Chemical and Biochemical Engineering, Ph.D.

**Requirements**

The Doctor of Philosophy program in chemical and biochemical engineering requires a minimum of 72 s.h. of graduate credit. However, the degree is granted primarily on the basis of achievement rather than on the accumulation of semester hours. Students typically are expected to have completed three academic years in residence, or two years if they already hold a recognized master's degree. Students must maintain a cumulative g.p.a. of at least 3.25.

All students must complete a core curriculum, which consists of one course in transport phenomena, chemical thermodynamics, chemical reaction kinetics, technical communication, and data science plus five additional courses (total of 30 s.h.).

The Ph.D. with a major in chemical and biochemical engineering requires the following coursework.

### Transport Phenomena

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE:5115</td>
<td>Transport Phenomena I</td>
<td>3</td>
</tr>
<tr>
<td>Alternate courses approved on a case-by-case basis, and may include:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME:5430</td>
<td>Biotransport</td>
<td>3</td>
</tr>
<tr>
<td>ME:5143</td>
<td>Computational Fluid and Thermal Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Other courses with consent of advisor

### Chemical Thermodynamics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE:5110</td>
<td>Intermediate Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>Alternate courses approved on a case-by-case basis, and may include:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 5000-level thermal physics course</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other courses with consent of advisor

### Chemical Reaction Kinetics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE:3205</td>
<td>Introduction to Biochemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CBE:5315</td>
<td>Polymer Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CBE:5425</td>
<td>Atmospheric Chemistry and Physics</td>
<td>3</td>
</tr>
</tbody>
</table>

### Technical Communication

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE:5105</td>
<td>Introduction to Literature Review and Proposal Writing</td>
<td>3</td>
</tr>
</tbody>
</table>

### Data Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE:5120</td>
<td>Data Science in Chemical and Engineering Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

### Additional Requirements

All students are required to take ENGR:7270 Engineering Ethics (1 s.h.) during their first semester and CBE:5000 Seminar in Chemical and Biochemical Engineering every semester in residence. Students earn the remainder of credit for the degree in elective courses and research.

Students are required to satisfy a qualifying requirement with a minimum g.p.a. of at least 3.50 in the four core courses and pass a comprehensive examination before they can become candidates for degree. The comprehensive examination is the presentation and defense of the candidate's research proposal. These examinations are arranged by members of the examining committee and may be repeated at the committee's discretion. Comprehensive examination policies are published in the Manual of Rules and Regulations on the Graduate College website. A final examination, which is a defense of the thesis, completes the doctoral program.

For a detailed description of program requirements, see Graduate Program on the Department of Chemical and Biochemical Engineering website.