CHEMICAL ENGINEERING, B.S.E.

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 States 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>
</tbody>
</table>
Complete all of the following:

**Lower Division Engineering (14-15 hours)**

- ECHE 101 Introduction to Chemical Engineering 2-3
- or ENCP 101 Introduction to Engineering

**Chemistry Electives (3 hours)**

<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:

- CSCE 145 Algorithmic Design I 4
- CSCE 206 Scientific Applications Programming 3

**Lower Division Engineering (14-15 hours)**

Complete all of the following:

- ECHE 101 Introduction to Chemical Engineering 2-3
- or ENCP 101 Introduction to Engineering

**Chemistry Electives (3 hours)**

A list of acceptable Chemistry 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>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:

- CSCE 145 Algorithmic Design I 4
- CSCE 206 Scientific Applications Programming 3

**Lower Division Engineering (14-15 hours)**

Complete all of the following:

- ECHE 101 Introduction to Chemical Engineering 2-3
- or ENCP 101 Introduction to Engineering

**Chemistry Electives (3 hours)**

A list of acceptable Chemistry 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>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>
BMEN 300 and above, except BMEN 301 and BMEN 303
CSCE 211  Digital Logic Design  3
CSCE 212  Introduction to Computer Architecture  3
CSCE 240  Advanced Programming Techniques  3
CSCE 274  Robotic Applications and Design  3
CSCE 313  Embedded Systems  3
CSCE 317  Computer Systems Engineering  3
CSCE 520  Database System Design  3
CSCE 567  Visualization Tools  3
CSCE 582  Bayesian Networks and Decision Graphs  3
CSCE 587  Big Data Analytics  3
ECHE 202  Exploring the Chemical Engineering Workplace  1
or ECHE 203  Research in Chemical Engineering  3
ECHE 372  Introduction to Materials  3
ECHE 389  Special Topics in Chemical Engineering  3
ECHE 497  Thesis Preparation  1-3
ECHE 499  Special Problems  1-3
ECHE 520  Chemical Engineering Fluid Mechanics  3
ECHE 521  Computational Fluid Dynamics for Engineering Applications  3
ECHE 571  Corrosion Engineering  3
ECHE 572  Polymer Processing  3
ECHE 573  Next Energy  3
ECHE 574  Combustion  3
ECHE 575  Engineering of Soft Materials  3
ECHE 589  Special Advanced Topics in Chemical Engineering  3
ELCT 220  Electrical Engineering for Non-Majors  3
ELCT 221  Circuits  3
ELCT 222  Signals and Systems  3
ELCT 300 and above
ECIV 300 and above, except ECIV 360
EMCH 300 and above, except EMCH 354 and EMCH 360

1 Except ECIV 360
2 Except EMCH 354 and EMCH 360

Technical Electives (12 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 Computer-Aided Design</td>
<td>3</td>
</tr>
<tr>
<td>or EMCH 111</td>
<td>Introduction to Computer-Aided Design</td>
<td></td>
</tr>
<tr>
<td>MATH 300</td>
<td>Transition to Advanced Mathematics</td>
<td>3</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>
<tr>
<td>BIOL 200 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENVR 231</td>
<td>Introduction to Sustainability Management and Leadership</td>
<td>3-4</td>
</tr>
<tr>
<td>ENVR 321</td>
<td>Environmental Pollution and Health</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 331</td>
<td>Integrating Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 300 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSCI 300 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 300 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE 145</td>
<td>Algorithmic Design I</td>
<td>4</td>
</tr>
<tr>
<td>CSCE 146</td>
<td>Algorithmic Design II</td>
<td>4</td>
</tr>
<tr>
<td>CSCE 210</td>
<td>Computer Hardware Foundations</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 215</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>
<tr>
<td>ACCT 222</td>
<td>Survey of Accounting</td>
<td>3</td>
</tr>
<tr>
<td>FINA 333</td>
<td>Finance and Markets</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 371</td>
<td>Principles of Management</td>
<td>3</td>
</tr>
<tr>
<td>MGSC 290</td>
<td>Computer Information Systems in Business</td>
<td>3</td>
</tr>
<tr>
<td>MKTG 350</td>
<td>Principles of Marketing</td>
<td>3</td>
</tr>
<tr>
<td>All approved Carolina Core Courses for AIU, CMS, GFL, GHS, GSS, and VSR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Engineering Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Chemistry Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Chemistry Lab Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Technical Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO 401</td>
<td>National Security/Leadership Responsibilities/Commissioning Preparation (POC cadets only)</td>
<td>3</td>
</tr>
<tr>
<td>AERO 402</td>
<td>National Security / Leadership Responsibilities /Commissioning Preparation II (POC cadets only)</td>
<td>3</td>
</tr>
<tr>
<td>AFAM 201</td>
<td>Introduction to African American Studies: Social and Historical Foundations</td>
<td>3</td>
</tr>
<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></td>
<td></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>
</tr>
<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></td>
<td></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></td>
<td></td>
</tr>
<tr>
<td>DANC 101</td>
<td>Dance Appreciation</td>
<td>3</td>
</tr>
<tr>
<td>ECON 221</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 222</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 224</td>
<td>Introduction to Economics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 300 and above except ECON 399, ECON 421, ECON 499, ECON 524, ECON 595</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Concentrations (15 hours) optional

Students may pursue any of the following concentrations by choosing specified engineering, technical, and chemistry elective courses to fulfill degree requirements:

- Concentration in Biomolecular Engineering
- Concentration in Energy
- Concentration in Interdisciplinary Engineering
- Concentration in Materials
- Concentration in Environmental Engineering
- Concentration in Numerical Methods and Computing

To fulfill the requirements for any concentration, a student must complete five courses (15 credit hours) in one area. Consult the department website or advising handbook for the most up to date list of approved concentration courses. Although these courses are designated as electives in the B.S.E. curriculum in chemical engineering, certain courses in the lists are designated as “required” with respect to fulfilling concentration requirements. Also note that the lists may not include all of the prerequisites for some of the listed courses.

### 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>
<td></td>
</tr>
<tr>
<td>CHEM 550</td>
<td>Biochemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

### Major Courses (33 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 321</td>
<td>Heat-Flow Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 322</td>
<td>Mass Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 430</td>
<td>Chemical Engineering Kinetics</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 440</td>
<td>Separation Process Design</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 456</td>
<td>Computational Methods for Engineering Applications</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 460</td>
<td>Chemical Engineering Laboratory I</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 461</td>
<td>Chemical Engineering Laboratory II</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 465</td>
<td>Chemical-Process Analysis and Design I</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 466</td>
<td>Chemical-Process Analysis and Design II</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 550</td>
<td>Chemical-Process Dynamics and Control</td>
<td>3</td>
</tr>
<tr>
<td>ECHE 567</td>
<td>Process Safety, Health and Loss Prevention</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Hours**: 33
Select one of the following:  
BMEN 271 Introduction to Biomaterials  
BMEN 391 Kinetics in Biomolecular Systems  

Select two of the following:  
BIOL 303 Fundamental Genetics  
BIOL 460 Advanced Human Physiology  
BIOL 505 Developmental Biology  
BIOL 530 Histology  
BIOL 665 Human Molecular Genetics  
BMEN 271 Introduction to Biomaterials  
BMEN 321 Biomonitoring and Electrophysiology  
BMEN 342 Infectious Disease & Immunology for Biomedical Engineers  
BMEN 345 Human Anatomy and Physiology for Biomedical Engineers  
BMEN 346 Medical Microbiology for Biomedical Engineers  
BMEN 389 Special Topics in Biomedical Engineering for Undergraduates  
BMEN 391 Kinetics in Biomolecular Systems  
BMEN 392 Fundamentals of Biochemical Engineering  
BMEN 499 Independent Research  
BMEN 546 Delivery of Bioactive Agents  
BMEN 547 Immunoen engineering  
BMEN 548 Cardiovascular System: From Development to Disease  
BMEN 565 Advanced Biomechanics  
BMEN 572 Tissue Engineering  
BMEN 589 Special Topics in Biomedical Engineering  
ECHE 575 Engineering of Soft Materials

Total Credit Hours 15

1 Multiple distinct 389/589 courses may be counted.

Concentration in Energy (15 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 573</td>
<td>Next Energy</td>
<td>3</td>
</tr>
</tbody>
</table>

Select four of the following:  
ECHE 372 Introduction to Materials  
ECHE 389 Special Topics in Chemical Engineering (designated energy electives)  
ECHE 499 Special Problems (approved energy-related research project, up to 3 credit hours)  
ECHE 571 Corrosion Engineering  
ECHE 574 Combustion  
ECHE 589 Special Advanced Topics in Chemical Engineering (designated energy electives)  
ELCT 363 Introduction to Microelectronics  
ELCT 510 Photovoltaic Materials and Devices  
ELCT 563 Semiconductor Devices for Power, Communications and Lighting  
EMCH 552 Introduction to Nuclear Engineering  
EMCH 553 Nuclear Fuel Cycles  
EMCH 576 Fundamentals and Applications of Fuel Cells

Total Credit Hours 15

Concentration in Interdisciplinary Engineering (15 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMCH 200</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>or ECIV 200</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>or ENCP 200</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 260</td>
<td>Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 310</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 526</td>
<td>Numerical Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>STAT 509</td>
<td>Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 206</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>or ECHE 456</td>
<td>Computational Methods for Engineering Applications</td>
<td>3</td>
</tr>
<tr>
<td>ELCT 220</td>
<td>Electrical Engineering for Non-Majors</td>
<td>3</td>
</tr>
<tr>
<td>or ELCT 221</td>
<td>Circuits</td>
<td>3</td>
</tr>
</tbody>
</table>

Select five courses from the following:  
EMCH 372 Introduction to Materials  
EMCH 389 Special Topics in Chemical Engineering (designated materials courses)  
ECHE 571 Corrosion Engineering  
ECHE 572 Polymer Processing  
EMCH 589 Special Advanced Topics in Chemical Engineering (designated materials courses)  

Total Credit Hours 15

Concentration in Materials (15 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 372</td>
<td>Introduction to Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:  
ECHE 389 Special Topics in Chemical Engineering (designated materials courses)  
ECHE 571 Corrosion Engineering  
ECHE 572 Polymer Processing  
EMCH 589 Special Advanced Topics in Chemical Engineering (designated materials courses)  

Select three of the following:  
CHEM 511 Inorganic Chemistry  
CHEM 633 Introduction to Polymer Synthesis  
CHEM 644 Materials Chemistry  
ELCT 363 Introduction to Microelectronics  
ELCT 563 Semiconductor Devices for Power, Communications and Lighting  
EMCH 573 Introduction to Nuclear Materials  
ECHE 389 Special Topics in Chemical Engineering (designated materials electives)  
ECHE 499 Special Problems (approved materials-related research project, up to 3 credit hours)  
ECHE 571 Corrosion Engineering  
ECHE 572 Polymer Processing  
ECHE 589 Special Advanced Topics in Chemical Engineering (designated materials electives)  

Total Credit Hours 15

1 BIOL 101 and BIOL 102 are prerequisites for BIOL 302. Multiple distinct 389/589 courses may be counted.
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>
</tr>
</thead>
<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>
<td>3</td>
</tr>
<tr>
<td>CHEM 623</td>
<td>Introductory Environmental Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 624</td>
<td>Aquatic Chemistry</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVR 231</td>
<td>Introduction to Sustainability Management and Leadership</td>
<td>3</td>
</tr>
<tr>
<td>ENVR 321</td>
<td>Environmental Pollution and Health</td>
<td></td>
</tr>
<tr>
<td>ENVR 322</td>
<td>Environmental Ethics</td>
<td></td>
</tr>
<tr>
<td>ENVR 331</td>
<td>Integrating Sustainability</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credit Hours**: 15

### Concentration in Numerical Methods and Computing (15 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMCH 201</td>
<td>Introduction to Applied Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>ENCP 201</td>
<td>Introduction to Applied Numerical Methods</td>
<td></td>
</tr>
</tbody>
</table>

Select four 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></td>
</tr>
<tr>
<td>CSCE 146</td>
<td>Algorithmic Design II</td>
<td></td>
</tr>
<tr>
<td>MATH 374</td>
<td>Discrete Structures</td>
<td></td>
</tr>
<tr>
<td>MATH (500-level or higher)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEOL 575</td>
<td>Numerical Modeling for Earth Science Applications</td>
<td>9</td>
</tr>
<tr>
<td>EMCH 501</td>
<td>Engineering Analysis I</td>
<td></td>
</tr>
<tr>
<td>ECHE 521</td>
<td>Computational Fluid Dynamics for Engineering Applications</td>
<td>6</td>
</tr>
<tr>
<td>ECHE 589</td>
<td>Special Advanced Topics in Chemical Engineering (depending on topic coverage, multiple versions possible)</td>
<td>9</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 (https://academicbulletins.sc.edu/search/?P=ECHE%20465), ECHE 466 (https://academicbulletins.sc.edu/search/?P=ECHE%20466), ECHE 567 (https://academicbulletins.sc.edu/search/?P=ECHE%20567), 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 (https://academicbulletins.sc.edu/search/?P=ECHE%20499) 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 (https://academicbulletins.sc.edu/search/?P=ECHE%20497), 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 (https://academicbulletins.sc.edu/search/?P=ECHE%20497), 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.