Chemical and Biomolecular Engineering, M.S.

Chemical engineering uses the knowledge of chemistry, mathematics, physics, biology, and humanities to solve societal problems in areas such as energy, health, environment, food, clothing, materials, and sustainability, and serves a variety of processing industries whose vast array of products include chemicals, petroleum products, plastics, pharmaceuticals, foods, textiles, fuels, consumer products, and electronic and cryogenic materials. Chemical Engineering also advances societal goals by developing environmentally conscious and sustainable technologies to meet global challenges. Chemical engineering is an engineering discipline that has its strongest ties with the molecular sciences. This is an important asset since sciences such as chemistry, molecular biology, biomedicine, and solid-state physics are providing the seeds for future technologies. Chemical engineering has a bright future as the discipline which will bridge science with engineering in multidisciplinary environments.

Biomolecular Engineering is concerned with the processing of biological materials and processes that use biological agents such as living cells, enzymes, or antibodies. Biomolecular Engineering, with integrated knowledge of the principles of biology and chemical engineering, plays a major engineering role in the rapidly developing area of biotechnology. Career opportunities in Biomolecular Engineering are available in a variety of industries such as biotechnology, chemical, environmental, food, petrochemical, and pharmaceutical industries.

The principal objectives of the graduate curriculum in Chemical and Biomolecular Engineering are to develop and expand students' abilities to solve new and more challenging engineering problems and to promote their skills in independent thinking and learning in preparation for careers in manufacturing, research, or teaching. These objectives are reached through a program of course work and research designed by each student with the assistance, advice, and approval of a primary faculty advisor and a faculty advisory committee. Programs of study leading to the M.S. and Ph.D. in Chemical and Biomolecular Engineering are offered.

Students applying with the objective of a Ph.D. are admitted to the M.S./Ph.D. program only if they are likely to successfully complete a Ph.D. program. These students do not formally re-apply to the Ph.D. program after completing the M.S. Students who apply to the M.S.-only program must petition for the Ph.D. program if they desire to continue on for the Ph.D. Financial support is usually reserved for those students who plan to complete the Ph.D. The normative time to complete M.S. and Ph.D. degrees is two and five years, respectively.

It is strongly recommended that students have background and training in core Chemical Engineering topics (transport phenomena, thermodynamics, and reaction kinetics) as well as a strong background in mathematics, chemistry, and physics. A student who enters the program without undergraduate preparation in chemical engineering is required to take three to five additional prerequisite courses (MATH 3A and MATH 3D , and CBE 40B - CBE 40C , CBE 110 , CBE 161 , and CBE 120A).

Students are required to take the following courses for the M.S. and as a basis for the Ph.D. preliminary examination.

CBE 210	Reaction Engineering
CBE 220A	Transport Phenomena I
CBE 200	Applied Engineering Mathematics I
CBE 240	Advanced Engineering Thermodynamics

Electives

Graduate advisors should be consulted on the selection of elective courses. All graduate courses offered in CBE are potential electives. Graduate-level courses offered in other Engineering departments and relevant graduate courses from other schools may also be taken as electives.

Two plans are available for the M.S. degree: a thesis option and a comprehensive examination option. Opportunities are available for part-time study toward the M.S.

Plan I: Thesis Option

For the M.S. thesis option, students are required to complete a research study of great depth and originality and obtain approval for a complete program of study. A minimum of 36 units is required for the M.S. The following are required: four required core courses, three quarters of CBE 298 (Department Seminar), three graduate elective courses offered within the department and numbered 200–289, two additional graduate elective courses numbered 200-289 (or 200–295 if offered by other departments), related to their field of graduate studies, and approved by the graduate advisor. Up to two of these elective courses can be substituted by up to eight units of CBE 296 (M.S. Thesis Research), and one of the elective courses may be substituted by an upper-division undergraduate elective course approved by the CBE graduate advisor.

Full-time graduate students must enroll in the departmental seminar each quarter during their first year unless exempt by petition.

Plan II: Comprehensive Examination Option

For the comprehensive examination option, students are required to complete 36 units of study and a comprehensive examination. The following are required: four required core courses, three quarters of CBE 298 (Department Seminar), three graduate elective courses offered within the department and numbered 200–289, two additional graduate elective courses numbered 200-289 (or 200–295 if offered by other departments), related to their field of graduate studies, and approved by the graduate advisor. One of the elective courses may be substituted by an upper-division undergraduate

elective course approved by the CBE graduate advisor. Research units (CBE 296/CBE 299) do not count towards the degree requirements of the Comprehensive Exam Option.

Full-time graduate students must enroll in the departmental seminar each quarter during their first year unless exempt by petition.

In addition to fulfilling the course requirements outlined above, it is a University requirement for the Master of Science degree that students fulfill a minimum of 36 units of study.

Additional Information

Students are required to consult the graduate student handbook for more specific details regarding the course, exam, and unit requirements.