CHEMICAL ENGINEERING, M.S.

The Department of Chemical and Biological Engineering does not consider applications for a terminal M.S. degree; the department admits only to the Ph.D. program. The M.S. degree can be awarded post admission for work completed leading to the Ph.D. degree. The M.S. degree is not a prerequisite for the Ph.D. degree.

Graduate study in the department may be directed toward the master of science or the doctor of philosophy in chemical engineering. The graduate courses are planned to train outstanding students for advanced work in research and development.

The Department of Chemical and Biological Engineering has a tradition of excellence dating back to 1905. For a century, the program has consistently ranked as one of the best in the world. The department offers research opportunities in both traditional and emerging areas of research in chemical and biological engineering. These areas include energy-related science and technology, soft and hard materials science and engineering, systems engineering and optimization, catalysis, process control and design, nanotechnology, biotechnology, biomedical engineering, complex fluids, colloid and interfacial phenomena, atomic, molecular, and multiscale modeling, polymers (synthesis and processing), micro- and nano-electronics, environmental engineering and sustainability, reactor design, and atomic-scale design of surface reactivity. These areas of research are advanced by leveraging tools from the fields of applied mathematics, statistical mechanics, kinetics and catalysis, thermodynamics, and transport phenomena.

Research in the department is highly interdisciplinary, capitalizing on programs of national prominence such as the NSF Materials Research Science and Engineering Center (MRSEC), the nation’s largest NIH-funded biotechnology training program, and the Computation and Informatics in Biology and Medicine training program. Interdisciplinary research opportunities are also available through the Materials Science Program, the Center for Nanotechnology, and the Rheology Research Center. Researchers in the department have access to state-of-the-art facilities for research, including facilities for nanofabrication and the life sciences.

Graduate students in the department are encouraged to participate in international research experiences, industry internships, and entrepreneurial activities.

For interests and activities of faculty members, along with a list of selected publications for each, see the department’s faculty directory (http://directory. engr. wisc. edu/che/faculty).

ADMISSIONS

This master's program is offered for work leading to the Ph.D. Students may not apply directly for the master’s, and should instead see the admissions information for the Ph.D. (http://guide. wisc. edu/graduate/ chemical-biological-engineering/chemical-engineering-phd).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad. wisc. edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

PROGRAM RESOURCES

Financial support for qualified graduate students is available in the form of research assistantships, teaching assistantships, and fellowships.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide. wisc. edu/graduate/ #policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Mode of Instruction</th>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

Evening/Weekend: These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

Online: These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

Hybrid: These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

Accelerated: These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

CURRICULAR REQUIREMENTS

Minimum Credit Requirement

<table>
<thead>
<tr>
<th>Requirement</th>
<th>30 credits</th>
</tr>
</thead>
</table>

Minimum Residence Credit Requirement 16 credits

Minimum Graduate Coursework Requirement Half of degree coursework (15 credits out of 30 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (https://registrar.wisc.edu/course-guide/).

Overall Graduate GPA Requirement 3.00 GPA required.

Other Grade Requirements Professional group of courses: Grades of B or better are required.

Elective group of courses: In general, grades of B or better are required for credit in this group, but grades of BC or C in non-CBE courses will be counted if balanced credit for credit by grades of A or AB in other courses from this group.

Assessments and Examinations An M.S. candidate must successfully complete an oral examination before a departmental examining committee of the advisor(s) plus two other CBE faculty members. The candidate may defend an M.S. thesis or an independent study project report.

Language Requirements No language requirements.

REQUIRED COURSES

To qualify for the M.S. degree, student must complete a minimum of 30 graduate-level credits (300 and above), divided into two groups:

1. Professional group: minimum of 12 credits of chemical engineering courses. At least 6 credits must be numbered 700–899 (excluding research).

2. Elective group: minimum of 12 credits of graduate courses. At least 6 of these credits shall be in departments other than CBE and shall be chosen for their relevance to chemical and biological engineering.

Up to 6 credits will be allowed for chemical and biological engineering courses numbered between 300 and 499 in groups I and II combined, provided equivalent courses were not previously taken by the student.

The independent study project will comprise a minimum of 3 credits of supervised CBE 790 Master's Research or Thesis and may involve a lab project, theoretical work, or a critical review of an advanced engineering topic.

An M.S. candidate must successfully complete an oral examination before a departmental examining committee.

When a candidate presents a thesis, no fewer than 5 nor more than 8 credits of research (CBE 790) may be counted toward the 30-credit-total requirement. When a thesis is not presented, a maximum of 6 credits of research may be counted toward the total.

Special M.S. Degree

Students who enter the program without a B.S. in chemical engineering must take the following courses, unless equivalent credits can be offered from their undergraduate studies:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBE/B M E 320</td>
<td>Introductory Transport Phenomena</td>
<td>4</td>
</tr>
<tr>
<td>CBE 326</td>
<td>Momentum and Heat Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>CBE 426</td>
<td>Mass Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>CBE 430</td>
<td>Chemical Kinetics and Reactor Design</td>
<td>3</td>
</tr>
<tr>
<td>CBE 440</td>
<td>Chemical Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td>CBE 450</td>
<td>Process Design</td>
<td>3</td>
</tr>
<tr>
<td>or CBE 470</td>
<td>Process Dynamics and Control</td>
<td>3</td>
</tr>
</tbody>
</table>

Departmental M.S. degree requirements (described above), must also be satisfied, except that eight credits rather than 12 credits will be required in the elective group. Upon matriculation, students should request approval of their proposed academic program by department faculty.

POLICIES

GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

GRADUATE PROGRAM HANDBOOK

The Graduate Program Handbook (https://www.engr.wisc.edu/app/uploads/2016/01/CBE_Academic-Policies-8-17.pdf) is the repository for all of the program's policies and requirements.

PRIOR COURSEWORK

Graduate Work from Other Institutions

With program approval, students are allowed to count graduate coursework from other institutions toward the Minimum Graduate Degree Credit Requirement and the Minimum Graduate coursework (50%) Requirement. No credits from other institutions can be counted toward the Minimum Graduate Residence Credit Requirement. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

UW–Madison Undergraduate

A total of 7 undergraduate credits from the UW–Madison undergraduate degree may be counted toward coursework requirements. If those credits are numbered 300 or above, they may be counted toward the Minimum Graduate Degree Credit Requirement. If those credits are numbered 700 or above, they may be counted toward the Minimum Graduate coursework (50%) Requirement. No credits can be counted toward the Minimum Graduate Residence Credit Requirement. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

UW–Madison University Special

With program approval, students are allowed to count up to 15 credits of coursework numbered 300 or above taken as a UW–Madison Special student toward the Minimum Graduate
Residence Credit Requirement, and the Minimum Graduate Degree Credit Requirement and the Minimum Graduate Coursework (50%) Requirement. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

PROBATION
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, orIncomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE
The thesis examining committee comprises the advisor(s) plus two other CBE faculty members. The candidate may defend an M.S. thesis or an independent study project report.

CREDITS PER TERM ALLOWED
15 credits

TIME CONSTRAINTS
Master’s degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

OTHER
Admitted students are offered research assistantships to support the pursuit of dissertation or degree research in chemical engineering. The stipend, after tuition and fees, is guaranteed for the duration of a student’s graduate studies provided satisfactory progress is made toward their degree. Support for students receiving external funding or other program opportunities are reviewed case by case. Although students can be awarded M.S. degrees, there is no direct admission to the M.S. program.

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES
Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.

LEARNING OUTCOMES
1. Demonstrate a strong understanding of mathematical, scientific, and engineering principles in the field.
2. Demonstrate an ability to formulate, analyze, and solve advanced engineering problems.
3. Demonstrate creative, independent problem solving skills.
4. Apply the latest scientific and technological advancements, advanced techniques, and modern engineering tools to these problems.
5. Recognize and apply principles of ethical and professional conduct.

PEOPLE
Faculty: Professors Abbott, Dumesic, Graham, Huber, Klingenberg, Kuech, Lynn, Maravelias (Assistant Chair), Mavrikakis (Chair), Murphy, Palecek, Pfleger, Rawlings, Root, Shusta, Yin; Associate Professors Reed and Swaney; Assistant Professors Van Lehn, and Zavala.

For interests and activities of faculty members, along with a list of selected publications for each, see the department’s faculty directory.