IOWA | Chemical and Biochemical Engineering

ENERGY AND ENVIRONMENT FOCUS AREA

Summary

The energy and environment focus area prepares students to address pressing challenges in clean energy, sustainability, environmental protection, and climate resilience. Through the application of chemical and biochemical engineering principles, students develop expertise in renewable and alternative energy systems, energy efficiency, air and water quality engineering, pollution prevention, sustainable process design, environmental monitoring, climate impact analysis, and data-driven modeling of atmospheric and energy systems. Coursework emphasizes green manufacturing, resource recovery, environmental compliance, and emerging clean-energy technologies. The ASCET certificate and environmental engineering minor provide additional interdisciplinary knowledge in climate science, energy systems, and sustainability. These pathways equip graduates to develop innovative solutions for renewable energy, environmental stewardship, and climate-focused technologies, preparing them for careers in clean energy, environmental consulting, sustainability engineering, regulatory compliance, environmental monitoring, and the advancement of technologies that protect both human and ecological health.

Focus Area Requirements

In addition to the core chemical engineering requirements, you must choose a focus area and complete 12 s.h. toward that focus area. ***Within this focus area there are multiple options to earn a certificate or minor.*** If you feel another course would fit within this requirement, you must get approval from the department undergraduate director to have it count.

Applied Climate Science and Energy Technologies (ACSET) Certificate Earned

This certificate requires 18 s.h. of courses. These courses can fall within the chemical engineering degree by fulfilling the 12 s.h. of focus area electives, 3 s.h. of the statistics elective, and 3 s.h. (out of 9 s.h.) of the general education electives. See certificate for details. Below are recommended courses to complete the certificate without additional credit hours needed. To discuss alternative possible routes for this certificate, please see your advisor.

Required Statistical Elective 3 s.h. (does not count toward focus area electives but is needed for certificate)

Offered	Course	s.h.
S	CBE:3020 Applied Statistics for Chemical and Natural Resources Engineering	3

Required Focus Area Elective 6 s.h.

Offered	Course	s.h.
S/F	CBE:2050 Severe and Unusual Weather	3
S-ODD	CBE:3405 Green Chemical and Energy Technologies (recommended)	3

Focus Area Electives 6 s.h. (pick at least one class from each of the following categories)

Energy Technology and Climate Impacts/Solutions Courses

Offered	Course	s.h.
S	CBE:2040 Environment, Energy, and Climate Change (recommended)	3
ALL	CEE:4180 Fundamentals of Atmospheric Science	3

Analytical, Statistical, and Applied Courses

Offered	Course	s.h.
S	CBE:4410/CEE:4107 Sustainable Systems	3
S	CBE:4459/CEE:4159/IGPI:4159 Air Pollution Control Technology	3
F	CBE:4460 Process and Design for Satellites and Environmental Sensors (recommended)	3
S-EVEN	CBE:5410 Electrochemical Engineering (recommended)	3
S-EVEN	CBE:5425/CEE:5115 Atmospheric Chemistry and Physics (recommended)	3
ALL	CBE:5412 Atmospheric Modeling (recommended)	3
F-EVEN	CBE:5415/IGPI:5415 Satellite Image Processing and Remote Sensing of Atmosphere	3
S-ODD	CBE:5417/CEE:5417/IGPI:5417 Physical Meteorology and Atmospheric Radiative Transfer	3
S	CEE:5310/IGPI:5311/URP:5310 Informatics for Sustainable Systems	3
F	ME:4048 Energy Systems Design	3

Other (pick at least one from courses listed below or a second course from lists above)

Offered	Course	s.h.
F/S	BAIS:3200 Database Management	3
F/S	BAIS:3500 Data Mining	3
F/S	BAIS:4150 Business Analytics and Information Systems Capstone	3
F/S	CPH:1600 Public Health Science: Inquiry and Investigation in Public Health	3
S	CPH:2220 Building a Healthier Tomorrow: Public Health Methods to Minimize Disease and Pollutant Exposures	3
F-ODD	CPH:4200 Agriculture, Food Systems, and Sustainability	3
F/S	ENGR:2730 Computers in Engineering	3
F/S	SEES:2050 Foundations of GIS	3
S-EVEN	SEES:2310 Introduction to Climatology	3
F	SEES:3320 Earth's Climate System	3
S-EVEN	SEES:4720 Paleoclimatology	3

Required General Education Elective 3 s.h. (does not count toward focus area electives but need one for certificate)

Offered	Course	s.h.
S-EVEN	MKTG:4250 Marketing and Sustainability	3
S	ECON:3625/URP:3135 Environmental and Natural Resource Economics	3

Other Electives that Align with this Focus Area

In addition to the focus area electives listed above, you will be required to take the following electives to complete your degree: the Advanced Chemistry Elective (3 s.h.), the Advanced Chemistry Lab Elective, the Advanced Science Elective (3 s.h.), the Statistics Elective (3 s.h.), a free elective (3 s.h.), the Engineering Be Creative General Education Elective (3 s.h.), the Cultural Perspectives, Values, & Society General Education Elective (3 s.h.), and additional general education requirements (9 s.h.). ***These do not count toward your focus area electives.*** Below are lists of possible courses to fulfill these requirements that align with this focus area.

Advanced Chemistry Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
F - EVEN	CHEM:4873 Atmospheric and Environmental Chemistry	3
ALL	CHEM 3000+ level	3

Advanced Chemistry Lab Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
F/S	CHEM:2021 Fundamentals of Chemical Measurements Lab	3
F/S	CHEM:2220 Organic Chemistry Lab	3
S	CHEM:2240 Organic Chemistry for Majors Lab	3

Advanced Science Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
S-EVEN	CBE:5425/CEE:5115 Atmospheric Chemistry and Physics	3
ALL	SEES 3000+ level course	3
ALL	See Advance Science LIst	3

Cultural Perspectives, Values, & Society Gen Education Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
F/S	JMC:1800 Environmental Communication in the Digital Age	3
F/S	WRIT:2100 Writing and Community Outreach	3

General Education Elective 9 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
F/S	ANTH:2261 Human Impacts on the Environment	3
S	SEES:3780 US Energy Policy in Global Context	3
S	POLI:2417 Comparative Environmental Policy	3

Environmental Engineering Minor Earned

This minor requires 12 s.h. of courses. These courses can fall within the chemical engineering degree by fulfilling the 12 s.h. of focus area electives and using your free elective. See minor for details. Below are recommended courses to complete the minor without additional credit hours needed. To discuss alternative possible routes for this certificate, please see your advisor.

Required Focus Area Electives 7 s.h.

Offered	Course	s.h.
S	CEE:3155 Principles of Environmental Engineering (with lab)	4
S-ODD	CBE:3405 Green Chemical and Energy Technologies (recommended)	3

Focus Area Electives 5 s.h. (pick classes from the following list)

Offered	Course	s.h.
S	CEE:3430 Water Treatment	3
F	CEE:4102 Groundwater	3
S	CEE:4107 Sustainable Systems	3
F	CEE:4150 Environmental Chemistry	3
F	CEE:4157 Environmental Engineering Design	3
F	CEE:4158 Solid and Hazardous Wastes	3
S	CEE:4159 Air Pollution Control Technology	3
W	CEE:4385 Water Scarcity in Rural India	3

Required Free Elective 3 s.h. (required for minor)

Offered	Course	s.h.
S-ODD	Pick one from Focus Area list above	3

Other Electives that Align with this Focus Area

In addition to the focus area electives listed above, you will be required to take the following electives to complete your degree: the Advanced Chemistry Elective (3 s.h.), the Advanced Chemistry Lab Elective, the Advanced Science Elective (3 s.h.), the Statistics Elective (3 s.h.), a Free Elective (3 s.h.), the Engineering Be Creative General Education Elective (3 s.h.), the Cultural Perspectives, Values, & Society General Education Elective (3 s.h.), and additional general education requirements (9 s.h.). ***These do not count toward your focus area electives.*** Below are lists of possible courses to fulfill these requirements that align with this focus area.

Statistics Requirement 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
S	CBE:3020 Applied Statistics for Chemical and Natural Resources Engineering (recommended)	3

Advanced Chemistry Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
S	CHEM:4873 Atmospheric and Environmental Chemistry	
ALL	CHEM 3000+ level	3

Advanced Chemistry Lab Elective 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
F/S	CHEM:2210 Fundamentals of Chemical Measurements Lab	3
F/S	CHEM:2220 Organic Chemistry Lab	3
S	CHEM:2240 Organic Chemistry for Majors Lab	3

Advanced Science Elective 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
S-EVEN	CBE:5425/CEE:5115 Atmospheric Chemistry and Physics (recommended)	3
ALL	SEES 3000+ level course	3
ALL	See Advanced Science list	3

Cultural Perspectives, Values, & Society Gen Education Elective 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
F/S	JMC:1800 Environmental Communication in the Digital Age	3
F/S	WRIT:2100 Writing and Community Outreach	3

General Education Elective 9 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
F/S	ANTH:2261 Human Impacts on the Environment	3
F/S	GHS:2000 Introduction to Global Health Studies	3
S	POLI:2417 Comparative Environmental Policy	3
S-ODD	POLI:3518 Water Wars: Conflict and Cooperation	3
S	SEES:3780 US Energy Policy in Global Context	3
F/S	URP:2013 Introduction to sustainability	3

Energy Focus Area Requirements

The energy focus area gives you a solid background to enter the energy sector. In addition to the core chemical engineering requirements, you must choose a focus area and complete 12 s.h. toward that focus area and take the required CBE3020 Applied Statistics for Chemical and Natural Resources Engineering for your statistics elective. Below are the lists of possible focus area electives that can fulfill this requirement for the energy focus area. If you feel another course would fit within this requirement, you must get approval from the department undergraduate director to have it count.

Required Focus Area Elective 3 s.h.		
Offered	**Course**	**s.h.**
S-ODD	CBE:5405 Green Chemical and Energy Technologies	3

Focus Area Electives 9 s.h.		
Offered	**Course**	**s.h.**
S	CBE:2040 Environment, Energy, and Climate Change	3
S-EVEN	CBE:4125 Advance Process Safety	3
F	CBE:4460 Process and Design for Satellites and Environmental Sensors	3
S-EVEN	CBE:5410 Electrochemical Engineering	3
F/S	CBE:5199 Contemporary Topics: Chem & Biochem Engr--Petroleum Refining (recommended)	1
S	CBE:5199 Contemporary Topics: Chem & Biochem Engr—Advanced Process Control	1
S	CEE:4107 Sustainable Systems	3
S	ECE:5620 Electric Power System & Renewable Energy	3
ALL	ENGR:2120 Electrical Circuits	3
F-EVEN	ISE:5520 Renewable Energy	3
F	ME:4048 Energy Systems Design	3
S	SEES:1115 The History of Oil	3

Other Electives that Align with this Focus Area

In addition to the focus area electives listed above, you will be required to complete the following electives to complete your degree: the Advanced Chemistry Elective (3 s.h.), the Advanced Chemistry Lab Elective, the Advanced Science Elective (3 s.h.), the Statistics Elective (3 s.h.), a free elective (3 s.h.), the Engineering Be Creative General Education Elective (3 s.h.), the Cultural Perspectives, Values, & Society General Education Elective (3 s.h.), and additional general education requirements (9 s.h.). ***These do not count toward your focus area electives.*** Below are lists of possible courses to fulfill these requirements that align with this focus area.

Statistics Requirement 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
S	CBE:3020 Applied Statistics for Chemical and Natural Resources Engineering (recommended)	3

Advanced Chemistry Elective 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
ALL	CHEM 3000+ level	3

Advanced Chemistry Lab Elective 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
ALL	CHEM:2210 Fundamentals of Chemical Measurements Lab	3
ALL	CHEM:2220 Organic Chemistry Lab	3
ALL	CHEM:2240 Organic Chemistry for Majors Lab	3

Advanced Science Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
S-EVEN	CBE:5425/CEE:5115 Atmospheric Chemistry and Physics	3
ALL	See Advance Science List	3

Cultural Perspectives, Values, & Society Gen Education Elective 3 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
F/S	JMC:1800 Environmental Communication in the Digital Age	3
F/S	WRIT:2100 Writing and Community Outreach	3

General Education Elective 9 s.h. (possible courses that align with this focus area)

Offered	Course	s.h.
F/S	ANTH:2261 Human Impacts on the Environment	3
S	POLI:2417 Comparative Environmental Policy	3
S	SEES:3780/HIST3240/POLI3431/GHS3780 US Energy Policy in global context	3
F/S	SOC:1040 Energy, Sustainability, and Society	3
F/S	URP:2013 Introduction to Sustainability	3