry, mathematics and physics.

Code	Title	Course Units
<b>Fundamental Engineering Science</b>		
<i>Engineering Thermodynamics</i>		
Select one of the following:		1
CBE 2300	Material and Energy Balances of Chemical Processes	
CBE 2310	Thermodynamics of Fluids <sup>1</sup>	
MEAM 2030	Thermodynamics I	
MSE 2600	Energetics of Macro and Nano-scale Materials	
<i>Basic Principles in Solid State Physics</i>		
MSE 2210	Quantum Physics of Materials	1
<b>Energy and Sustainability Renewable Energy</b>		
CBE 3250	Renewable Energy	1
<b>Energy and Sustainability Policy, Regulation and Societal Impact</b>		
Select one of the following:		1
EAS 3010	Climate Policy and Technology	
EAS 3060	Electricity and Systems Markets	
EAS 4010	Energy and Its Impacts: Technology, Environment, Economics, Sustainability	
EAS 4020	Renewable Energy and Its Impacts: Technology, Environment, Economics, Sustainability.	
EAS 4030	Energy Systems and Policy	
<b>Energy and Sustainability Electives</b>		
Select 2-3 course units of the following:		2-3
CBE 3750	Engineering and the Environment	

CBE 5450	Electrochemical Energy Conversion and Storage
CBE 5460	Fundamentals of Industrial Catalytic Processes
ENGR 2500	Energy Systems, Resources and Technology
ENGR 5030	Engineering in Oil, Gas and Coal, from Production to End Use
ESE 5210	The Physics of Solid State Energy Devices
MEAM 5030	Direct Energy Conversion: from Macro to Nano
MSE 5450	Materials for Energy and Environmental Sustainability
MEAM 5020	Energy Engineering in Power Plants and Transportation Systems

**Total Course Units** 6

1

Of the two CBE courses, CBE 2310 Thermodynamics of Fluids is preferred.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2023 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.