CHEMICAL AND BIOLOGICAL ENGINEERING - BACHELOR OF SCIENCE (BS)

Program Educational Objectives
The department prepares our graduates to make significant contributions in many diverse areas. Specifically, within a few years of graduation our graduates will have achieved one or more of the following attributes:

- In their chosen field, be established in a professional career, be pursuing an advanced degree, or be seeking advanced certification.
- Be recognized as academic, industrial, or entrepreneurial leaders.
- Be successfully working and communicating in a variety of technical fields.
- Be adapting to new technologies and changing professional environments.

Student Outcomes
At the time of graduation, graduates will demonstrate:

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

Premed Track
This track is offered for students preparing for medical school. Since chemical engineering already requires most of the premed courses, it is a logical choice for students who desire an engineering degree and the opportunity to pursue a medical profession. For information on the premed track, visit the department’s Current Students (http://www.colorado.edu/chbe/academics/undergraduate-program/current-students) webpage and consult the current advising guide.

Concurrent Degree Program
BS/MS in Chemical and Biological Engineering and Chemical Engineering
The concurrent BS/MS program in the Department of Chemical and Biological Engineering enables especially well qualified students to work concurrently towards a BS in chemical and biological engineering and a MS degree in chemical engineering. Students are admitted into the program during the spring of their junior year and begin planning a graduate program. This program allows for early planning of the MS portion of the student’s education, taking graduate courses as part of their BS degree requirements. Up to 6 credits may be counted towards both the BS and MS degree programs.

Recommended Four-Year Plan of Study

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>APPM 1350</td>
<td>Calculus 1 for Engineers</td>
<td>4</td>
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<tr>
<td>CHEN 1211</td>
<td>General Chemistry for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1221</td>
<td>Engineering General Chemistry Lab</td>
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</tr>
<tr>
<td>CHEN 1310</td>
<td>Introduction to Engineering Computing</td>
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<td>CHEN 1300</td>
<td>Introduction to Chemical Engineering</td>
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<td>APPM 1360</td>
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<tr>
<td>CHEN 2810</td>
<td>Biology for Engineers</td>
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<tr>
<td>PHYS 1110</td>
<td>General Physics 1</td>
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<td>Calculus 3 for Engineers</td>
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<tr>
<td>CHEM 3311</td>
<td>Organic Chemistry 1</td>
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<td>CHEM 3321</td>
<td>Laboratory in Organic Chemistry 1</td>
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<tr>
<td>CHEN 2120</td>
<td>Chemical Engineering Material and Energy Balances</td>
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<td>PHYS 1120</td>
<td>General Physics 2</td>
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<td>Introduction to Differential Equations with Linear Algebra</td>
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<tr>
<td>CHEM 3331</td>
<td>Organic Chemistry 2</td>
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<td>CHEM 3341</td>
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<td>CHEN 3200</td>
<td>Chemical Engineering Fluid Mechanics</td>
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<td>CHEN 4521</td>
<td>Physical Chemistry for Engineers</td>
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### Year Three

#### Fall Semester

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<th>Course Title</th>
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<tbody>
<tr>
<td>CHEN 3320</td>
<td>Chemical Engineering Thermodynamics ¹</td>
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<td>CHEN 3010</td>
<td>Applied Data Analysis ¹</td>
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<td>CHEN 3210</td>
<td>Chemical Engineering Heat Transfer ¹</td>
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<td></td>
<td>College-approved writing course ⁶</td>
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<td></td>
<td>Free Electives</td>
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#### Spring Semester

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<tr>
<td>CHEM 4611</td>
<td>Survey of Biochemistry ⁴</td>
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<tr>
<td>CHEN 4090</td>
<td>Undergraduate Seminar ¹</td>
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<tr>
<td>CHEN 3220</td>
<td>Chemical Engineering Separations and Mass Transfer ¹</td>
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<tr>
<td>CHEN 4805</td>
<td>Biomaterials ¹</td>
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<td>CHEN 4830</td>
<td>Chemical Engineering Biokinetics ¹</td>
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### Year Four

#### Fall Semester

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<tr>
<td>CHEN 4520</td>
<td>Chemical Process Synthesis ¹</td>
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<tr>
<td>CHEN 4810</td>
<td>Biological Engineering Laboratory ¹</td>
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<tr>
<td>CHEN 4820</td>
<td>Biochemical Separations ¹</td>
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<td>Technical Electives ³</td>
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#### Spring Semester

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<th>Course Title</th>
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<tbody>
<tr>
<td>CHEN 4530</td>
<td>Chemical Engineering Design Project ¹</td>
<td>2</td>
</tr>
<tr>
<td>CHEN 4570</td>
<td>Instrumentation and Process Control ¹</td>
<td>4</td>
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<td>Focus Tech Elective ⁵</td>
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</table>

**Total Credit Hours**

| Total Credit Hours | **128** |

¹ Course is offered only in the semester indicated.
² Students may choose courses from the list of college-approved humanities and social sciences (HSS) electives on the college's Humanities, Social Sciences and Writing Requirements (http://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements) webpage.
³ Electives must meet specific requirements. Visit the department's Current Students (http://www.colorado.edu/chbe/academics/undergraduate-program/current-students) webpage and consult the current advising guide.
⁴ Alternate is CHEM 4700 and either CHEM 4720 or CHEM 4740.
⁵ One of the following courses must be taken as the focus technical elective: Pharmaceutical Biotechnology (CHEN 4801, 3), Tissue Engineering and Medical Devices (CHEN 4802, 3) or Metabolic Engineering (CHEN 4803, 3). These courses will be taught in alternating years and should be taken in the junior or senior year as available.