

Chemical Engineering

Course 10

Chemical engineering is the practical application of molecular science. Chemical engineers are involved in basic chemicals, semiconductors, cosmetics, pharmaceuticals, advanced materials, petroleum, medical devices, food, polymers, energy, environmental protection, and biotechnology — anywhere that molecules matter. Chemical engineers leverage their knowledge of molecular processes across multiple length scales to create, analyze, and modify the complex systems that describe processes and the products they make.

Chemical Engineering at MIT

The chemical engineering profession began as the intersection of chemistry with mechanical engineering. Prof. Lewis Norton's new Course, offered in the MIT Department of Chemistry in 1888, advertised "applications of chemistry to the arts" and granted its first bachelor's degrees in 1891.

A key step in the development of the profession was when MIT Profs. Walker, Lewis, and McAdams published *Principles of Chemical Engineering* in 1923. Chemical engineering was its own MIT department by then, and the textbook articulated unified methods by which chemical engineers could approach the wide variety of chemical processes.

The scope of chemical engineering has grown ever wider since the years of its founding and definition. Today Course 10 at MIT remains the largest chemical engineering department in the country. The faculty extend the boundaries with research that ranges from quantum phenomena to atmospheric dispersion, from physics of flow to cell metabolism, from microreactors to the structure of industrial research organizations, and from computational methods to tissue engineering. We think Prof. Norton would be pleased.

Undergraduate Program

The undergraduate program is built on a base of courses in mathematics, chemistry, biology, and physics. Subsequent courses in the engineering sciences explore two important concepts —

equilibrium conditions and rates of change — in physical, chemical, and biological systems. Further courses cover chemical engineering applications, especially the analysis of chemical reactors and methods to recover valuable components from mixtures. Finally, experience in laboratories and design courses emphasizes the variety of chemical and biological processes and the products they make, as well as the role of the engineer in society.

The department offers four degree programs:

- Course 10 leads to the Bachelor of Science in Chemical Engineering. The curriculum prepares the graduate to enter the profession of chemical engineering.
- Course 10B leads to the Bachelor of Science in Chemical-Biological Engineering. Course 10B expands the biological science base, and its laboratory courses focus on biological processes. The extra biology courses are added at the expense of electives and one required subject in Course 10. The curriculum prepares the graduate to enter the profession of chemical engineering.
- Course 10-ENG leads to the Bachelor of Science in Engineering. A more flexible curriculum, it combines a rigorous chemical engineering foundation with a specialization track, such as energy, environment, health, or materials. The curriculum prepares the graduate to enter professions in that specialty area. We anticipate that the curriculum will be accredited by the Accreditation Board for Engineering and Technology (ABET) during its next review cycle as an unspecified engineering degree.
- Course 10C leads to the Bachelor of Science, without specification. This curriculum has fewer formal engineering requirements, allowing the student a wide range of specialization. The curriculum is not accredited by ABET.

Research

Many chemical engineering students take advantage of the MIT Undergraduate Research Opportunities Program (UROP) to supplement their coursework with research experience. UROP provides opportunities to interact with graduate students, post-doctoral visitors, and faculty. Students develop skills not normally acquired in the classroom and occasionally become contributors to a significant research result. The range of research topics in the department is quite wide. In addition, MIT is an institution with low boundaries; members of different academic departments frequently collaborate. Thus, Course 10 students also find opportunities in biology, chemistry, materials science, biological engineering, and other departments.

Professional Development

The department maintains student chapters of the American Institute of Chemical Engineers and the Society for Biological Engineering professional societies. The student chapters organize an Industrial Seminar series during the year, in which representatives of various companies visit MIT and describe opportunities for chemical engineers. In addition, students are invited to attend the monthly meetings of the local section of AIChE, where they will meet practicing engineers from the New England area. The department also assists students in finding summer job opportunities.

After Graduation

Chemical engineering graduates are typically successful at securing jobs or admission to further study. Our graduates go to a wide range of industries, to graduate school, to medical, law, and business schools, to consulting, government agencies, and a variety of other pursuits. The study of chemical engineering provides unexpected qualifications.

The department does not accept our SB graduates into our PhD/ScD program, as we believe that students should have the experience of attending more than one institution. Nevertheless, some SB graduates are accepted into the Department's MSCEP program. The Master of Science in Chemical Engineering Practice requires two terms of graduate level courses and a third term of industrial immersion in the David H. Koch School of Chemical Engineering Practice. The MSCEP can be completed in one calendar year. The program provides an excellent basis for further graduate study or a quick start in industry.

Contact Information

To explore chemical engineering at MIT, contact:
Dr. B. S. Johnston
Department of Chemical Engineering, MIT
77 Massachusetts Avenue, Room 66-368
Cambridge, MA 02139
Phone: (617) 248-7141
Email: bsjohnst@mit.edu
Website: <http://web.mit.edu/cheme>

The MIT Course Catalog contains further information on the Institute, including all graduate and undergraduate courses and programs. For details on ordering the course catalogue, please visit the MIT Press Bookstore website at <http://web.mit.edu/bookstore/www/bulletin.html>.

2011