

College of Engineering

Chemical Engineering

Overview

Chemical engineers design and develop processes to manufacture materials and products that enhance our quality of life. They model and apply the core principles of thermodynamics, transport phenomena and chemical kinetics to implement efficient, economic and environmentally friendly large-scale chemical synthesis.

Professional options

Careers

Chemical engineers have skills and expertise that are valued in industries as diverse as energy and fuel production, commodity and specialty chemicals, environmental engineering, food processing, health care and biotechnology. Chemical engineers design and implement the process for producing pharmaceuticals, semiconductors and alternative energy. Their professional and analytical skills also provide a strong foundation in careers such as finance, management, medicine and law.

Throughout their careers, chemical engineers have tremendous opportunities for professional development, to work with diverse audiences around the world and to have an impact on society.

Career paths for our graduates vary widely. Many begin as process or production engineers, rotating between locations and learning about their industry in breadth and depth. With experience, they are given more responsibilities and move into management, supervising other engineers, continuing to advance to higher leadership positions within their companies.

Points of pride

The chemical engineering student design team, Chem-E Car, regularly wins awards and competes at the national meeting of the American Institute of Chemical Engineers. Recent chemical engineering graduates have received Goldwater, National Science Foundation and Tau Beta Pi scholarships and fellowships.

Others may follow a technical path, becoming the company's expert on specific technologies or processes. Engineering process design, technical sales, safety, meeting environmental regulation or working in federal agencies are other possible career paths.

Employers

The Department of Chemical Engineering at K-State has strong connections with many industrial companies, including Exxon Mobil, Phillips 66, Chevron, Hospira, Dow Corning, Cargill, Burns and McDonnell, Koch Industries and 3M. Chemical engineering graduates can be found in Kansas and across the nation. Many graduates pursue international opportunities during their careers.

Academics

Degree options

Chemical engineering is best suited for highly motivated students with excellent abilities and interests in chemistry, physics and mathematics. The first two years in the program build the necessary intellectual base in pure sciences and essential communication skills. The last two years are a carefully structured sequence of courses that blend engineering science and design. Graduates of the program are well-prepared to work in the chemical engineering industry or pursue advanced degrees.

By their choices of technical electives, students may develop an area of emphasis, a minor or a secondary major. Examples include biotechnology, biological engineering, environmental engineering, natural resources, leadership and materials science. Electives also can be selected to prepare for medical or law school. A description of options and a list of technical electives are available at che.k-state.edu.

Accreditation

The program is accredited by the Engineering Accreditation Commission of ABET, abet.org.

Admission

Admission is selective based on academic performance. Submit application, application fee, all transcripts and ACT or SAT scores postmarked by the priority Feb. 1 deadline. Transfer students will be considered for all terms. Freshmen will be considered only for summer and fall terms.

Financial assistance

The priority deadline for incoming freshmen to submit the K-State scholarship application is Nov. 1, or Feb. 1 for transfer students. Students should submit their Free Application for Federal Student Aid by March 1. For additional details, go to k-state.edu/sfa.

Activities

Students are involved in a broad range of activities for professional and social development. More than 10 percent of recent chemical engineering graduates have studied abroad. Two-thirds of our students have served in one or more industrial engineering internships or gained related experience. Many are involved in intramural sports, student organizations and leadership within their living groups.

The student chapter of the American Institute of Chemical Engineers hosts speakers to provide information on industry-focused professional development and the wide range of educational opportunities available. Recent topics include job interviewing tips, graduate school, financial planning, study abroad and cultural diversity.

Students involved in the Chem-E Car team build, test and modify a car model that is propelled by a chemical reaction to a specified distance.

Many chemical engineering students also pursue independent individual research projects during the academic year with a faculty mentor, or during the summer at a Research Experience for Undergraduates, or REU, site at K-State or other universities.

Suggested coursework

128 hours

Freshman

Hrs. Fall semester

0	CHE 015	Engineering Assembly
1	CHE 110	Current Topics in Chemical Engineering
4	CHM 210	Chemistry I
3	ENGL 100	Expository Writing I
4	MATH 220	Analytic Geometry and Calculus I
3		Humanities/social science elective
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Hrs. Spring semester

0	CHE 015	Engineering Assembly
2	COMM 105	Public Speaking 1A
3	ECON 110	Principles of Macroeconomics I
4	MATH 221	Analytical Geometry and Calculus II
4	CHM 230	Chemistry II**
3		Humanities/social science elective
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Sophomore

Hrs. Fall semester

0	CHE 015	Engineering Assembly
5	PHYS 213	Engineering Physics I
4	MATH 222	Analytical Geometry and Calculus III
3	CHE 320	Chemical Process Analysis*
4	CHM 371	Chemical Analysis†
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Hrs. Spring semester

0	CHE 015	Engineering Assembly
5	PHYS 214	Engineering Physics II
4	MATH 240	Elementary Differential Equations
3	CHE 416	Computational Techniques in Chemical Engineering*
2	CHE 520	Chemical Engineering Thermodynamics I*
3	CHM 531	Organic Chemistry I
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Junior

Hrs. Fall semester

0	CHE 015	Engineering Assembly
3	ENGL 415	Written Communication for Engineers
3	CHE 521	Chemical Engineering Thermodynamics II*
3	CHE 530	Transport Phenomena I*
3		Chemistry/biochemistry elective‡
2		Advanced laboratory experience§
3		Humanities/social science elective
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Hrs. Spring semester

0	CHE 015	Engineering Assembly
3	CHE 531	Transport Phenomena II*
3	CHE 535	Transport Phenomena Lab*
1	CHE 354	Basic Concepts in Materials and Engineering
1	CHE 355	Fundamentals of Mechanical Properties
1	CHE 356	Fundamentals of Electrical Properties
3	CHM 595	Physical Chemistry II
3		Technical elective
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Senior

Hrs. Fall semester

0	CHE 015	Engineering Assembly
3	CHE 550	Chemical Reaction Engineering*
3	CHE 560	Separational Process Design*

3	CHE 570	Chemical Engineering Systems Design I*
6		Humanities/social science electives (>300 level)
3		Technical elective
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Hrs. Spring semester

0	CHE 015	Engineering Assembly
3	CHE 542	Unit Operations Laboratory*
3	CHE 561	Chemical Process Dynamics and Control
1	CHE 565	Health and Safety in Chemical Engineering Systems
3	CHE 571	Chemical Engineering Systems Design II*
3		Unrestricted elective
3		Chemical engineering elective
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*These courses form the chemical engineering core program.

**Chemical Principles I (CHM 220) and Chemical Principles II (CHM 250) may be taken instead of CHM 210, CHM 230 and CHM 371. If this option is elected, two additional credit hours of technical electives are to be selected.

†Instrumental Methods of Analysis (CHM 566) (three credit hours) and Instrumental Analysis Laboratory (CHM 567) (one credit hour) may be substituted for Chemical Analysis (CHM 371). However, prerequisites would require that these courses be taken following Organic Chemistry I (CHM 531).

‡Chemistry/biochemistry/biology electives
Chemistry: Possible selections include Organic Chemistry II (CHM 550), Instrumental Analysis (CHM 566) and Physical Chemistry I (CHM 585).
Biochemistry: Possible selections include General Biochemistry (BIOCH 521), Physical Studies of Biomacromolecules (BIOCH 590), Biochemistry I (BIOCH 755) and Biochemistry II (BIOCH 765).
Biology: BIOL 450 or above; some possible courses include Modern Genetics (BIOL 450), General Microbiology (BIOL 455), Plant Physiology (BIOL 500), Fundamentals of Ecology (BIOL 529) or Cell Biology (BIOL 541).

§The advanced laboratory experience is to be a two credit-hour laboratory course selected from the following courses: Organic Chemistry Laboratory (CHM 532) Physical Methods Laboratory (CHM 596), General Biochemistry Laboratory (BIOCH 522) or Biochemistry I Laboratory (BIOCH 756).

Departmental requirements

The departmental requirements below must be satisfied.

- 32 credit hours of electives are required, and they are to be selected in consultation with the student's advisor. All electives must be on the lists approved by the department or have the approval of the department head and must support the educational objectives of the chemical engineering program. Both the required and elective components of a student's overall program of study must meet the K-State 8 general education program criteria.
- 14 credit hours of technical electives are required. These electives must include one chemistry/biochemistry/biology (3 credit hours) course, an advanced laboratory experience (2 credit hours) and a chemical engineering elective (3 credit hours). The remaining 6 credit hours of technical electives are to be selected from engineering topics to enhance the student's professional development. At least one course selected from either analytical mechanics (both statics and dynamics must be represented) or circuits, fields and electronics must be included.

- 15 credit hours of social science and humanities electives are required, selected from the list approved by the College of Engineering. At least six credit hours of 300-level or higher courses must be included within these 15 hours. All courses must be taken for a letter grade.
- A grade of C or higher in each course within the chemical engineering core program is required for graduation.

For more information about chemical engineering, contact:

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For more information about Kansas State University, contact:

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Post-Graduation Statistics
k-state.edu/postgrad-stats
ksdegrestats.org