CHEMICAL ENGINEERING

Home Department: Chemical Engineering And Materials Science

Department Head:

Susan Farhat, Ph.D.

Program Overview

Chemical engineers apply the principles of chemistry, math, and physics to the design and operation of large-scale chemical manufacturing processes. They translate processes developed in the lab into practical applications for the production of products such as plastics, medicines, detergents, and fuels; design plants to maximize productivity and minimize costs; and evaluate operations for performance and product quality. Due to the diversity seen in the field, chemical engineers have a broad knowledge of engineering science and environmental regulations, and as a consequence are prepared to manage large scale, multi-disciplinary projects.

The BS in Chemical Engineering is designed to prepare graduates with an understanding of advanced chemistry topics; fundamental material and energy balances for chemical processes; thermodynamics; fluid dynamics and heat transfer; chemical reaction engineering; separations and mass transfer technology; and process design, optimization, and control. Students are also exposed to experimental and computational methods related to chemical engineering, in a sequential set of courses beginning in their sophomore year. Many of these laboratory courses require students to work in teams to submit written and oral reports or apply computational software to complete their projects. In their senior year, students take part in a capstone design course which allows them to integrate the knowledge acquired from their prior foundational courses. Throughout the curriculum, process safety and health as well as environmental and ethical issues in engineering are incorporated. Chemical engineering elective courses are designed to expose students to applications of chemical engineering - including polymer science and engineering, sustainable engineering design, battery technology, and process safety.

Graduates of this program are working in a wide range of industries, including petrochemicals, biotechnology, pharmaceuticals, alternative energy, food, electronics, health, automotive, aerospace, and the environment. Many of them work in product and process engineering, research and development, operations, technical sales, engineering systems design, plant or corporate management, and manufacturing. Common minors that complement the BS in Chemical Engineering degree include Sustainability, Business, Manufacturing, PreMed, and Statistics.

Kettering University's Bachelor of Science in Chemical Engineering is a strong interdisciplinary program that draws on the strengths of our exceptional faculty, curricula, laboratories, and unique co-op component.

The Chemical Engineering program is accredited by the Engineering Accreditation Commission (EAC) of ABET.

Program Educational Objectives

The Chemical Engineering program is designed to provide its graduates a solid educational foundation on which they can build successful and sustainable careers in chemical engineering or a related field. In particular, all graduates of the Chemical Engineering program will:

- Be employed or pursuing an advanced degree in the field of chemical engineering or other related disciplines.
- Be productive members of interdisciplinary teams.
- Assume leadership positions in their industry, their continuing education, or in their communities, as their careers develop.
- Continue their professional development and engage in the life-long learning necessary for a sustainable career.

BS/MASTERS PATHWAY

Undergraduate students also have an opportunity to get their bachelor's and master's degrees in five years with the BS/MASTERS Pathway.

Chemical Engineering Program Curriculum Requirements

Code	Title	Credit Hours
First Year Experience		
CILE-101	First Year Foundations	1
General Education		
COMM-101	Rhetoric & Writing	4
ECON-201	Economic Principles	4
200-level Liberal Arts Electives		8
LA-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
Advanced Humanities Electives [1]		4
Advanced Social Science Electives [1]		4
Advanced Humanities or Social Science Elective [1]		4
Total Credit Hours		**33**

[1] Humanities and Social Science advanced electives must be selected from approved 300 and 400 level courses.

Code	Title	Credit Hours
Basic Sciences		
Select one of the following:		4
CHEM-137 & CHEM-136	General Chemistry I and Principles of Chemistry Lab	
CHEM-135 & CHEM-136	Principles of Chemistry and Principles of Chemistry Lab	
CHEM-237 & CHEM-238	General Chemistry II and General Chemistry II Lab	4
CHEM-345 & CHEM-346	Organic Chemistry I and Organic Chemistry I Lab	6
CHEM-347	Organic Chemistry II	4
Advanced Chemistry Elective [3]		4
PHYS-114 & PHYS-115	Newtonian Mechanics and Newtonian Mechanics Laboratory	4
PHYS-224 & PHYS-225	Electricity and Magnetism and Electricity and Magnetism Laboratory	4
	Credit Hours Subtotal:	*30*
Mathematics		
MATH-101	Calculus I	4

or MATH-101X	Calculus I	
MATH-102	Calculus II	4
or MATH-102X	Calculus II	
MATH-203	Multivariate Calculus	4
or MATH-203X	Multivariate Calculus	
MATH-204	Differential Equations & Laplace Transforms	4
MATH-258	Probability and Statistics	4
	Credit Hours Subtotal:	*20*
Engineering Topics		
CHME-100	Introduction to Chemical Engineering	4
CHME-200	Mass & Energy Balance	4
CHME-210	Chemical Engineering Thermodynamics	4
CHME-225	Computing in Chemical Engineering	2
CHME-230	Foundations of Materials	4
CHME-310	Fluid Dynamics and Heat Transfer	4
CHME-325	Fluid Dynamics and Heat Transfer Lab	2
CHME-330	Mass Transfer and Separations	4
CHME-350	Reaction Engineering	4
CHME-425	Separations, Reactions, and Prototyping Lab	2
CHME-430	Process Controls	4
CHME-440	Senior Chemical Engineering Design I	4
Chemical Engineering Program Electives		
Select 2 of the following:		8
CHME-460	Sustainable Engineering Design: Energy and Environment	
CHME-470	Polymer Science & Engineering	
CHME-472	Fundamentals - Battery Systems	
CHME-482	Alternative Fuels	
CHME-491	Chemical Eng. Special Topics	
Electives		
Programming Elective [4]		4
Engineering Elective [5]		4
Technical Electives [6]		8
Free Electives		8
	Credit Hours Subtotal:	*74*
Undergraduate Thesis		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [7]	4

(Minimum) Total Credits Required for Program: 161[2]

[2] The minimum total number of credit hours required for graduation is 161; however, the total number of credit hours taken may exceed 161. All Chemical Engineering majors must meet the general educational requirements and their program's requirements for a minor or concentration.

[3] The Advanced Chemistry Elective must be numbered 300 or higher and cannot be Organic Chemistry I or Organic Chemistry II, since these are are already required courses.

[4] A Programming Elective can be chosen from the following options: IME-211, CS-101, ECE-101, or MECH 211.

[5] An Engineering Elective is any course with the IME, EE, CE, ME, or ECE prefix, 100-level or higher.

[6] A minimum of eight hours of technical electives are required for the Chemical Engineering Degree. A technical elective may be any course numbered 300-599 in BIOL, CE, CHEM, CHME, CS, EE, IME, ISYS, MATH, MECH, or PHYS that is not used to complete core degree requirements. Additional courses that can be used include BUSN-303, BUSN-304, and MGMT-419/619. Other courses may be used but require approval by the Department Head of Chemical Engineering.

[7] Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Representative Program [1,2]

Course	Title	Credit Hours
Freshman I		
CILE-101	First Year Foundations	1
CHEM-137 or CHEM-135	General Chemistry I or Principles of Chemistry	3
CHEM-136	Principles of Chemistry Lab	1
CHME-100	Introduction to Chemical Engineering	4
COMM-101	Rhetoric & Writing	4
MATH-101	Calculus I	4
	Credit Hours	**17**
Freshman II		
CHEM-237	General Chemistry II	3
CHEM-238	General Chemistry II Lab	1
ECON-201	Economic Principles	4
MATH-102	Calculus II	4
PHYS-114	Newtonian Mechanics	3
PHYS-115	Newtonian Mechanics Laboratory	1
	Credit Hours	**16**
Sophomore I		
CHME-200	Mass & Energy Balance	4
MATH-203	Multivariate Calculus	4
PHYS-224	Electricity and Magnetism	3
PHYS-225	Electricity and Magnetism Laboratory	1
200-level Liberal Arts Elective		4
	Credit Hours	**16**
Sophomore II		
CHME-210	Chemical Engineering Thermodynamics	4
CHME-225	Computing in Chemical Engineering	2
CHEM-345	Organic Chemistry I	4
CHEM-346	Organic Chemistry I Lab	2
MATH-204	Differential Equations & Laplace Transforms	4
	Credit Hours	**16**
Junior I		
CHME-310	Fluid Dynamics and Heat Transfer	4
CHME-325	Fluid Dynamics and Heat Transfer Lab	2
CHEM-347	Organic Chemistry II	4
MATH-258	Probability and Statistics	4
200-level Liberal Arts Elective		4
	Credit Hours	**18**

Junior II		
CHME-230	Foundations of Materials	4
CHME-330	Mass Transfer and Separations	4
CHME-350	Reaction Engineering	4
Programming Elective [4]		4
Advanced Social Science Elective [2]		4
	Credit Hours	**20**
Senior I		
CHME-425	Separations, Reactions, and Prototyping Lab	2
CHME-430	Process Controls	4
Technical Elective [6]		4
Advanced Chemistry Elective [3]		4
Advanced Humanities Elective [2]		4
	Credit Hours	**18**
Senior II		
CHME-440	Senior Chemical Engineering Design I	4
Chemical Engineering Program Elective		4
Engineering Elective [5]		4
Advanced Humanities or Social Science Elective [2]		4
Free Elective		4
	Credit Hours	**20**
Senior III		
Technical Elective [6]		4
Chemical Engineering Program Elective		4
Free Elective		4
LA-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
	Credit Hours	**16**
Any Term		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion	4
	Credit Hours	**4**
	Total Credit Hours	**161**

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