CHEMICAL AND BIOLOGICAL ENGINEERING PHD

Degree Requirements
The following requirements are in addition to, or further elaborate upon, those requirements outlined in The Graduate School Policy Guide (https://catalogs.northwestern.edu/tgs/academic-policies-procedures).

PhD
Total Units Required: 10

<table>
<thead>
<tr>
<th>Course</th>
<th>Department Courses (6 units)</th>
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<tbody>
<tr>
<td>Core chemical engineering topics (4 units):</td>
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<tr>
<td>CHEM_ENG 421-0</td>
<td>Fluid Mechanics</td>
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<tr>
<td>CHEM_ENG 422-0</td>
<td>Heat and Mass Transfer</td>
</tr>
<tr>
<td>CHEM_ENG 408-0</td>
<td>Chemical Engineering Kinetics and Reactor Design</td>
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<tr>
<td>CHEM_ENG 404-0</td>
<td>Advanced Thermodynamics</td>
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</table>

Departmental electives (2 units)

Additional Electives

Must be chosen from outside the department (2 units)

May be chosen from within or outside the department (2 units)

Other PhD Degree Requirements:

• Departmental Seminar: 4 quarters of attendance of the research seminar
• Short courses: Responsible Conduct of Research and Professional Skills
• Teaching: Four quarters as a teaching assistant or a participant as a Teaching Apprentice
• Examinations: oral defense of dissertation research proposal during first nine quarters of residency
• Research/Projects: toward dissertation
• PhD Dissertation: based on independent, original research
• Final Evaluations: oral defense of dissertation