CHEMICAL ENGINEERING, B.S.E.

Program Educational Objectives
Within six years of graduation, our graduates are expected to achieve one or more of the following milestones:

1. Advance professionally in the chemical process industries or in their chosen career field.
2. Earn advanced degrees in chemical engineering (or a related technical discipline), medicine, law, or business.
3. Attain leadership positions in today’s rapidly changing, increasingly technological, global society.

Learning Outcomes
- Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 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.
- Ability to communicate effectively with a range of audiences.
- 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.
- 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.
- Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Standards
Program GPA
Program GPA requirement policies are described in the College of Engineering and Computing section of this bulletin. For the purpose of these policies, the following courses are used to determine the Program GPA for the Chemical Engineering B.S.E. program: all Lower Division Engineering courses, all Chemical Engineering Major courses, and all Engineering Electives.

Admissions
Entrance Requirements
Admission requirements and processes for freshman, transfer students, and former students seeking readmission are managed by the Office of Undergraduate Admissions (http://sc.edu/about/offices_and_divisions/undergraduate_admissions/).

Transfer applicants from regionally accredited colleges and universities must have a cumulative 2.75 GPA on a 4.00 scale to enter the College of Engineering and Computing. In addition, transfer applicants for the Aerospace Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, or Mechanical Engineering majors must also have completed a four semester-hour calculus course equivalent to MATH 141 with a grade of “C” or better.

Current University of South Carolina students who wish to enter the College of Engineering and Computing, and former students seeking readmission, must have an institutional GPA of 2.50 or better on at least 15 hours earned at UofSC. In addition, such applicants for the Aerospace Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, or Mechanical Engineering majors must also have completed a four semester-hour calculus course equivalent to MATH 141 with a grade of “C” or better.

Degree Requirements (131-138 hours)
See College of Engineering and Computing (https://academicbulletins.sc.edu/undergraduate/engineering-computing/) for progression requirements and special academic opportunities.

Program of Study

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carolina Core</td>
<td>34-43</td>
</tr>
<tr>
<td>2. College Requirements</td>
<td>0</td>
</tr>
<tr>
<td>3. Program Requirements</td>
<td>64-65</td>
</tr>
<tr>
<td>4. Major Requirements</td>
<td>33</td>
</tr>
</tbody>
</table>

Founding Documents Requirement
All undergraduate students must take a 3-credit course or its equivalent with a passing grade in the subject areas of History, Political Science, or African American Studies that covers the founding documents including the United State Constitution, the Declaration of Independence, the Emancipation Proclamation and one or more documents that are foundational to the African American Freedom struggle, and a minimum of five essays from the Federalist papers. This course may count as a requirement in any part of the program of study including the Carolina Core, the major, minor or cognate, or as a general elective. Courses that meet this requirement are listed here (https://academicbulletins.sc.edu/undergraduate/founding-document-courses/).

1. Carolina Core Requirements (34-43 hours)
CMW – Effective, Engaged, and Persuasive Communication: Written (6 hours)
• ENGL 101 - must be passed with a grade of C or higher
• ENGL 102

ARP – Analytical Reasoning and Problem Solving (8 hours)
must be passed with a grade of C or higher
• MATH 141
• MATH 142

SCI – Scientific Literacy (8 hours)
must be passed with a grade of C or higher
• CHEM 111 & CHEM 111L
• PHYS 211 & PHYS 211L
GFL – Global Citizenship and Multicultural Understanding: Foreign Language (0-6 hours)
Score two or better on foreign language placement test; or complete the 109 and 110 courses in FREN, GERM, LATN or SPAN; or complete the 121 course in another foreign language.

- CC-GFL courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

GHS – Global Citizenship and Multicultural Understanding: Historical Thinking (3 hours)
- any CC-GHS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

GSS – Global Citizenship and Multicultural Understanding: Social Sciences (3 hours)
- any CC-GSS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

AIU – Aesthetic and Interpretive Understanding (3 hours)
- any CC-AIU course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

CMS – Effective, Engaged, and Persuasive Communication: Spoken Component 1 (0-3 hours)
- PHIL 325 (CMS/VSR overlay)

INF – Information Literacy 1 (0-3 hours)
- any overlay or stand-alone CC-INF course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

VSR – Values, Ethics, and Social Responsibility 1 (0-3 hours)
- PHIL 325 (CMS/VSR overlay)

1 Carolina Core Stand Alone or Overlay Eligible Requirements – Overlay-approved courses offer students the option of meeting two Carolina Core components in a single course. A maximum of two overlays is allowed. The total Carolina Core credit hours for this program must add up to a minimum of 34 hours.

2. College Requirements (0 hours)
No college-required courses for this program.

3. Program Requirements (64-65 hours)
Supporting Courses (64-65 hours)
Foundational Courses (20 hours)
Complete all of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 112</td>
<td>General Chemistry II (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 112L</td>
<td>General Chemistry II Lab (must be passed with a grade of C or higher)</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 333</td>
<td>Organic Chemistry I (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 334</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Vector Calculus</td>
<td>3</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Elementary Differential Equations (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>Essentials of Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 212L</td>
<td>Essentials of Physics II Lab</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Credit Hours 20

Chemistry Electives (6 hours)
A list of acceptable Chemistry Elective courses is maintained in the department office and on its website. These include the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 321</td>
<td>Quantitative Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 322</td>
<td>Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 511</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 533</td>
<td>Comprehensive Organic Chemistry III</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 541</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 542</td>
<td>Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 545</td>
<td>Physical Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 550</td>
<td>Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 555</td>
<td>Biochemistry/Molecular Biology I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 556</td>
<td>Biochemistry/Molecular Biology II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 621</td>
<td>Instrumental Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 622</td>
<td>Forensic Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 623</td>
<td>Introductory Environmental Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 624</td>
<td>Aquatic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 633</td>
<td>Introduction to Polymer Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 643</td>
<td>Computational Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 644</td>
<td>Materials Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 655</td>
<td>Metabolic Biochemistry of Human Disease</td>
<td>3</td>
</tr>
</tbody>
</table>

Chemistry Laboratory Electives (2 hours)
A list of acceptable Chemical Laboratory Elective courses is maintained in the department office and on its website. These include the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 321L</td>
<td>Quantitative Analysis Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 322L</td>
<td>Analytical Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 331L</td>
<td>Essentials of Organic Chemistry Laboratory I</td>
<td>1-2</td>
</tr>
<tr>
<td>or CHEM 333L</td>
<td>Comprehensive Organic Chemistry Laboratory I</td>
<td></td>
</tr>
<tr>
<td>CHEM 332L</td>
<td>Essentials of Organic Chemistry Laboratory II</td>
<td>1-2</td>
</tr>
<tr>
<td>or CHEM 334L</td>
<td>Comprehensive Organic Chemistry Laboratory II</td>
<td></td>
</tr>
<tr>
<td>CHEM 541L</td>
<td>Physical Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 542L</td>
<td>Physical Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 550L</td>
<td>Biochemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 621L</td>
<td>Instrumental Analysis Lab</td>
<td>1</td>
</tr>
</tbody>
</table>

Computer Programming Elective (3-4 hours)
Select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCE 145</td>
<td>Algorithmic Design I</td>
<td>4</td>
</tr>
<tr>
<td>CSCE 206</td>
<td>Scientific Applications Programming</td>
<td>3</td>
</tr>
</tbody>
</table>

Lower Division Engineering (14 hours)
Complete all of the following:
The list includes the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 101</td>
<td>Introduction to Engineering I</td>
<td>2-3</td>
</tr>
<tr>
<td>or ENCP 101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECHE 300</td>
<td>Chemical Process Principles (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 310</td>
<td>Introductory Chemical Engineering Thermodynamics (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 290</td>
<td>Thermodynamic Fundamentals</td>
<td></td>
</tr>
<tr>
<td>ECHE 311</td>
<td>Chemical Engineering Thermodynamics (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 320</td>
<td>Chemical Engineering Fluid Mechanics (must be passed with a grade of C or higher)</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 360</td>
<td>Fluid Mechanics</td>
<td></td>
</tr>
</tbody>
</table>

**Professional Development Elective (1 hour)**

A list of acceptable Professional Development Elective courses is maintained in the department office and on its website. The list includes the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 202</td>
<td>Exploring the Chemical Engineering Workplace</td>
<td>1</td>
</tr>
<tr>
<td>ECHE 203</td>
<td>Research in Chemical Engineering</td>
<td>1</td>
</tr>
</tbody>
</table>

**Engineering Electives (6 hours)**

A list of acceptable Engineering Elective courses is maintained in the department office and on its website. The list includes the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENCP 200</td>
<td>Statics</td>
<td></td>
</tr>
<tr>
<td>ECIV 200</td>
<td>Statics</td>
<td></td>
</tr>
<tr>
<td>EMCH 200</td>
<td>Statics</td>
<td></td>
</tr>
<tr>
<td>ENCP 201</td>
<td>Introduction to Applied Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>or EMCH 201</td>
<td>Introduction to Applied Numerical Methods</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENCP 210</td>
<td>Dynamics</td>
<td></td>
</tr>
<tr>
<td>ECIV 210</td>
<td>Dynamics</td>
<td></td>
</tr>
<tr>
<td>EMCH 310</td>
<td>Dynamics</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENCP 260</td>
<td>Introduction to the Mechanics of Solids</td>
<td></td>
</tr>
<tr>
<td>ECIV 220</td>
<td>Mechanics of Solids</td>
<td></td>
</tr>
<tr>
<td>EMCH 260</td>
<td>Solid Mechanics</td>
<td></td>
</tr>
<tr>
<td>ENCP 330</td>
<td>Introduction to Vibrations</td>
<td>3</td>
</tr>
<tr>
<td>or EMCH 330</td>
<td>Mechanical Vibrations</td>
<td></td>
</tr>
<tr>
<td>ENCP 440</td>
<td>Sustainable Development in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENCP 460</td>
<td>Special Topics in Engineering and Computing</td>
<td>1-6</td>
</tr>
<tr>
<td>ENCP 481</td>
<td>Project Management</td>
<td>1</td>
</tr>
<tr>
<td>ENCP 499</td>
<td>Interdisciplinary Technical Elective</td>
<td>1-3</td>
</tr>
<tr>
<td>ENCP 540</td>
<td>Environmentally Conscious Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>BMEN 240</td>
<td>Cellular and Molecular Biology with Engineering Applications</td>
<td>4</td>
</tr>
<tr>
<td>BMEN 271</td>
<td>Introduction to Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>BMEN 290</td>
<td>Thermodynamics of Biomolecular Systems</td>
<td>3</td>
</tr>
<tr>
<td>BMEN 300 and above, except BMEN 301 and BMEN 303</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE 211</td>
<td>Digital Logic Design</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 212</td>
<td>Introduction to Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 240</td>
<td>Advanced Programming Techniques</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 274</td>
<td>Robotic Applications and Design</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 313</td>
<td>Embedded Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 317</td>
<td>Computer Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 520</td>
<td>Database System Design</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 567</td>
<td>Visualization Tools</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 582</td>
<td>Bayesian Networks and Decision Graphs</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 587</td>
<td>Big Data Analytics</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 202</td>
<td>Exploring the Chemical Engineering Workplace</td>
<td>1</td>
</tr>
<tr>
<td>or ECHE 203</td>
<td>Research in Chemical Engineering</td>
<td></td>
</tr>
<tr>
<td>ECHE 372</td>
<td>Introduction to Materials</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 389</td>
<td>Special Topics in Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 456</td>
<td>Computational Methods for Engineering Applications</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 497</td>
<td>Thesis Preparation</td>
<td>1-3</td>
</tr>
<tr>
<td>ECHE 499</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td>ECHE 520</td>
<td>Chemical Engineering Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 521</td>
<td>Computational Fluid Dynamics for Engineering Applications</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 571</td>
<td>Corrosion Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 572</td>
<td>Polymer Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 573</td>
<td>Next Energy</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 574</td>
<td>Combustion</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 589</td>
<td>Special Advanced Topics in Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 220</td>
<td>Electrical Engineering for Non-Majors</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 221</td>
<td>Circuits</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 222</td>
<td>Signals and Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 300 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECIV 300 and above, except ECIV 360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMCH 300 and above, except EMCH 354 and EMCH 360</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1 Excerpt ECIV 360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Excerpt EMCH 354 and EMCH 360</td>
<td></td>
<td></td>
</tr>
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</table>

**Technical Electives (9 hours)**

A list of acceptable Technical Elective courses is maintained in the department office and on its website. The list includes the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Engineering Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry Lab Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENCP 102</td>
<td>Introduction to Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>or EMCH 111</td>
<td>Introduction to Computer-Aided Design</td>
<td></td>
</tr>
<tr>
<td>MATH 374</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>MATH 500 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 500 and above, except STAT 541 and STAT 591</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 101</td>
<td>Biological Principles I</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 101L</td>
<td>Biological Principles I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 102</td>
<td>Biological Principles II</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 102L</td>
<td>Biological Principles II Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 120</td>
<td>Human Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 120L</td>
<td>Laboratory in Human Biology</td>
<td>1</td>
</tr>
</tbody>
</table>
Core AIU, CMS, GHS, GSS, VSR requirement must be either at least one course used to satisfy the Liberal Arts Elective or a Carolina Liberal Arts Electives (3 hours)

1. the 300-level or above and in the same field of study as one of the other courses, or
2. 270 or above in the field of ENGL. Liberal Arts Electives include the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 200 and above</td>
<td>Introduction to Sustainability Management and Leadership</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 231</td>
<td>Environmental Pollution and Health</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 321</td>
<td>Integrating Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 300 and above</td>
<td>Algorithmic Design I</td>
<td>4</td>
</tr>
<tr>
<td>MSCI 300 and above</td>
<td>Algorithmic Design II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 300 and above</td>
<td>Computer Hardware Foundations</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 145</td>
<td>UNIX/Linux Fundamentals</td>
<td>1</td>
</tr>
<tr>
<td>CSCE 350</td>
<td>Data Structures and Algorithms</td>
<td>3</td>
</tr>
</tbody>
</table>

**Liberal Arts Electives (3 hours)**

At least one course used to satisfy the Liberal Arts Elective or a Carolina Core AIU, CMS, GHS, GSS, VSR requirement must be either at least one course used to satisfy the Liberal Arts Elective or a Carolina Liberal Arts Electives (3 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERO 401</td>
<td>National Security/Leadership Responsibilities/Commissioning Preparation (POC cadets only)</td>
<td>4</td>
</tr>
<tr>
<td>AERO 402</td>
<td>National Security / Leadership Responsibilities / Commissioning Preparation II (POC cadets only)</td>
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<tr>
<td>AFAM 201</td>
<td>Introduction to African American Studies: Social and Historical Foundations</td>
<td>3</td>
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<tr>
<td>AFAM 202</td>
<td>Introduction to African-American Studies</td>
<td>3</td>
</tr>
<tr>
<td>AFAM 335</td>
<td>The American Civil Rights Movement</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 101</td>
<td>Primates, People, and Prehistory</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 102</td>
<td>Understanding Other Cultures</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 219</td>
<td>Great Discoveries in Archaeology</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 300 and above except ANTH 399, ANTH 501</td>
<td>Introduction to Women's and Gender Studies</td>
<td>3</td>
</tr>
<tr>
<td>ARTE 101</td>
<td>Introduction to Art</td>
<td>3</td>
</tr>
<tr>
<td>ARTH 105</td>
<td>History of Western Art I</td>
<td>3</td>
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<tr>
<td>ARTH 106</td>
<td>History of Western Art II</td>
<td>3</td>
</tr>
<tr>
<td>ARTH 300 and above except ARTH 399, ARTH 498, ARTH 499, ARTH 599</td>
<td>Introduction to the Theatre I</td>
<td>3</td>
</tr>
<tr>
<td>ARMY 406</td>
<td>American Military Experience (Army cadets only)</td>
<td>3</td>
</tr>
<tr>
<td>CPLT any course; courses CPLT 270 and above count as 300-level</td>
<td>Dance Appreciation</td>
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<tr>
<td>DANC 101</td>
<td>Principles of Microeconomics</td>
<td>3</td>
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<tr>
<td>ECON 221</td>
<td>Principles of Macroeconomics</td>
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<tr>
<td>ECON 224</td>
<td>Introduction to Economics</td>
<td>3</td>
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<tr>
<td>ECON 300 and above except ECON 399, ECON 421, ECON 499, ECON 524, ECON 595</td>
<td>Introduction to the Theatre II</td>
<td>3</td>
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<tr>
<td>ENGL any course above 102, except 460 through 467</td>
<td>Women's Health</td>
<td>3</td>
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<tr>
<td>Foreign languages 121 Elementary</td>
<td>Race, Class, Gender, and Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>Foreign languages 300 and above except intensive reading courses or courses about teaching</td>
<td>Sociology of Families</td>
<td>3</td>
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</tbody>
</table>

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**Chemical Engineering, B.S.E.**

<table>
<thead>
<tr>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Introduction to Geography</td>
<td>3</td>
</tr>
<tr>
<td>Globalization and World Regions</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 300 and above except GEOG 399, GEOG 595</td>
<td>3</td>
</tr>
<tr>
<td>Interdisciplinary Study of Latin America</td>
<td>3</td>
</tr>
<tr>
<td>Latin American Cultures</td>
<td>3</td>
</tr>
<tr>
<td>South American Indian Cultures</td>
<td>3</td>
</tr>
<tr>
<td>Mesoamerican Prehistory</td>
<td>3</td>
</tr>
<tr>
<td>Geography of Latin America</td>
<td>3</td>
</tr>
<tr>
<td>Politics and Governments of Latin America</td>
<td>3</td>
</tr>
<tr>
<td>Special Topics in Latin American Studies</td>
<td>3</td>
</tr>
<tr>
<td>Prehistoric Archaeology of South America</td>
<td>3</td>
</tr>
<tr>
<td>International Relations of Latin America</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Language Sciences</td>
<td>3</td>
</tr>
<tr>
<td>Language, Culture, and Society</td>
<td>3</td>
</tr>
<tr>
<td>Topics in Linguistics</td>
<td>3</td>
</tr>
<tr>
<td>Topics in Language and Culture</td>
<td>3</td>
</tr>
<tr>
<td>Language and Gender</td>
<td>3</td>
</tr>
<tr>
<td>Research in Language Conflict and Language Rights</td>
<td>3</td>
</tr>
<tr>
<td>Discourse, Gender, and Politics of Emotion</td>
<td>3</td>
</tr>
<tr>
<td>Anthropological Approaches to Narrative and Performance</td>
<td>3</td>
</tr>
<tr>
<td>Psychology of Language</td>
<td>3</td>
</tr>
<tr>
<td>Survey of Linguistics</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Jazz and American Popular Music</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Music Literature</td>
<td>3</td>
</tr>
<tr>
<td>MUSC any music history course at or above 300-level</td>
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<tr>
<td>Evolution of the Art of War (Midshipmen only)</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Philosophy</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Psychology of Adjustment</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 300 and above except PSYC 570 to PSYC 599</td>
<td>3</td>
</tr>
<tr>
<td>RELG any course</td>
<td>3</td>
</tr>
<tr>
<td>Introductory Sociology</td>
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</tr>
<tr>
<td>SOC 300 and above except 399</td>
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</tr>
<tr>
<td>Understanding and Appreciation of Theatre</td>
<td>3</td>
</tr>
<tr>
<td>History of the Theatre I</td>
<td>3</td>
</tr>
<tr>
<td>History of the Theatre II</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Women's and Gender Studies</td>
<td>3</td>
</tr>
<tr>
<td>Women's Health</td>
<td>3</td>
</tr>
<tr>
<td>Gender and Culture</td>
<td>3</td>
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<tr>
<td>Sex and Gender</td>
<td>3</td>
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<tr>
<td>Psychology of Marriage</td>
<td>3</td>
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<tr>
<td>Race, Class, Gender, and Sexuality</td>
<td>3</td>
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<tr>
<td>Sociology of Families</td>
<td>3</td>
</tr>
<tr>
<td>Feminist Theory</td>
<td>3</td>
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<tr>
<td>African-American Feminist Theory</td>
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<tr>
<td>Psychology of Women</td>
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</table>
Select two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 303</td>
<td>Fundamental Genetics</td>
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<tr>
<td>BIOL 460</td>
<td>Advanced Human Physiology</td>
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<tr>
<td>BIOL 505</td>
<td>Developmental Biology</td>
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<tr>
<td>BIOL 530</td>
<td>Histology</td>
<td></td>
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<tr>
<td>BIOL 665</td>
<td>Human Molecular Genetics</td>
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</tr>
<tr>
<td>BMEN 271</td>
<td>Introduction to Biomaterials</td>
<td></td>
</tr>
<tr>
<td>BMEN 321</td>
<td>Biomonitoring and Electrophysiology</td>
<td></td>
</tr>
<tr>
<td>BMEN 342</td>
<td>Infectious Disease &amp; Immunology for Biomedical Engineers</td>
<td></td>
</tr>
<tr>
<td>BMEN 345</td>
<td>Human Anatomy and Physiology for Biomedical Engineers</td>
<td></td>
</tr>
<tr>
<td>BMEN 346</td>
<td>Medical Microbiology for Biomedical Engineers</td>
<td></td>
</tr>
<tr>
<td>BMEN 389</td>
<td>Special Topics in Biomedical Engineering for Undergraduates</td>
<td></td>
</tr>
<tr>
<td>BMEN 391</td>
<td>Kinetics in Biomolecular Systems</td>
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<tr>
<td>BMEN 392</td>
<td>Fundamentals of Biochemical Engineering</td>
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</tr>
<tr>
<td>BMEN 499</td>
<td>Independent Research</td>
<td></td>
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<tr>
<td>BMEN 546</td>
<td>Delivery of Bioactive Agents</td>
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<tr>
<td>BMEN 547</td>
<td>Immunoengineering</td>
<td></td>
</tr>
<tr>
<td>BMEN 548</td>
<td>Cardiovascular System: From Development to Disease</td>
<td></td>
</tr>
<tr>
<td>BMEN 565</td>
<td>Advanced Biomechanics</td>
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</tr>
<tr>
<td>BMEN 572</td>
<td>Tissue Engineering</td>
<td></td>
</tr>
<tr>
<td>BMEN 589</td>
<td>Special Topics in Biomedical Engineering</td>
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</tr>
</tbody>
</table>

Total Credit Hours 15

1 BIOL 101 and BIOL 102 are prerequisites for BIOL 302. Multiple distinct 389/589 courses may be counted.

**Concentration in Biomolecular Engineering (15 hours)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 302</td>
<td>Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>or BMEN 240</td>
<td>Cellular and Molecular Biology with Engineering Applications</td>
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<tr>
<td>CHEM 550</td>
<td>Biochemistry</td>
<td>3</td>
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</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMEN 271</td>
<td>Introduction to Biomaterials</td>
<td></td>
</tr>
<tr>
<td>BMEN 391</td>
<td>Kinetics in Biomolecular Systems</td>
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</tr>
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</table>

Total Credit Hours 15
Concentration in Interdisciplinary Engineering (15 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>EMCH 220</td>
<td>Mechanical Engineering Fundamentals for Non-Majors</td>
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</tr>
<tr>
<td>EMCH 260</td>
<td>Solid Mechanics</td>
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<tr>
<td>EMCH 310</td>
<td>Dynamics</td>
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<tr>
<td>MATH 526</td>
<td>Numerical Linear Algebra</td>
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<tr>
<td>STAT 509</td>
<td>Statistics for Engineers</td>
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<tr>
<td>CSCE 206</td>
<td>Scientific Applications Programming</td>
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<tr>
<td>or ECHE 456</td>
<td>Computational Methods for Engineering Applications</td>
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<tr>
<td>ELCT 220</td>
<td>Electrical Engineering for Non-Majors</td>
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<tr>
<td>or ELCT 221</td>
<td>Circuits</td>
<td></td>
</tr>
<tr>
<td>ECHE 372</td>
<td>Introduction to Materials</td>
<td></td>
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<tr>
<td>or EMCH 371</td>
<td>Materials</td>
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<tr>
<td>CHEM 621</td>
<td>Instrumental Analysis</td>
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Total Credit Hours 15

Concentration in Materials (15 hours)

<table>
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<tr>
<td>ECHE 372</td>
<td>Introduction to Materials</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>ECHE 389</td>
<td>Special Topics in Chemical Engineering (designated materials courses)</td>
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<tr>
<td>ECHE 571</td>
<td>Corrosion Engineering</td>
<td></td>
</tr>
<tr>
<td>ECHE 572</td>
<td>Polymer Processing</td>
<td></td>
</tr>
<tr>
<td>ECHE 589</td>
<td>Special Advanced Topics in Chemical Engineering (designated materials courses)</td>
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<tr>
<td>Select three of the following:</td>
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<tr>
<td>CHEM 511</td>
<td>Inorganic Chemistry</td>
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<tr>
<td>CHEM 633</td>
<td>Introduction to Polymer Synthesis</td>
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<tr>
<td>CHEM 644</td>
<td>Materials Chemistry</td>
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<tr>
<td>ELCT 363</td>
<td>Introduction to Microelectronics</td>
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<tr>
<td>ELCT 563</td>
<td>Semiconductor Electronic Devices</td>
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<tr>
<td>EMCH 573</td>
<td>Introduction to Nuclear Materials</td>
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<tr>
<td>ECHE 389</td>
<td>Special Topics in Chemical Engineering (designated materials electives)</td>
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<tr>
<td>ECHE 499</td>
<td>Special Problems (approved materials-related research project, up to 3 credit hours)</td>
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<tr>
<td>ECHE 571</td>
<td>Corrosion Engineering</td>
<td></td>
</tr>
<tr>
<td>ECHE 572</td>
<td>Polymer Processing</td>
<td></td>
</tr>
<tr>
<td>ECHE 589</td>
<td>Special Advanced Topics in Chemical Engineering (designated materials electives)</td>
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</table>

Total Credit Hours 15

1 Multiple distinct 389/589 courses may be counted.

Concentration in Environmental Engineering (15 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ECIV 350</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 362</td>
<td>Introduction to Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 558</td>
<td>Environmental Engineering Process Modeling</td>
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<tr>
<td>CHEM 623</td>
<td>Introductory Environmental Chemistry</td>
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<tr>
<td>or CHEM 624</td>
<td>Aquatic Chemistry</td>
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<td>Select one of the following:</td>
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<tr>
<td>ENVR 231</td>
<td>Introduction to Sustainability Management and Leadership</td>
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<tr>
<td>ENVR 321</td>
<td>Environmental Pollution and Health</td>
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<tr>
<td>ENVR 322</td>
<td>Environmental Ethics</td>
<td></td>
</tr>
<tr>
<td>ENVR 331</td>
<td>Integrating Sustainability</td>
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Total Credit Hours 15

Concentration in Numerical Methods and Computing (15 hours)

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<td>Select one of the following:</td>
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<tr>
<td>EMCH 201</td>
<td>Introduction to Applied Numerical Methods</td>
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<td>ENCP 201</td>
<td>Introduction to Applied Numerical Methods</td>
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<td>Select four of the following:</td>
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<tr>
<td>CSCE 145</td>
<td>Algorithmic Design I</td>
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<tr>
<td>CSCE 146</td>
<td>Algorithmic Design II</td>
<td></td>
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<tr>
<td>MATH 374</td>
<td>Discrete Structures</td>
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<tr>
<td>or MATH 574</td>
<td>Discrete Mathematics (500-level or higher)</td>
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<tr>
<td>GEOL 575</td>
<td>Numerical Modeling for Earth Science Applications</td>
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</tr>
<tr>
<td>EMCH 501</td>
<td>Engineering Analysis I</td>
<td></td>
</tr>
<tr>
<td>ECHE 589</td>
<td>Special Advanced Topics in Chemical Engineering (depending on topic coverage, multiple versions possible)</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 15

B.S.E. with Distinction

The B.S.E. with Distinction is available to students majoring in chemical engineering who wish to participate in significant research and/or design activities in chemical engineering with a faculty mentor.

A minimum GPA of 3.50 in major courses, 3.50 in all engineering courses, and 3.50 overall is required at the time the student applies to enter the departmental undergraduate research track.

The student should apply to enter the departmental undergraduate research track and choose the members of the thesis committee as early as possible but in all cases at least one year before submitting and defending the thesis. The thesis committee will consist of a thesis advisor, who must be a tenure-track faculty member in chemical engineering, and two other tenure-track or research faculty members in chemical engineering or in any other department.

By the end of the semester in which the student is admitted into the research track, a short description of the research must be agreed upon by the thesis committee and the student, and filed in the college office. Projects involving research and/or design are acceptable. The design projects or research projects for ECHE 465, ECHE 466, ECHE 567, or other courses are not acceptable as the thesis. The student must also choose three credit hours of engineering or technical elective courses related to the thesis topic. The course(s) must be approved by the thesis committee.
and completed by the student at least one semester before the thesis is submitted and defended.

Before submitting and defending the thesis, the student must have completed three credit hours of ECHE 499 under the thesis advisor, preferably one credit hour per semester. During the semester in which the thesis is submitted and defended the student must also complete three credit hours of ECHE 497, one credit hour under each of the three members of the thesis committee. At least two months before submitting and defending the thesis, the student must present a progress report to the thesis committee orally and in writing.

By the end of his/her last semester, the student must have presented the research at a national meeting of a professional society (such as AIChE, ACS, ECS, etc.), at Discovery Day at USC, or at a comparable venue. The student must also submit a written thesis describing the research and defend it orally before the thesis committee. The defense must be announced at least one week in advance and be open to the general public.

Students who successfully fulfill all of these requirements with a GPA of at least 3.50 in the three hours of ECHE 497, 3.50 in all major courses, 3.50 in all engineering courses, and 3.50 overall, will be awarded their degree with “Distinction in Chemical Engineering” upon graduation.

**Major Map**

A major map is a layout of required courses in a given program of study, including critical courses and suggested course sequences to ensure a clear path to graduation.

Major maps are only a suggested or recommended sequence of courses required in a program of study. Please contact your academic advisor for assistance in the application of specific coursework to a program of study and course selection and planning for upcoming semesters.