Fermentation Technology is the longest-run course in the MIT Professional Education catalog. It has been offered continuously for more than 40 years. This course emphasizes the application of biological and engineering principles to problems involving microbial, mammalian, and biological/biochemical systems. The aim of the course is to review fundamentals and provide an up-to-date account of current knowledge in biological and biochemical technology. The lectures will emphasize and place perspectives on biological systems with industrial practices.

This course has made some major additions, modifications, and revisions in the course topics and course contents over the past few years. In recognition of the increasing number of attendees from non-pharmaceutical industries, the instructors are balancing the course to provide equal emphasis on mammalian and microbial technologies. More than half of the lecturers are currently working in industry or have industrial experience.

Learning Objectives

- Examine the application of biological and engineering principles to problems involving microbial, mammalian, and biological/biochemical systems.
- Recognize the fundamentals of fermentation technology.
- Describe current knowledge in biological and biochemical technology, with a focus on industrial practices.
- Comprehend growth and metabolism, genetics and metabolic engineering in the age of genomics, the biological basis for monitoring bioprocesses including process analytical technology, and applications of the modern biological concepts in bioprocess developments.
- Examine eukaryotic and prokaryotic protein expression relevant to industrial practice, including post-translational modifications (esp. protein glycosylation).
- Assess power requirements in bioreactors, modeling of bioprocesses, traditional and new concepts in bioprocess monitoring, and the biological basis for industrial fermentations and cell cultures.
- Distinguish bioreactor operations in bacteria and mammalian cell systems, oxygen transfer and shear in bioreactors, process improvement through metabolic manipulations, and scale-up of bioreactors such as bacterial, yeast, and mammalian cells.
- Analyze the bioprocess paradigm: Scale-down, bioprocess simulation and economics, sterilization, and bioburden in biological manufacturing.
- Examine considerations in bioprocess simulation and economics, sterilization in biological manufacturing, and clinical implications of bioprocesses.
ABOUT MIT PROFESSIONAL EDUCATION SHORT PROGRAMS

Short Programs offers one- to five-day intensive courses that enable you to access world-class thinking, acquire new skills, and bring innovative ideas back to work. Taught on the MIT campus by MIT faculty/researchers and experts from industry and academia, programs are offered in the following topic categories:

Biotechnology; Pharmaceutical; Computer Science; Crisis Management; Data Modeling and Analysis; Design, Analysis, and Manufacturing; Energy/Transportation; Imaging; Innovation; Leadership; Communication; Radar; Real Estate; Robotics; Systems Engineering; Sustainability; and Tribology

FERMENTATION TECHNOLOGY

PARTICIPANTS’ COMMENTS

⭐️ PROJECT MANAGER, EPITOPIX

“It really passes the fundamentals of fermentation and gets into the real world of analytical measurement, scale-up, media formulation and the theory behind applications.”

⭐️ TECHNOLOGY ENGINEER, WYETH PHARMACEUTICAL

“I felt like the course was well organized, was a good blend of biology and engineering, and has a good balance of practical experience.”

COURSE INSTRUCTORS

Daniel I. C. Wang

Dr. Daniel I.C. Wang is Institute Professor of Chemical Engineering at MIT. He holds a Bachelor of Science and a Master of Science degree in Biochemical Engineering from MIT and a doctorate in Chemical Engineering from the University of Pennsylvania. He is the recipient of numerous awards from the American Chemical Society, the American Institute of Chemical Engineers, and from schools here and abroad. He has been elected to the National Academy of Engineering and the American Institute of Medical and Biomedical Engineering. He has twice received Outstanding Teaching Awards at MIT and is a member of the Editorial Board of Biotechnology and Bioengineering, Comprehensive Biotechnology, Advances in Biotechnology, Genetic Engineering News, and World Scientific Publishing Life Sciences. His publications comprise 250+ papers, five books and 15 patents.

Kristala L. Jones Prather

Kristala Jones Prather is an Associate Professor of Chemical Engineering at MIT and an investigator in the multi-institutional Synthetic Biology Engineering Research Center (SynBERC) funded by the National Science Foundation (USA). She received an S.B. degree from MIT in 1994 and Ph.D. from the University of California, Berkeley (1999), and worked four years in BioProcess Research and Development at the Merck Research Labs (Rahway, NJ). Prather is the recipient of a Camille and Henry Dreyfus Foundation New Faculty Award (2004), an Office of Naval Research Young Investigator Award (2005), a Technology Review “TR35” Young Innovator Award (2007), a National Science Foundation CAREER Award (2010), and the Biochemical Engineering Journal Young Investigator Award (2011). She has been recognized for excellence in teaching with an Outstanding Faculty Award for Undergraduate Teaching in the Dept. of Chemical Engineering (2006) and the Junior Bose Award for Excellence in Teaching given by the MIT School of Engineering (2010). Professor Prather has co-authored more than 45 manuscripts and two book chapters, and has three issued patents with several additional applications pending.