

# Chemical Engineering

## Course 10

Chemical engineering is the practical application of molecular science. In basic chemicals, semiconductors, cosmetics, pharmaceuticals, advanced materials, petroleum, medical devices, food, polymers, energy, environmental protection, and biotechnology - anywhere that molecules matter - chemical engineers are involved. 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. Offered in the Chemistry Department at MIT in 1888, Prof. Lewis Norton's new Course advertised "applications of chemistry to the arts" and granted its first Bachelor's degrees in 1891.

A key step in developing the profession was the 1923 publication of *Principles of Chemical Engineering* by Profs. Walker, Lewis, and McAdams of MIT. Chemical engineering was its own department by then, and this 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 ChE Department in the country. Our 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, from computational methods to tissue engineering. We think Prof. Norton would be pleased.

### Undergraduate Program

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

equilibrium conditions and rates of change - in physical, chemical, and biological systems. Further subjects apply chemical engineering principles to chemical reactors and methods of recovering valuable components from mixtures. Finally, experience in laboratories and design subjects emphasizes the variety of chemical/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\***. 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 10ENG** leads to the **Bachelor of Science in Engineering\*\***. This flexible curriculum 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.
- **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.

\*accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

\*\* accreditation in preparation

### **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 members. 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: one frequently finds active collaboration among members of different academic departments. 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, believing 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.

### **We Should Become Acquainted**

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The MIT Course Catalog contains further information on the Institute, including all graduate and undergraduate courses and programs. Please visit the MIT Course Catalog website for more details at <http://web.mit.edu/catalog/index.html>

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