CHEMICAL & BIOMOLECULAR ENGINEERING, MSE

The Chemical and Biomolecular Engineering master's is for students who wish to prepare themselves for research and development activities by obtaining a more solid foundation in the principles of chemical and biomolecular engineering. At the same time, limited specialization in one of several fields, such as fluid mechanics, thermodynamics, control, design, bioengineering, polymer engineering, heat transfer, or computer applications is possible.

For more information: http://www.cbe.seas.upenn.edu/prospective-students/masters/index.php

Master’s Degree Requirements

10 course units are required for the MSE in Chemical and Biomolecular Engineering.\(^1\)\(^2\)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Course Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE 618</td>
<td>Advanced Molecular Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td>CBE 621</td>
<td>Advanced Chemical Kinetics and Reactor Design</td>
<td>1</td>
</tr>
<tr>
<td>CBE 640</td>
<td>Transport Processes I (Fall)</td>
<td>1</td>
</tr>
<tr>
<td>Math Requirement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENM 510</td>
<td>Foundations of Engineering Mathematics - I</td>
<td>1</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select 6 electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total Course Units</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Students are required to take ten course units to graduate: (3 core, 1 math and 6 electives)

\(^2\) Program Duration

- MSE students must register for at least three course units per semester to maintain full-time status. This is especially important for international students to maintain their visa status.
- Full-time master’s students can complete their degrees in one to two years. In order to complete the degree in one year, it is necessary to take four course units in both the fall and spring semesters, with two course units during the summer session.

With the exceptions given below, the electives can be chosen from any courses in engineering or the sciences at a level of 500 or above.

- Of the 4 elective courses, students may take two Independent Study (597) courses with a letter grade or two written Thesis (599) courses with an S grade.
- Two electives must be from CBE.
- Permission is required from the department for either CBE 597 Master’s Thesis Research or CBE 599 Master’s Indep Study.
- Courses from Wharton, including (STAT, MGMT, or OID), will not be counted towards the MSE degree.
- No more than two of the electives can be taken from the following list:
  - CIT 590 Programming Languages and Techniques.
  - CIT 592 Mathematical Foundations of Computer Science
  - EAS 503 Energy Systems and Policy
  - EAS 505 Climate Policy and Technology
  - EAS 506 Electricity and Systems Markets
  - EAS 507 Intellectual Property and Business Law for Engineers
  - EAS 510 Technical Communication and Academic Writing for Non-native Speakers of English
  - EAS 512 Engineering Negotiation
  - EAS 545 Engineering Entrepreneurship I
  - EAS 546 Engineering Entrepreneurship II
  - EAS 549 Engr Entrepreneurship Lab
  - EAS 590 Commercializing Information Technology
  - ESE 504 Intro to Linear, Nonlinear and Integer Optimization
  - ESE 540 Engineering Economics
  - ESE 544 Project Management

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2020 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.