BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING (BSChE) DEGREE

The program leading to the BS in Chemical Engineering is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and the Chemical, Biochemical, Biomolecular and Similarly Named Engineering Criteria.

Program Learning Outcomes (Student Outcomes) for the BSChE Degree

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

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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.
3. An ability to communicate effectively with a range of audiences.
4. 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.
5. 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.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Program Educational Objectives for the BSChE Degree

Within 3 to 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 (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/). Students pursuing the BSChE degree must complete:

- A minimum of 95 credit hours to satisfy major requirements.
- A minimum of 127 credit hours to satisfy degree requirements.
- A minimum of 20 courses (59 credit hours) taken at the 300-level or above.

The requirements for one area of specialization (see below for areas of specialization). When students declare the major (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Chemical Engineering (associated with the BSChE degree), students must additionally identify and declare one of five areas of specialization, either in:

- Biomolecular Engineering (p. 2), or
- Computational Engineering (p. 3), or
- Energy/Sustainability (p. 3), or
- Materials/Nanotechnology (p. 3), or
- Engineering Breadth (p. 4) (Engineering Breadth is an area of specialization comprised of electives from a mix of engineering disciplines).

Because of the common core requirements, it is possible for students to change their area of specialization 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, or where applicable, the department's Director of Undergraduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the major's Official Certifier (https://registrar.rice.edu/facstaff/degeworks/officialcertifier/).) 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>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the Major in Chemical Engineering</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Total Credit Hours Required for the BSChE Degree</td>
<td>127</td>
</tr>
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Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Core Requirements</td>
<td></td>
</tr>
<tr>
<td>CHEM 121</td>
<td>GENERAL CHEMISTRY I</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 111</td>
<td>AP/OTH CREDIT IN GENERAL CHEMISTRY I</td>
<td></td>
</tr>
<tr>
<td>CHEM 123</td>
<td>GENERAL CHEMISTRY LABORATORY I</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 113</td>
<td>AP/OTH CREDIT IN GENERAL CHEMISTRY LAB I</td>
<td></td>
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<tr>
<td>CHEM 122</td>
<td>GENERAL CHEMISTRY II</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 112</td>
<td>AP/OTH CREDIT IN GENERAL CHEMISTRY II</td>
<td></td>
</tr>
<tr>
<td>CHEM 124</td>
<td>GENERAL CHEMISTRY LABORATORY II</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 114</td>
<td>AP/OTH CREDIT IN GENERAL CHEMISTRY LAB II</td>
<td></td>
</tr>
<tr>
<td>CHEM 211</td>
<td>ORGANIC CHEMISTRY I</td>
<td>3</td>
</tr>
<tr>
<td>&amp; CHEM 213</td>
<td>and ORGANIC CHEMISTRY DISCUSSION I</td>
<td></td>
</tr>
<tr>
<td>CHEM 301</td>
<td>PHYSICAL CHEMISTRY I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td></td>
</tr>
<tr>
<td>MATH 101</td>
<td>SINGLE VARIABLE CALCULUS I</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 105</td>
<td>AP/OTH CREDIT IN CALCULUS I</td>
<td></td>
</tr>
<tr>
<td>MATH 102</td>
<td>SINGLE VARIABLE CALCULUS II</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 106</td>
<td>AP/OTH CREDIT IN CALCULUS II</td>
<td></td>
</tr>
</tbody>
</table>
Bachelor of Science in Chemical Engineering (BSChE) Degree

MATH 211  ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA  
MATH 212  MULTIVARIABLE CALCULUS  

Select 1 from the following:

PHYS 101  MECHANICS (WITH LAB) 
& PHYS 103  and MECHANICS DISCUSSION 

PHYS 111  HONORS MECHANICS (WITH LAB)  

Select 1 from the following:

PHYS 102  ELECTRICITY & MAGNETISM (WITH LAB) 
& PHYS 104  and ELECTRICITY AND MAGNETISM DISCUSSION 

PHYS 112  HONORS ELECTRICITY & MAGNETISM (WITH LAB)  

Chemical and Biomolecular Engineering Core Courses
CHBE 243  CHEMICAL ENGINEERING LAB I  
CHBE 301  CHEMICAL ENGINEERING FUNDAMENTALS  
CHBE 302  APPLIED MATHEMATICS AND NUMERICAL METHODS FOR CHEMICAL ENGINEERS I  
CHBE 305  APPLIED MATHEMATICS AND NUMERICAL METHODS FOR CHEMICAL ENGINEERS II  
CHBE 310  FUNDAMENTALS OF BIOMOLECULAR ENGINEERING  
CHBE 344  CHEMICAL ENGINEERING LAB II  
CHBE 350  PROCESS SAFETY IN CHEMICAL ENGINEERING  
CHBE 390  CHEMICAL KINETICS AND REACTOR DESIGN  
CHBE 401  TRANSPORT PHENOMENA I  
CHBE 402  TRANSPORT PHENOMENA II  
CHBE 403  DESIGN FUNDAMENTALS  
CHBE 404  CHEMICAL ENGINEERING DESIGN  
CHBE 410  APPLIED BIOMOLECULAR ENGINEERING  
CHBE 411  THERMODYNAMICS I  
CHBE 412  THERMODYNAMICS II  
CHBE 443  CHEMICAL ENGINEERING LAB III  
CHBE 470  PROCESS DYNAMICS AND CONTROL  

Area of Specialization
Select 1 from the following Areas of Specialization (see Areas of Specialization below):

- Biomolecular Engineering
- Computational Engineering
- Energy/Sustainability
- Materials/Nanotechnology
- Engineering Breadth

Total Credit Hours Required for the Major in Chemical Engineering  
Additional Credit Hours to Complete Degree Requirements

University Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/)

Total Credit Hours

Footnotes and Additional Information

* Note: University Graduation Requirements include 31 credit hours, comprised of Distribution Requirements (Groups I, II, and III), FWIS, and LPAP coursework. In some instances, courses satisfying FWIS or distribution requirements may additionally meet other requirements, such as the Analyzing Diversity (AD) requirement, or some of the student’s declared major, minor, or certificate requirements. Additional Credit Hours to Complete Degree Requirements include general electives, coursework completed as upper-level, residency (hours taken at Rice), and/or any other additional academic program requirements.

1 MATH 221 and MATH 222 may substitute for MATH 212.
2 The Chemical and Biomolecular Engineering department has determined that credit awarded for PHYS 141 CONCEPTS IN PHYSICS I is not eligible for meeting the requirements of the Chemical Engineering major.
3 The Chemical and Biomolecular Engineering department has determined that credit awarded for PHYS 142 CONCEPTS IN PHYSICS II is not eligible for meeting the requirements of the Chemical Engineering major.

Areas of Specialization

Students must complete the requirements as listed for one of the following areas of specialization for the BSChE degree program. A minimum of 4 courses (minimum of 12 credit hours) must be taken from one of the areas of specialization as listed below.

Please Note: The following list of approved courses can be used to satisfy the requirements of the area of specialization. Courses not on the list may be taken upon approval of the academic advisor. Students and their academic advisors should identify and clearly document the courses to be taken.

Area of Specialization: Biomolecular Engineering

To fulfill the BSChE degree requirements, students pursuing the Biomolecular area of specialization must complete:

- 1 course (3 credit hours) from the area of specialization Core Requirement
- 3 courses (9 credit hours) from the area of specialization Elective Requirements

<table>
<thead>
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<tbody>
<tr>
<td>CHBE 415</td>
<td>SEPARATION TECHNOLOGIES FOR CHEMICAL AND BIOMOLECULAR PROCESSES</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Requirements

Select 3 courses from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOS 201</td>
<td>INTRODUCTORY BIOLOGY I</td>
<td></td>
</tr>
<tr>
<td>BIOS 301</td>
<td>BIOCHEMISTRY I</td>
<td></td>
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<tr>
<td>BIOE 321</td>
<td>CELLULAR ENGINEERING</td>
<td></td>
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<tr>
<td>BIOE 330</td>
<td>BIOREACTION ENGINEERING</td>
<td></td>
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<tr>
<td>BIOE 370</td>
<td>BIOMATERIALS</td>
<td></td>
</tr>
<tr>
<td>BIOE 372</td>
<td>BIOMECHANICS</td>
<td></td>
</tr>
<tr>
<td>BIOE 383</td>
<td>BIOMEDICAL ENGINEERING INSTRUMENTATION</td>
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<tr>
<td>BIOE 408</td>
<td>SYNTHETIC BIOLOGY</td>
<td></td>
</tr>
</tbody>
</table>
Bachelor of Science in Chemical Engineering (BSChE) Degree

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**Elective Requirements**

**Select 3 courses from the following:**

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>CEVE 302</td>
<td>SUSTAINABLE DESIGN</td>
<td></td>
</tr>
<tr>
<td>CEVE 307</td>
<td>ENERGY AND THE ENVIRONMENT</td>
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<tr>
<td>CEVE 310</td>
<td>PRINCIPLES OF ENVIRONMENTAL ENGINEERING</td>
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<tr>
<td>CEVE 314</td>
<td>SUSTAINABLE WATER PURIFICATION FOR THE DEVELOPING WORLD</td>
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<tr>
<td>CEVE 401</td>
<td>CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE</td>
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<tr>
<td>CEVE 434</td>
<td>FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT</td>
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<tr>
<td>CEVE 484</td>
<td>ENVIRONMENTAL RISK ASSESSMENT &amp; HUMAN HEALTH</td>
<td></td>
</tr>
<tr>
<td>CEVE 518</td>
<td>ENVIRONMENTAL HYDROGEOLOGY</td>
<td></td>
</tr>
<tr>
<td>CEVE 535</td>
<td>PHYSICAL CHEMICAL PROCESSES FOR WATER QUALITY CONTROL</td>
<td></td>
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<tr>
<td>CHBE 405</td>
<td>TECHNOECONOMIC ANALYSIS AND ENGINEERING DECISION TOOLS</td>
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<tr>
<td>CHBE 450</td>
<td>PETROLEUM PHASE BEHAVIOR AND FLOW ASSURANCE</td>
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<tr>
<td>CHBE 468</td>
<td>INDUSTRIAL CHEMICAL PROCESSES AND THE ENERGY TRANSITION</td>
<td></td>
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<tr>
<td>CHBE 570</td>
<td>INDUSTRIAL CATALYSIS AND PETROCHEMICAL PROCESSES</td>
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<tr>
<td>CHBE 571</td>
<td>FLOW AND TRANSPORT THROUGH POROUS MEDIA I</td>
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</tr>
<tr>
<td>CHBE 671</td>
<td>FLOW AND TRANSPORT THROUGH POROUS MEDIA II</td>
<td></td>
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<tr>
<td>EEPS 420</td>
<td>ORGANIC GEOCHEMISTRY</td>
<td></td>
</tr>
<tr>
<td>EEPS 448</td>
<td>EXPLORATION GEOPHYSICS</td>
<td></td>
</tr>
<tr>
<td>EEPS 465</td>
<td>ROCK DEFORMATION AND RHEOLOGY</td>
<td></td>
</tr>
<tr>
<td>EEPS 484</td>
<td>DECISION MAKING AND ECONOMICS IN THE ENERGY INDUSTRY</td>
<td></td>
</tr>
<tr>
<td>EEPS 486</td>
<td>PETROLEUM INDUSTRY ECONOMICS AND MANAGEMENT</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credit Hours:** 12

**Area of Specialization: Materials/Nanotechnology**

To fulfill the BSChE degree requirements, students pursuing the Materials/Nanotechnology area of specialization must complete:

- 1 course (3 credit hours) from the Core Requirement
- 3 courses (9 credit hours) from the area of specialization Elective Requirements
### Bachelor of Science in Chemical Engineering (BSChE) Degree

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<td>3</td>
</tr>
</tbody>
</table>

**Elective Requirements**

Select 3 courses from the following:

- BIOE 431 BIOMATERIALS APPLICATIONS
- CHBE 560 / CHBE 594 COLLOIDAL AND INTERFACIAL PHENOMENA
- CHBE 594 / MSNE 594 PROPERTIES OF POLYMERS
- ELEC 361 QUANTUM MECHANICS FOR ENGINEERS
- MSNE 211 INTRODUCTION TO MATERIALS SCIENCE FOR ENGINEERS
- MSNE 302 MATERIALS PROCESSING AND NANOMANUFACTURING
- MSNE 365 / ELEC 365 NANOMATERIALS FOR ENERGY
- MSNE 401 THERMODYNAMICS IN MATERIALS SCIENCE
- MSNE 402 MECH PROPERTIES OF MATERIALS
- MSNE 406 PHYSICAL PROPERTIES OF SOLIDS
- MSNE 411 MATERIALS CHARACTERIZATION FROM NANO TO MACRO
- MSNE 415 CERAMICS AND GLASSES
- MSNE 433 COMPUTATIONAL MATERIALS MODELING
- MSNE 435 CRYSTALLOGRAPHY & DIFFRACTION
- MSNE 523 PROPERTIES, SYNTHESIS AND DESIGN OF COMPOSITE MATERIALS

**Total Credit Hours**

12

### Area of Specialization: Engineering Breadth

To fulfill the BSChE degree requirements, students pursuing the Engineering Breadth area of specialization must complete:

- 1 course (3 credit hours) from the area of specialization Core Requirement
- 3 courses (9 credit hours) from the area of specialization Elective Requirements

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<tr>
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<td>3</td>
</tr>
</tbody>
</table>

**Elective Requirements**

Select 3 courses from at least 3 categories below:

#### Basic Science

- BIOS 201 INTRODUCTORY BIOLOGY I
- CHEM 330 ANALYTICAL CHEMISTRY
- CHEM 360 INORGANIC CHEMISTRY
- EEPS 334 THE EARTH LABORATORY
- EEPS 340 GLOBAL BIOGEOCHEMICAL CYCLES

#### Environmental Engineering Courses

- CEVE 310 PRINCIPLES OF ENVIRONMENTAL ENGINEERING
- CEVE 311 / MECH 311 MECHANICS OF SOLIDS AND STRUCTURES
- CEVE 434 FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT

#### Materials Science Engineering Courses

- MSNE 211 INTRODUCTION TO MATERIALS SCIENCE FOR ENGINEERS
- MSNE 402 MECH PROPERTIES OF MATERIALS
- MSNE 406 PHYSICAL PROPERTIES OF SOLIDS
- MSNE 594 / CHBE 594 PROPERTIES OF POLYMERS

#### Bioengineering Courses

- BIOE 370 BIOMATERIALS
- BIOE 372 BIOMECHANICS
- BIOE 420 / CHBE 420 TRANSPORT PHENOMENA IN BIOENGINEERING
- CHBE 640 METABOLIC ENGINEERING

#### Sustainability and Energy Courses

- CEVE 302 / ENGI 302 SUSTAINABLE DESIGN
- CEVE 307 / ENST 307 / EEPS 307 ENERGY AND THE ENVIRONMENT
- CHBE 450 PETROLEUM PHASE BEHAVIOR AND FLOW ASSURANCE

#### Computational Applied Mathematics and Operations Research Course

- CMOR 302 MATRIX ANALYSIS

#### Other Approved Engineering Courses

- CHBE 560 / MSNE 560 COLLOIDAL AND INTERFACIAL PHENOMENA
- ELEC 242 SIGNALS, SYSTEMS, AND TRANSFORMS
- ELEC 261 INTRODUCTION TO PHYSICAL ELECTRONICS I

**Total Credit Hours**

12

### Footnotes and Additional Information

1. A maximum of 3 credit hours for CHBE 495, CHBE 498, or CHBE 499 may replace 3 credit hours of any of the discipline electives above, but not the Core Requirement.

### Policies for the BSChE Degree

**Program Restrictions and Exclusions**

Students pursuing the BSChE degree should be aware of the following program restriction:

- As noted in Majors, Minors, and Certificates (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), under Declaring Majors, Minors and Certificates, students may not obtain both a BA and a BS in the same major. Students pursuing the Bachelor of Science in Chemical Engineering (BSChE)
Degree may not additionally pursue the BA Degree with a Major in Chemical Engineering.

**Transfer Credit**
For Rice University's policy regarding transfer credit, see Transfer Credit ([https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/](https://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 ([https://oaa.rice.edu/advising-network/transfer-credit-advisors/](https://oaa.rice.edu/advising-network/transfer-credit-advisors/)) on their website: [https://oaa.rice.edu](https://oaa.rice.edu). Students are encouraged to meet with their academic program's transfer credit advisor when considering transfer credit possibilities.

**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.

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

**Opportunities for the BSChE Degree**

**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](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work ([https://ga.rice.edu/undergraduate-students/honors-distinctions/university/](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/)). Some departments have department-specific Honors awards or designations.

**Fifth-Year Master's Degree Option for Rice Undergraduate Students**
In certain situations and with some terminal master's degree programs, Rice students have an option to pursue a master's degree by adding an additional fifth year to their four years of undergraduate studies.

Advanced Rice undergraduate students in good academic standing typically apply to the master's degree program during their junior or senior year. Upon acceptance, depending on course load, financial aid status, and other variables, they may then start taking some required courses of the master's degree program. A plan of study will need to be approved by the student's undergraduate major advisor and the master's degree program director.

As part of this option and opportunity, Rice undergraduate students:

- must complete the requirements for a bachelor's degree and the master's degree independently of each other (i.e. no course may be counted toward the fulfillment of both degrees).
- should be aware there could be financial aid implications if the conversion of undergraduate coursework to that of graduate level reduces their earned undergraduate credit for any semester below that of full-time status (12 credit hours).

• more information on this Undergraduate - Graduate Concurrent Enrollment opportunity, including specific information on the registration process can be found [here](https://ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment/).

Rice undergraduate students completing studies in science and engineering may have the option to pursue the Master of Chemical Engineering (MChE) degree. For additional information, students should contact their undergraduate major advisor and the MChE chair of the department graduate studies committee.

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