Chemical Engineering, B.S.Ch.E.

**Degree Offered**
- Bachelor of Science in Chemical Engineering (B.S.Ch.E.)

**Nature of the Program**

The chemical engineering curriculum is designed to give graduates a broad background in chemical engineering processes and to prepare them to become practicing engineers. Graduates are prepared for positions in operations, development, design, construction, and management of chemical plants, environmental processes, life sciences, and materials processing. These industries convert raw materials, such as ethylene and other organic feedstocks, via chemical and physical changes to produce economically desirable products such as plastics, detergents, paints, and adhesives. Students with this background are also prepared for graduate school in engineering and science as well as for any professional school. The Bachelor of Science in Chemical Engineering program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org/.

**Program Educational Objectives**
- Graduates will be successful in their professional careers and/or post graduate training as demonstrated by their identification and subsequent solution of problems, development of new and valuable ideas, pursuit of continual professional development, and application of chemical engineering and related skills to new challenges.
- Graduates will be able to succeed in diverse professional environments, working effectively in multifunctional teams and independently, providing leadership, and communicating effectively.
- Graduates will demonstrate professional character exhibited by their ethical behavior, their commitment to responsible safety practices, and their dedication to maintain accountability for the global, societal, and environmental impact of their work.

Click here to view the Suggested Plan of Study (p. 6)

**Curriculum in Chemical Engineering**

**General Education Foundations**

Please use this link to view a list of courses that meet each GEF requirement. (http://registrar.wvu.edu/gef/)

**Note:** Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 - F2B - Science &amp; Technology</td>
<td>ENGL 101 &amp; ENGL 102 or ENGL 103 - Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research</td>
<td>3-6</td>
</tr>
<tr>
<td>F2A/F2B - Science &amp; Technology</td>
<td>ENGL 103 - Accelerated Academic Writing</td>
<td>9</td>
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<tr>
<td>F3 - Math &amp; Quantitative Reasoning</td>
<td>3-4</td>
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</tr>
<tr>
<td>F4 - Society &amp; Connections</td>
<td>3</td>
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<tr>
<td>F5 - Human Inquiry &amp; the Past</td>
<td>3</td>
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<tr>
<td>F6 - The Arts &amp; Creativity</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>F7 - Global Studies &amp; Diversity</td>
<td>3</td>
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<tr>
<td>F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)</td>
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<tr>
<td><strong>Total Hours</strong></td>
<td><strong>31-37</strong></td>
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</table>

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

**Degree Requirements**

Students must meet the following criteria to qualify for a Bachelor of Science in Chemical Engineering degree:
- Complete a minimum of 128 credit hours
- Satisfy WVU's undergraduate degree requirements
• Satisfy Statler College's undergraduate degree requirements (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policies/text)
• Complete all courses listed in the curriculum requirements with the required minimum grades
• Attain an overall grade point average of 2.00 or better
• Attain a WVU grade point average of 2.00 or better
• Attain a Statler grade point average of 2.00 or better
• A maximum of one math or science course with a grade of D+, D, or D- may apply towards a Statler College degree
• Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans.

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, PDA, PNGE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at WVU. The Overall GPA is computed based on all work taken at WVU and transfer work.

**Curriculum Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>University Requirements</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Fundamentals of Engineering Requirements</td>
<td>5</td>
</tr>
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<td></td>
<td>Math and Science Requirements</td>
<td>36</td>
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<td>Chemical Engineering Program Requirements</td>
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<td>Total Hours</td>
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**University Requirements**

<table>
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<tr>
<th>Code</th>
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<tr>
<td></td>
<td>General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)</td>
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<td>Outstanding GEF Requirements 1, 4, 5, 6, and 7</td>
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<td>ENGR 191 First-Year Seminar</td>
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**Fundamentals of Engineering Requirements**

<table>
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<tr>
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<tr>
<td></td>
<td>ENGR 101 Engineering Problem Solving 1</td>
<td>2</td>
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<tr>
<td>CHE 102</td>
<td>Introduction to Chemical Engineering</td>
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<tr>
<td>ENGR 102 Engineering Problem-Solving 2</td>
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<tr>
<td>MAE 102</td>
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**Math and Science Requirements**

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<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry 1</td>
<td>8</td>
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<tr>
<td>&amp; 115L</td>
<td>and Fundamentals of Chemistry 1 Laboratory</td>
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<tr>
<td>&amp; CHEM 116</td>
<td>and Fundamentals of Chemistry 2</td>
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<tr>
<td>&amp; CHEM 116L</td>
<td>and Fundamentals of Chemistry 2 Laboratory</td>
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<tr>
<td>CHEM 233</td>
<td>Organic Chemistry 1</td>
<td>4</td>
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<tr>
<td>&amp; 233L</td>
<td>and Organic Chemistry 1 Laboratory</td>
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<tr>
<td>MATH 153</td>
<td>Calculus 1a with Precalculus</td>
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<tr>
<td>&amp; MATH 154</td>
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<td>MATH 155</td>
<td>Calculus 1</td>
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MATH 156  Calculus 2 (GEF 8)  4
MATH 251  Multivariable Calculus  4
MATH 261  Elementary Differential Equations  4

Physics:
PHYS 111  General Physics 1  4
& 111L  and General Physics 1 Laboratory (GEF 8)
PHYS 112  General Physics 2  4
& 112L  and General Physics 2 Laboratory (GEF 8)

Total Hours  36

Chemical Engineering Major Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
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<td>Material and Energy Balance</td>
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<tr>
<td>CHE 230</td>
<td>Numerical Methods for Chemical Engineering</td>
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<tr>
<td>CHE 231</td>
<td>Chemical Engineering Thermodynamics and Kinetics</td>
<td>4</td>
</tr>
<tr>
<td>CHE 322</td>
<td>Unit Operations 1</td>
<td>4</td>
</tr>
<tr>
<td>CHE 323</td>
<td>Unit Operations 2</td>
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<td>CHE 315</td>
<td>Chemical Engineering Transport Analysis</td>
<td>3</td>
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<tr>
<td>CHE 325</td>
<td>Chemical Reaction Engineering</td>
<td>3</td>
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<tr>
<td>CHE 351L</td>
<td>Chemical Process Laboratory</td>
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<tr>
<td>CHE 355</td>
<td>Process Simulation and Design</td>
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<tr>
<td>CHE 435</td>
<td>Chemical Process Control</td>
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<tr>
<td>CHE 452L</td>
<td>Chemical Engineering Senior Laboratory</td>
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<td>CHE 452S</td>
<td>Chemical Engineering Senior Laboratory Analysis</td>
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<tr>
<td>CHE 455</td>
<td>Chemical Process Design 1</td>
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& 455S    | and Chemical Process Design 1 Studio                      |       |
| CHE 456S | Chemical Process Design 2                                 | 3     |
| CHE 475  | Chemical Process Safety                                   | 3     |

Technical Electives
- Engineering Science Electives  6
- Advanced Science Electives  7
  - Advanced Chemistry Elective (3hrs)
  - Life Science Elective (4hrs)
- Other Technical Electives  9

Total Hours  68

TECHNICAL ELECTIVES

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>BMG 201</td>
<td>Introduction to Biomedical Engineering</td>
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<td>BMG 311</td>
<td>Biomaterials</td>
<td>1</td>
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<tr>
<td>BMG 480</td>
<td>Cellular Machinery</td>
<td>1</td>
</tr>
<tr>
<td>BMG 481</td>
<td>Applied Bio-Molecular Modeling</td>
<td>1</td>
</tr>
<tr>
<td>BMG 482</td>
<td>Introduction to Tissue Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE 310</td>
<td>Civil Engineering Materials</td>
<td>1</td>
</tr>
<tr>
<td>CE 332</td>
<td>Introduction to Transportation Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CE 347</td>
<td>Introduction to Environmental Engineering</td>
<td>1</td>
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</table>
& 347L    | and Introduction to Environmental Engineering Laboratory   |       |
| CE 351   | Introductory Soil Mechanics                                | 1     |
& 351L    | and Introductory Soil Mechanics Laboratory                 |       |
<p>| CHE 366  | Materials Science                                          | 1     |
| CHE 414  | Coal Conversion Engineering                                | 1     |</p>
<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CHE 461</td>
<td>Polymer Science and Engineering</td>
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<td>CHE 462</td>
<td>Polymer Processing</td>
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<tr>
<td>CHE 463</td>
<td>Polymer Composites Processing</td>
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<tr>
<td>CHE 466</td>
<td>Electronic Materials Processing</td>
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<tr>
<td>CHE 471</td>
<td>Biochemical Engineering</td>
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<td>CHE 472</td>
<td>Biochemical Separations</td>
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<td>CHE 476</td>
<td>Pollution Prevention</td>
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<td>CHE 495</td>
<td>Independent Study</td>
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<td>CHE 496</td>
<td>Senior Thesis</td>
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<tr>
<td>CHE 498</td>
<td>Honors</td>
</tr>
<tr>
<td>CPE 271 &amp; 271L</td>
<td>Introduction to Digital Logic Design</td>
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<tr>
<td>EE 221 &amp; 221L</td>
<td>Introduction to Electrical Engineering</td>
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<tr>
<td>EE 223 &amp; 223L</td>
<td>Electrical Circuits</td>
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<td>IENG 213</td>
<td>Engineering Statistics</td>
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<td>IENG 220 &amp; 220L</td>
<td>Re-Engineering Management Systems</td>
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<td>IENG 377</td>
<td>Engineering Economy</td>
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<tr>
<td>IENG 461</td>
<td>System Safety Engineering</td>
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<tr>
<td>MAE 211 &amp; 211L</td>
<td>Mechatronics</td>
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<td>MAE 215</td>
<td>Intro to Aerospace Engineering</td>
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<tr>
<td>MAE 241</td>
<td>Statics</td>
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<td>MAE 242</td>
<td>Dynamics</td>
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<td>MAE 243</td>
<td>Mechanics of Materials</td>
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<td>MAE 425</td>
<td>Internal Combustion Engines</td>
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<tr>
<td>MAE 473</td>
<td>Bioengineering</td>
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<tr>
<td>PNGE 200</td>
<td>Introduction to Petroleum Engineering</td>
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<tr>
<td>AGBI 410 &amp; 410L</td>
<td>Introductory Biochemistry</td>
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<tr>
<td>AGBI 512</td>
<td>Nutritional Biochemistry</td>
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<tr>
<td>BIOC 339</td>
<td>Introduction to Human Biochemistry</td>
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<tr>
<td>BMEG 311</td>
<td>Biomaterials</td>
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<tr>
<td>BMEG 480</td>
<td>Cellular Machinery</td>
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<tr>
<td>BMEG 481</td>
<td>Applied Bio-Molecular Modeling</td>
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<tr>
<td>BMEG 482</td>
<td>Introduction to Tissue Engineering</td>
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<td>CHE 366</td>
<td>Materials Science</td>
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<tr>
<td>CHE 466</td>
<td>Electronic Materials Processing</td>
</tr>
<tr>
<td>CHEM 215 &amp; 215L</td>
<td>Introductory Analytical Chemistry</td>
</tr>
<tr>
<td>CHEM 234 &amp; 234L</td>
<td>Organic Chemistry 2</td>
</tr>
<tr>
<td>CHEM 310 &amp; 310L</td>
<td>Instrumental Analysis</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>Environmental Chemistry</td>
</tr>
<tr>
<td>CHEM 348 &amp; 348L</td>
<td>Physical Chemistry 2</td>
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<tr>
<td>AEM 341 &amp; 341L</td>
<td>General Microbiology</td>
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Advanced Chemistry Electives 3

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<tr>
<td>CHEM 215 &amp; 215L</td>
<td>Introductory Analytical Chemistry</td>
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<tr>
<td>CHEM 234 &amp; 234L</td>
<td>Organic Chemistry 2</td>
</tr>
<tr>
<td>CHEM 310 &amp; 310L</td>
<td>Instrumental Analysis</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>Environmental Chemistry</td>
</tr>
<tr>
<td>CHEM 348 &amp; 348L</td>
<td>Physical Chemistry 2</td>
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Life Sciences Electives 4

<table>
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<tr>
<td>AEM 341 &amp; 341L</td>
<td>General Microbiology</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>AEM 401</td>
<td>Environmental Microbiology and Environmental Microbiology Laboratory</td>
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<td>AEM 401L</td>
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<tr>
<td>BIOL 101</td>
<td>General Biology 1 and General Biology 1 Laboratory</td>
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<td>&amp; 101L</td>
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<td>&amp; BIOL 102</td>
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<tr>
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<td>Principles of Biology and Principles of Biology Laboratory</td>
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<td>Introductory Physiology and Introductory Physiology Laboratory</td>
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<tr>
<td>&amp; 117L</td>
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<td>BIOL 235</td>
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<td>GEN 371</td>
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**Other Technical Electives**

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<tr>
<td>AEM 341</td>
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<td>&amp; 115L</td>
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<td>BIOL 117</td>
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<td>&amp; 117L</td>
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<td>BIOL 219</td>
<td>The Living Cell and The Living Cell Laboratory</td>
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<tr>
<td>&amp; 219L</td>
<td>The Living Cell and The Living Cell Laboratory</td>
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<td>Ecology and Evolution</td>
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<td>Human Physiology</td>
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<td>BMEG 311</td>
<td>Biomaterials</td>
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<td>Civil Engineering Materials</td>
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<tr>
<td>CE 332</td>
<td>Introduction to Transportation Engineering</td>
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<td>CE 347</td>
<td>Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory</td>
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<td>Introductory Soil Mechanics and Introductory Soil Mechanics Laboratory</td>
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<tr>
<td>CHE 366</td>
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<td>Senior Thesis</td>
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<td>Introductory Analytical Chemistry</td>
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<td>Introductory Analytical Chemistry and Introductory Analytical Chemistry Laboratory</td>
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### CHE 497
Research

### CHEM 234
Organic Chemistry 2

& 234L
and Organic Chemistry 2 Laboratory

### CHEM 310
Instrumental Analysis

& 310L
and Instrumental Analysis Laboratory

### CHEM 312
Environmental Chemistry

### CHEM 348
Physical Chemistry 2

& 348L
and Physical Chemistry 2 Laboratory

### CPE 271
Introduction to Digital Logic Design

& 271L
and Digital Logic Laboratory

### CS 110
Introduction to Computer Science

& 110L
and Introduction to Computer Science Laboratory

### CS 220
Discrete Mathematics

### EE 221
Introduction to Electrical Engineering

& 221L
and Introduction to Electrical Engineering Laboratory

### EE 223
Electrical Circuits

& 223L
and Electrical Circuits Laboratory

### ESWS 155
Elements of Environmental Protection

### GEN 371
Principles of Genetics

& 371L
and Principles of Genetics Laboratory

### GEOL 101
Planet Earth

& 101L
and Planet Earth Laboratory

### GEOL 203
Physical Oceanography

### IENG 213
Engineering Statistics

*Completion of IENG 213 and STAT 215 will fulfill one elective requirement.*

### IENG 220
Re-Engineering Management Systems

& 220L
and Re-Engineering Management Systems Laboratory

### IENG 377
Engineering Economy

### IENG 461
System Safety Engineering

### MAE 211
Mechatronics

& 211L
and Mechatronics Laboratory

### MAE 215
Intro to Aerospace Engineering

### MAE 241
Statics

### MAE 242
Dynamics

### MAE 243
Mechanics of Materials

### MAE 244L
Dynamics and Strength Laboratory

### MAE 425
Internal Combustion Engines

### MAE 473
Bioengineering

### MATH 303
Introduction to the Concepts of Mathematics

### PHYS 211
Introduction to Mathematical Physics

### PHYS 314
Introductory Modern Physics

### PSIO 241
Elementary Physiology

### STAT 215
Introduction to Probability and Statistics

*Completion of IENG 213 and STAT 215 will not fulfill two elective requirements.*

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**SUGGESTED PLAN OF STUDY**

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical B.S.Ch.E degree program that completes degree requirements in four years is as follows.

### First Year

#### Fall

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 115 &amp; 115L (GEF 2)</td>
<td>4 MATH 156 (GEF 8)</td>
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</tr>
<tr>
<td>ENGL 101 (GEF 1)</td>
<td>3 ENGR 102 or CHE 102</td>
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ENGR 101  |  2 PHYS 111 & 111L (GEF 8)  |  4  
ENGR 191  |  1 CHEM 116 & 116L  |  4  
MATH 155 (GEF 3)  |  4  
GEF 4  |  3  

### Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CHE 221</td>
<td>4</td>
<td>CHE 230</td>
<td>3</td>
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<tr>
<td>CHEM 233</td>
<td>3</td>
<td>MATH 261</td>
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<tr>
<td>CHEM 233L</td>
<td>1</td>
<td>PHYS 112</td>
<td>4</td>
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<tr>
<td>ENGL 102 (GEF 1)</td>
<td>3 GEF 6</td>
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<tr>
<td>MATH 251</td>
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<td>GEF 5</td>
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<thead>
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<th>Third Year</th>
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</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>CHE 321</td>
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<tr>
<td>CHE 322</td>
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<tr>
<td>Life Science Elective</td>
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<tr>
<td>GEF 7</td>
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<tr>
<td>Technical Elective</td>
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<table>
<thead>
<tr>
<th>Fourth Year</th>
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<tbody>
<tr>
<td>Fall</td>
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<tr>
<td>CHE 315</td>
</tr>
<tr>
<td>CHE 452L</td>
</tr>
<tr>
<td>CHE 452S</td>
</tr>
<tr>
<td>CHE 455 &amp; 455S</td>
</tr>
<tr>
<td>Advanced Chemistry Elective</td>
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<tr>
<td>Technical Elective</td>
</tr>
</tbody>
</table>

|            | 16    |                      | 15    |

Total credit hours: 128

### Major Learning Outcomes

**CHEMICAL ENGINEERING**

Upon graduation, all Bachelors of Science students in Chemical Engineering will have:

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.
The Chemical and Biomedical Engineering Department uses an outcomes-assessment plan for continuous program improvement. Course work and design projects, in conjunction with yearly interviews provide the measures of learning outcomes. These outcomes-assessment results provide feedback to the faculty to improve teaching and learning processes.