BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING (BSChE) DEGREE AND A MAJOR CONCENTRATION IN SUSTAINABILITY AND ENERGY ENGINEERING

The program leading to the BSChE degree is accredited by the Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org.

Program Learning Outcomes (Student Outcomes) for the BSChE Degree

Upon completing the BSChE degree, students will be able to demonstrate:

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multidisciplinary teams.
5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for, and have an ability to engage in life-long learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

Program Educational Objectives for the BSChE Degree

Within 3-5 years of graduation, graduates with a Bachelor of Science in Chemical Engineering (BSChE) degree are expected to be:

1. Graduate students, professionals, and entrepreneurs who are moving towards leadership positions as exemplary members of the global workforce; and
2. Professionals who practice their societal, environmental, and ethical responsibilities.

Requirements for the BSChE Degree

For general university requirements, see Graduation Requirements (ga.rice.edu/undergraduate-students/academic-policies-procedures/

graduation-requirements). Students pursuing the BSChE degree must complete:

- A minimum of 97-100 credit hours, depending on major concentration declared, to satisfy major requirements.
- A minimum of 132 credit hours to satisfy degree requirements.
- A minimum of 18 courses (53 credit hours), depending on major concentration declared, taken at the 300-level or above.
- The requirements of a major concentration. When students declare the major (ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Chemical Engineering, students must additionally identify and declare one of the major concentrations, either in:
  - Biotechnology and Bioengineering (ga.rice.edu/programs-study/departments-programs/engineering/chemical-biomolecular-engineering/chemical-bsche-concentration-biotechnology-bioengineering/#Biotechnology_Bioengineering), or
  - Computational Engineering (ga.rice.edu/programs-study/departments-programs/engineering/chemical-biomolecular-engineering/chemical-bsche-concentration-computational/#Computational_Engineering), or
  - Environmental Engineering (ga.rice.edu/programs-study/departments-programs/engineering/chemical-biomolecular-engineering/chemical-bsche-concentration-environmental/#Environmental_Engineering), or
  - Materials Science and Engineering (ga.rice.edu/programs-study/departments-programs/engineering/chemical-biomolecular-engineering/chemical-bsche-concentration-materials-science/#Materials_Science), or
  - Sustainability and Energy Engineering (p. 2), or
  - Engineering Breadth (ga.rice.edu/programs-study/departments-programs/engineering/chemical-biomolecular-engineering/chemical-bsche-concentration-breadth/#Engineering_Breadth)

(Engineering Breadth is a major concentration comprised of electives from a mix of engineering disciplines).

Because of the common core requirements, it is possible for students to change their major concentration at any time, even after initially declaring the major. To do so, please contact the Office of the Registrar (registrar@rice.edu).

The courses listed below satisfy the requirements for this major. In certain instances, courses not on this official list may be substituted upon approval of the major's academic advisor. Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the Major in Chemical Engineering</td>
<td>97-100</td>
</tr>
<tr>
<td></td>
<td>Total Credit Hours Required for the BSChE Degree</td>
<td>132</td>
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### Degree Requirements

#### Core Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
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<tbody>
<tr>
<td>CHEM 121 &amp; CHEM 123</td>
<td>GENERAL CHEMISTRY I and GENERAL CHEMISTRY LABORATORY I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 122 &amp; CHEM 124</td>
<td>GENERAL CHEMISTRY II and GENERAL CHEMISTRY LABORATORY II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 211 &amp; CHEM 213</td>
<td>ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 217</td>
<td>ORGANIC LABORATORY FOR CHEMICAL ENGINEERS</td>
<td>1</td>
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Select 2 from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CHEM 212 &amp; CHEM 214</td>
<td>ORGANIC CHEMISTRY II and ORGANIC CHEM DISCUSSION II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 311</td>
<td>PHYSICAL CHEMISTRY I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>PHYSICAL CHEMISTRY II</td>
<td>3</td>
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</tbody>
</table>

#### Chemical and Biomolecular Engineering Core Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 301</td>
<td>CHEMICAL ENGINEERING FUNDAMENTALS</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 303</td>
<td>COMPUTER PROGRAMMING IN CHEMICAL ENGINEERING</td>
<td>2</td>
</tr>
<tr>
<td>CHBE 305</td>
<td>COMPUTATIONAL METHODS IN CHEMICAL ENGINEERING</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 310</td>
<td>FUNDAMENTALS OF BIOMOLECULAR ENGINEERING</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 343</td>
<td>CHEMICAL ENGINEERING LAB I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 350</td>
<td>PROCESS SAFETY IN CHEMICAL ENGINEERING</td>
<td>1</td>
</tr>
<tr>
<td>CHBE 390</td>
<td>CHEMICAL KINETICS AND REACTOR DESIGN</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 401</td>
<td>TRANSPORT PHENOMENA I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 402</td>
<td>TRANSPORT PHENOMENA II</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 403</td>
<td>DESIGN FUNDAMENTALS</td>
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<tr>
<td>CHBE 404</td>
<td>CHEMICAL ENGINEERING DESIGN</td>
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<tr>
<td>CHBE 411</td>
<td>THERMODYNAMICS I</td>
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<tr>
<td>CHBE 412</td>
<td>THERMODYNAMICS II</td>
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<tr>
<td>CHBE 443</td>
<td>CHEMICAL ENGINEERING LAB II</td>
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</tr>
<tr>
<td>CHBE 470</td>
<td>PROCESS DYNAMICS AND CONTROL</td>
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#### Mathematics

<table>
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<tr>
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<th>Credit Hours</th>
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<tbody>
<tr>
<td>MATH 101</td>
<td>SINGLE VARIABLE CALCULUS I</td>
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</tr>
<tr>
<td>MATH 102</td>
<td>SINGLE VARIABLE CALCULUS II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 211</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA</td>
<td>3</td>
</tr>
<tr>
<td>MATH 212</td>
<td>MULTIVARIABLE CALCULUS</td>
<td>3</td>
</tr>
<tr>
<td>CAAM 336</td>
<td>DIFFERENTIAL EQUATIONS IN SCIENCE AND ENGINEERING</td>
<td>3</td>
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</tbody>
</table>

#### Physics

Select 1 from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 101 &amp; PHYS 103</td>
<td>MECHANICS (WITH LAB) and MECHANICS DISCUSSION</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 111</td>
<td>HONORS MECHANICS (WITH LAB)</td>
<td>4</td>
</tr>
</tbody>
</table>

Select 1 from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 102 &amp; PHYS 104</td>
<td>ELECTRICITY &amp; MAGNETISM (WITH LAB) and ELECTRICITY AND MAGNETISM DISCUSSION</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 112</td>
<td>HONORS ELECTRICITY &amp; MAGNETISM (WITH LAB)</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Major Concentration

Select 1 from the following Major Concentrations (see below for Major Concentration requirements):

- Biotechnology and Bioengineering
- Computational Engineering
- Environmental Engineering
- Materials Science and Engineering
- Sustainability and Energy Engineering

#### Engineering Breadth

Total Credit Hours Required for the Major in Chemical Engineering: 97-100

University Graduation Requirements: 32-35

#### Footnotes and Additional Information

1. Includes coursework completed as distribution credit, FWIS, LPAP, upper-level, residency (hours taken at Rice), 60 hours outside of the major (if applicable), and any additional academic program requirements. The “hours outside of the major” requirement may include all of the above university requirements.

2. Notes regarding the Chemistry course requirements: CHEM 121 and CHEM 123 can be satisfied by completing CHEM 151 and CHEM 153.

#### Major Concentration: Sustainability and Energy Engineering

To fulfill the remaining requirements for the major in Chemical Engineering with a major concentration in Sustainability and Energy Engineering, students must complete a total of 15 credit hours as listed below.

Please Note: The following list of courses can be used to satisfy the requirements of the major concentration. As noted above with major requirements, in certain instances, courses not on the official list may be substituted upon approval of the major’s academic advisor. Students and their academic advisors should identify and clearly document the courses to be taken.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEVE 307 / ENST 307 / ESCI 307</td>
<td>ENERGY AND THE ENVIRONMENT</td>
<td>9-15</td>
</tr>
</tbody>
</table>
Bachelor of Science in Chemical Engineering (BSChE) Degree and a Major Concentration in Sustainability and Energy Engineering

**CEVE 314 / BIOE 365 / GLHT 314**  
SUSTAINABLE WATER PURIFICATION FOR THE DEVELOPING WORLD

**CEVE 401**  
CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE LAB

**CEVE 434**  
FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT

**CEVE 518**  
CONTAMINANT HYDROGEOLOGY

**CEVE 535**  
PHYSICAL CHEMICAL PROCESSES FOR WATER QUALITY CONTROL

**CHBE 281 / ENST 281**  
ENGINEERING SUSTAINABLE COMMUNITIES

**CHBE 450**  
PETROLEUM PHASE BEHAVIOR AND FLOW ASSURANCE

**CHBE 455**  
TWO PHASE FLOW/MULTIPHASE FLOW IN PIPES

**CHBE 571**  
FLOW AND TRANSPORT THROUGH POROUS MEDIA I

**CHBE 671**  
FLOW AND TRANSPORT THROUGH POROUS MEDIA II

**Elective Requirements**  
0-6

Select 2 from either the CEVE and CHBE course offerings listed above, or from the following:

**CEVE 302**  
SUSTAINABLE DESIGN

**CEVE 310**  
PRINCIPLES OF ENVIRONMENTAL ENGINEERING

**CEVE 484**  
ENVIRONMENTAL RISK ASSESSMENT & HUMAN HEALTH

**CHBE 570**  
INDUSTRIAL CATALYSIS AND PETROCHEMICAL PROCESSES

**CHEM 425 / ENST 425 / ESCI 425**  
ORGANIC GEOCHEMISTRY

**ESCI 415**  
DECISION MAKING AND ECONOMICS IN THE ENERGY INDUSTRY

**ESCI 417**  
PETROLEUM INDUSTRY ECONOMICS AND MANAGEMENT

**ESCI 442**  
EXPLORATION GEOPHYSICS

**ESCI 460**  
GEOLOGICAL AND GEOPHYSICAL FLUID DYNAMICS

**Total Credit Hours**  
15

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### Departmental Transfer Credit Guidelines

Students pursuing the BSChE degree should be aware of the following departmental transfer credit guidelines:

- Requests for transfer credit will be considered by the program director (and/or the program’s official transfer credit advisor) on an individual case-by-case basis.

For additional information, please see the Chemical and Biomolecular Engineering website: [https://chbe.rice.edu/](https://chbe.rice.edu/)

### Opportunities for the BSChE Degree with a Major Concentration in Sustainability and Energy Engineering

#### Academic Honors

The university recognizes academic excellence achieved over an undergraduate’s academic history at Rice. For information on university honors, please see Latin Honors ([ga.rice.edu/undergraduate-students/honors-distinctions/university](ga.rice.edu/undergraduate-students/honors-distinctions/university)) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work ([ga.rice.edu/undergraduate-students/honors-distinctions/university](ga.rice.edu/undergraduate-students/honors-distinctions/university)). Some departments have department-specific Honors awards or designations.

For additional information, please see the Chemical and Biomolecular Engineering website: [https://chbe.rice.edu/](https://chbe.rice.edu/)

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### Policies for the BSChE Degree with a Major Concentration in Sustainability and Energy Engineering

#### Transfer Credit

For Rice University’s policy regarding transfer credit, see Transfer Credit ([ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit](ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit)). Some departments and programs have additional restrictions on transfer credit. The Office of Academic Advising maintains the university’s official list of transfer credit advisors on their website: [http://oaa.rice.edu](http://oaa.rice.edu). Students are encouraged to meet with their academic program’s transfer credit advisor when considering transfer credit possibilities.