Chemical Engineering- Bachelor of Science in Engineering

For information, contact the Department of Chemical, Paper and Biomedical Engineering, 64 Engineering Building, 513-529-0760.

This program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Chemical Engineering encompasses the analysis, design, and synthesis of products and processes in a variety of areas, such as chemical and petrochemical processes, pharmaceuticals, environmental processes, biotechnology/bioengineering, and pulp and paper processes. The field of chemical engineering requires the ability to understand and apply math and science, to research concepts and apply modeling methods, and to simulate and test working conditions and their impact on the designed systems.

The chemical engineer of the 21st century must be able to think critically in broader contexts because problems in contemporary society are not only technical but also social and economic in nature. This program provides the student with a broad chemical engineering education enhanced by courses in manufacturing engineering, chemistry and biochemistry, economics, humanities, social science, global perspectives, and liberal arts.

Graduates have the opportunity to work in a diverse spectrum of professional fields. These vary from research to design, from development to manufacturing, and from technical sales to production. Chemical engineers work in manufacturing-related areas as well as in non-technical sectors of the economy such as business, law, and management. Graduates will also be prepared to continue their education at the graduate level.

A partial list of industries that employ chemical engineers includes biotechnology and biomedicine, electronics, food processing, environmental protection, paper, petroleum refining, and synthetic fibers.

Merit scholarships provided by the industry-supported Miami University Paper Science and Engineering Foundation enable those students with good academic records who choose the paper science and engineering option within chemical engineering to receive partial tuition to as much as full in-state tuition costs (tuition, fees, room and board). Out-of-state students may be eligible for an additional award of $2,000 per year.

Program Educational Objectives

The undergraduate Chemical Engineering program at Miami University is focused on the integration of engineering science, process design and a global liberal education, with concentrations in biochemical, environmental and paper engineering. Based on the needs of our constituents, we expect a graduate to attain the following within a few years of graduation:

1. The graduate will have and apply the technical knowledge, skills, and expertise required of a process engineer to achieve practical solutions to problems in the chemical industry or for a company allied to the chemical industry. The graduate will serve the needs of biochemical, environmental, and paper industries.
2. The graduate will have the ability to work with individuals from diverse backgrounds to meet professional obligations and will contribute to an inclusive and equitable workplace.
3. The graduate will have the key personal attributes (including independent critical thinking, problem solving, communication, organization, and leadership) desirable in an engineer and use these attributes to learn and develop.
4. The graduate will have life-long learning skills and awareness of ethical responsibilities, which will allow successful adaptation to the changing environment and evolving technologies throughout their professional career.
5. The graduate will have sound grounding in engineering, sciences, and liberal education, which will facilitate successful pursuit of graduate studies in engineering or other professional degrees, such as business, law and medicine.

Student Outcomes

These student outcomes prepare our graduates to attain the program educational objectives listed above, and should be attained by students by the time they graduate.

1. Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Ability to communicate effectively with a range of audiences.
4. Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Credit/No-Credit Policy

All courses in chemistry, physics, biology, mathematics, statistics and those in the College of Engineering and Computing (CPB, CSE, CYB, ECE, EGM, MME, CEC, QTM) that are used to fulfill requirements of the major, must be taken for a grade.

Divisional Policies

Multiple Majors: Students with two or more majors in the College of Engineering and Computing must take a minimum of 15 unique, additional credit hours in each major.

Career Foundations: The Career Foundations course sequence (CEC 190 series) is designed to equip students with the essential professional skills needed for lifelong career success. Students starting in CEC majors in fall 2025 and later are required to take CEC

190 each semester and are automatically registered. CEC 190 is zero credit hours, has a grade mode of credit/no-credit, requires 5-10 hours and awards a badge each semester. Students earn certificates for successfully completing eight badges.

Grade Requirements

You must earn a grade of C or better in CPB 204 .

Transfer Credit Policy

To obtain transfer credit for any 300- or 400-level chemical, paper and biomedical engineering course, you must first receive written departmental approval **before** enrolling in that course at another college or university. Transfer credit may be obtained for **only one** engineering course in the series CPB 204, CPB 318, CPB 314, CPB 313, CPB 403/CPB 503, and CPB 414/CPB 514. Contact the department if transferring into this program.

Program Requirements

(The Chemical Engineering major requires the following courses; additional hours to meet the Miami Plan for Liberal Education are also required.)

Code	Title	Credit Hours
Core Requirements		
CHM 141 & CHM 144	College Chemistry and College Chemistry Laboratory	5
CHM 142 & CHM 145	College Chemistry and College Chemistry Laboratory	5
Select one of the following:		6
CHM 241 & CHM 242	Organic Chemistry and Organic Chemistry	
CHM 251 & CHM 252	Organic Chemistry for Chemistry Majors and Organic Chemistry for Chemistry Majors	
Select the following:		
CHM 244	Organic Chemistry Laboratory	2
or CHM 254	Organic Chemistry Laboratory for Chemistry Majors	
CHM 332 & 332L	Outlines of Biochemistry and Outlines of Biochemistry Lab	3-4
or CHM 363	Analytical Chemistry	
or CHM 375	Analytical Chemistry for Majors	
or CHM 432	Fundamentals of Biochemistry	
or CHM 471	Biophysical Chemistry I	
ENG 313	Technical Writing	3
MTH 151	Calculus I	4
MTH 245	Differential Equations for Engineers	3-4
or MTH 246	Linear Algebra and Differential Equations for Engineers	
MTH 251	Calculus II	4-5
or MTH 249	Calculus II	
STA 301	Applied Statistics	3-4
or STA 261	Statistics	
or ECE 345	Introduction to Probability, Statistics, and Random Processes	
PHY 181	General Physics I	4
PHY 182	General Physics II	4
Engineering Science		
CEC 111	Imagination, Ingenuity and Impact I	2
CEC 112	Imagination, Ingenuity, and Impact II	2
CPB/MME 314	Engineering Thermodynamics	3
CPB/MME 341	Engineering Economics	3
CPB 219	Statics and Mechanics of Materials	3
or MME 211	Static Modeling of Mechanical Systems	
Chemical Engineering Courses		
CPB 204	Mass and Energy Balances I	2
CPB 202	Pulp and Paper Physics	3
or MME 223	Engineering Materials	
or CPB 419	Biomaterials	
CPB 205	Mass and Energy Balances II	2
CPB 311	Transport Phenomena Laboratory	2
CPB 318	Transport Phenomena I	4
CPB 324	Chemical and Bio- Engineering Computation and Statistics	3
or CSE 271	Object-Oriented Programming	
CPB 412	Chemical Engineering Thermodynamics	3
CPB 414	Mass Transfer and Unit Operations	4
CPB 415	Chemical Kinetics and Reactor Design	3
CPB 451	Unit Operations Laboratory	2
CPB 471	Engineering Design I	2
CPB 472	Engineering Design II	2
CPB 473	Chemical Process Design	3
CPB 482	Process Control	3
CPB 483	Chemical Process Safety	1
Technical Electives		
Select 9 or more credit hours of the following courses:		9
CPB 201	Principles of Paper Science and Engineering	
CPB 244	Introduction to Environmental Engineering	
CPB 301	Pulp and Paper Chemistry	
CPB 326	Fundamentals of Medical Device Design	
CPB 404	Papermaking	
CPB 416	Biochemical Engineering	
CPB 417	Quantitative Physiology	
CPB 423	Biomechanics	
CPB 426	Fundamentals of Tissue Engineering	
CPB 405	Industrial Environmental Control	
CPB 441	Pollution Prevention in Environmental Management	
CPB 442	Air Pollution Control	
CPB 490	Special Topics in Paper and Chemical Engineering	

ECE 205	Electric Circuit Analysis I	
Total Credit Hours		**107-111**