

# CHEMICAL ENGINEERING MAJOR: ENERGY OPTION (B.S.)

<https://ceps.unh.edu/chemical-engineering-bioengineering/program/bs/chemical-engineering-major-energy-option>

## Description

This option covers the major areas of current interest in the energy field. The required courses provide students with a general background knowledge of fossil fuels, nuclear power, solar energy, and other alternative energy resources. The elective courses will permit the student to study topics of special interest in more depth or gain a broader perspective on energy and some closely related subjects. Three courses are required, and one additional course of at least three credits should be selected from the electives list. Students interested in the energy option should declare their intention to the department faculty during the sophomore year.

The Chemical Engineering program (B Sci in Chemical Engineering) is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the General Criteria and the Program Criteria for Chemical, Biochemical, Biomolecular and Similarly Named Engineering Programs.

## Requirements

### Degree Requirements

**Minimum Credit Requirement:** 132 credits

**Minimum Residency Requirement:** 32 credits must be taken at UNH

**Minimum GPA:** 2.0 required for conferral\*

**Core Curriculum Required:** Discovery & Writing Program Requirements

**Foreign Language Requirement:** No

All Major, Option and Elective Requirements as indicated.

\*Major GPA requirements as indicated.

### Major Requirements

Code	Title	Credits
<b>Required Courses</b>		
CHBE 400	Chemical and Bioengineering Lectures	1
CHBE 501	Material Balances	3
CHBE 502	Energy Balances	3
CHBE 601	Fluid Mechanics and Unit Operations	3
CHBE 602	Heat Transfer and Unit Operations	3
CHBE 603	Applied Mathematics for Chemical Engineers	4
CHBE 604	Chemical Engineering Thermodynamics	3
CHBE 612	Chemical Engineering Laboratory I	3
CHBE 614	Separation Processes	3
CHBE 703	Mass Transfer and Stagewise Operations	3
CHBE 705	Fossil Fuels and Renewable Energy Sources	4
CHBE 706	Electrochemical Methods: Fundamentals and Applications	4
CHBE 707	Chemical Engineering Kinetics	3
CHBE 708	Chemical Engineering Design	4

CHBE 712	Introduction to Nuclear Engineering	4
CHBE 713	Chemical Engineering Laboratory II	3
CHBE 752	Process Dynamics and Control	4
CHEM 405	Chemical Principles for Engineers	4
CHEM 683	Physical Chemistry I	3
CHEM 684	Physical Chemistry II	3
CHEM 685	Physical Chemistry Laboratory	2
CHEM 686	Physical Chemistry Laboratory	2
CHEM 651	Organic Chemistry I	3
CHEM 652A	Organic Chemistry II	3
CHEM 653	Organic Chemistry Laboratory	2
MATH 425	Calculus I	4
MATH 426	Calculus II	4
MATH 527	Differential Equations with Linear Algebra	4
MATH 644	Statistics for Engineers and Scientists	4
PHYS 407	General Physics I	4
PHYS 408	General Physics II	4
<b>Elective Courses</b>		
Select one of the following:		3-4
CHBE 695	Chemical Engineering Project	
CHBE 696	Independent Study	
CHBE 761	Biochemical Engineering	
ME 705	Thermal System Analysis and Design	
ME 706	Renewable Energy: Physical and Engineering Principles	
NR 606	International Energy Topics	
NR 787	Advanced Topics in Sustainable Energy	
<b>Total Credits</b>		<b>104-105</b>

<sup>1</sup> This requires approval of the department; students should check with their advisor. Courses offered in the past include Renewable Electrical Power, Renewable Energy, and Peak Oil.

## Degree Plan

### Sample Degree Plan

*This sample degree plan serves as a general guide; students collaborate with their academic advisor to develop a personalized degree plan to meet their academic goals and program requirements.*

#### First Year

Fall		Credits
CHBE 400	Chemical and Bioengineering Lectures	1
CHEM 405	Chemical Principles for Engineers <sup>3</sup>	4
ENGL 401	First-Year Writing <sup>1</sup>	4
MATH 425	Calculus I <sup>2</sup>	4
Discovery Program Electives <sup>6</sup>		4
<b>Credits</b>		<b>17</b>

#### Spring

MATH 426	Calculus II	4
PHYS 407	General Physics I <sup>3</sup>	4
Discovery Program Electives (2) <sup>6</sup>		8
<b>Credits</b>		<b>16</b>

#### Second Year

Fall		Credits
CHBE 501	Material Balances	3
CHEM 683	Physical Chemistry I	3
CHEM 685	Physical Chemistry Laboratory	2
MATH 527	Differential Equations with Linear Algebra	4

PHYS 408	General Physics II	4
<b>Credits</b>		<b>16</b>
<b>Spring</b>		
CHBE 502	Energy Balances <sup>4</sup>	3
CHEM 684	Physical Chemistry II	3
CHEM 686	Physical Chemistry Laboratory	2
MATH 740 or MATH 644	Design of Experiments I <sup>6</sup> or Statistics for Engineers and Scientists	4
Discovery Program Elective <sup>6</sup>		4
<b>Credits</b>		<b>16</b>
<b>Third Year</b>		
<b>Fall</b>		
CHBE 601	Fluid Mechanics and Unit Operations	3
CHBE 603	Applied Mathematics for Chemical Engineers	4
CHEM 651	Organic Chemistry I	3
CHEM 653	Organic Chemistry Laboratory	2
CHBE 705	Fossil Fuels and Renewable Energy Sources	4
<b>Credits</b>		<b>16</b>
<b>Spring</b>		
CHBE 602	Heat Transfer and Unit Operations	3
CHBE 604	Chemical Engineering Thermodynamics	3
CHBE 612	Chemical Engineering Laboratory I	3
CHEM 652A	Organic Chemistry II	3
Discovery Program Elective <sup>6</sup>		4
<b>Credits</b>		<b>16</b>
<b>Fourth Year</b>		
<b>Fall</b>		
CHBE 703	Mass Transfer and Stagewise Operations	3
CHBE 707	Chemical Engineering Kinetics	3
CHBE 713	Chemical Engineering Laboratory II	3
CHBE 752	Process Dynamics and Control	4
CHBE 706	Electrochemical Methods: Fundamentals and Applications	4
<b>Credits</b>		<b>17</b>
<b>Spring</b>		
CHBE 614	Separation Processes	3
CHBE 708	Chemical Engineering Design <sup>5</sup>	4
CHBE 712	Introduction to Nuclear Engineering	4
Energy Option Elective		3-4
Discovery Elective <sup>6</sup>		4
<b>Credits</b>		<b>18-19</b>
<b>Total Credits</b>		<b>132-133</b>

<sup>6</sup> Chemical Engineering students do not have to take a course in the Discovery ETS category since they satisfy this requirement through a combination of courses in the curriculum.

## Student Learning Outcomes

### Program Learning Outcomes By the time of graduation, students will have:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- an ability to communicate effectively with a range of audiences.
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

<sup>1</sup> ENGL 401 First-Year Writing satisfies the Discovery Foundation Writing Skills category.

<sup>2</sup> MATH 425 Calculus I satisfies the Discovery Foundation Quantitative Reasoning category.

<sup>3</sup> PHYS 407 General Physics I or CHEM 405 Chemical Principles for Engineers satisfies the Discovery Physical Science (with lab) category.

<sup>4</sup> CHBE 502 Energy Balances satisfies the Discovery Inquiry requirement.

<sup>5</sup> CHBE#708 Chemical Engineering Design satisfies the Discovery Capstone Experience/Course.