Chemical Engineering (BSChE)

Chemical engineering is one of the most broadly-based engineering disciplines. Its field of practice covers the development, design, and control of processes and products that involve molecular change, both chemical and biological, and the operation of such processes. Because many of the products that sustain and improve life are produced by carefully designed and controlled molecular changes, the chemical engineer serves in a wide variety of industries. These industries range from chemical and energy companies to producers of all types of consumer and specialty products, pharmaceuticals, textiles, polymers, advanced materials, and solid-state and biomedical devices.

Careers are available in industry, government, consulting, and education. Areas of professional work include research and development, operations, technical service, product development, process and plant design, market analysis and development, process control, and pollution abatement.

The chemical engineering degree program prepares students for professional practice in chemically related careers after the bachelor's degree or an advanced degree. Chemical engineering graduates are expected to attain the following capabilities at or within a few years of graduation: Become leading professionals who advance chemical engineering practice and knowledge in multiple fields, such as energy, materials, environmental and systems engineering, electronics, biotechnology, human health, public service, and education; continue to educate themselves, seeking new and innovative engineering approaches as dictated by their needs, interests, and circumstances; become ethical and productive engineers, who recognize and acknowledge the local and global impacts of engineering technology on humans and the environment. To meet the program objective, the faculty has designed a rigorous, demanding, and state-of-the-art curriculum that integrates lectures and laboratory experience in basic science, mathematics, engineering science, engineering design, and the liberal arts.

ABET Student Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an 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. an ability to communicate effectively with a range of audiences
4. an 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. an ability to function effectively on a team whose members together provide leadership, crate a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Total Hours Required: 129

Plan of Study

The Plan of Study is a suggested four-year course sequence to support academic planning and serves as a helpful guide. Currently enrolled students should meet with their academic advisor to tailor their course selections and timelines to their individual goals and circumstances.

Course	Title	Hours
Year 1		
Semester 1		
CH 302	Principles of Chemistry II	3
CHE 210	Introduction to Computing	2
M 408C	Differential and Integral Calculus	4
RHE 306	Rhetoric and Writing	3
Social and Behavioral Sciences (080)		3
	Hours	**15**
Semester 2		
CH 204	Introduction to Chemical Practice	2
M 408D	Sequences, Series, and Multivariable Calculus	4
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
American and Texas Government (070)		3
$090		3
	Hours	**16**
Year 2		
Semester 1		
CH 328M	Organic Chemistry I	3
CH 128K	Organic Chemistry Laboratory	1
CHE 317	Introduction to Chemical Engineering Analysis	3
M 427J	Differential Equations with Linear Algebra	4
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
	Hours	**15**
Semester 2		
CH 328N	Organic Chemistry II	3
CH 128L	Organic Chemistry Laboratory	1
CH 353	Physical Chemistry I	3
CHE 319	Transport Phenomena	3
M 427L	Advanced Calculus for Applications II	4
Humanities (040)		3
	Hours	**17**
Year 3		
Semester 1		
CH 153K	Physical Chemistry Laboratory	1
CHE 322	Thermodynamics	3
E S 333T	Engineering Communication	3
CHE 253K	Applied Statistics	2
CHE 354	Transport Processes	3
Chemistry Elective		4
	Hours	**16**
Semester 2		
CHE 253M	Measurement, Control, and Data Analysis Laboratory	2
CHE 363	Separation Processes and Mass Transfer	3
CHE 348	Numerical Methods in Chemical Engineering and Problem Solving	3
CHE 338	Biochemical Engineering	3
Visual and Performing Arts (050)		3
U.S. History (060)		3
	Hours	**17**
Year 4		
Semester 1		
CHE 350	Chemical Engineering Materials	3
CHE 264	Chemical Engineering Process and Projects Laboratory	2

CHE 372	Chemical Reactor Analysis and Design	3
Approved Engineering Area Course		3
Approved Technical Area Course		3
American and Texas Government (070)		3
	Hours	**17**
Semester 2		
CHE 360	Process Control	3
CHE 473K	Process Design and Operations	4
Approved Engineering Area Course		3
Approved Technical Area Course		3
U.S. History (060)		3
	Hours	**16**
	Total Hours	**129**

Requirements

All requirements are listed below, starting with the most specialized moving to the most general. Additional requirements may follow the table, so be sure to read the entire page. Some required courses listed below may also satisfy General Education requirements, including Core Curriculum.

Code	Title	Hours
Concentration		
Approved technical focus area electives in engineering (see Course Lists tab)		6
Approved technical focus area electives (see Course Lists tab)		6
Subtotal		*12*
Degree (see details below)		**93**
Subtotal		*93*
Free electives: Additional coursework to reach total hours required.		0
General Education		
Remaining Core Curriculum (42 hours total)		24
Foreign Language other than English, Beginning Proficiency		
Subtotal		*24*
College Requirements - Engineering		
General University Requirements		
Total Hours		**129**

Additional Requirements and Policies

Course requirements are divided into three categories: lower-division courses in the major, upper-division courses in the major, and other required courses. Enrollment in some upper-division Chemical Engineering courses requires completion of eight hours of lower-division Chemical Engineering coursework (CHE 210, CHE 317 and CHE 319) and 11 hours of non-Chemical Engineering coursework (CH 353, M 427J, PHY 303L and PHY 105N) in the major, while earning a grade of *C-* or better in each course.

Technical Option Areas

Because of the broad training in natural sciences and engineering received by the chemical engineer, opportunities are provided for students also to develop particular talents and interests in one or two areas of emphasis. Each student must complete 12 semester hours in one of the following areas or six semester hours in each of two areas. These courses must include at least two engineering courses, of which one must be in Chemical Engineering. If two technical option areas are selected, then two courses from each technical option area should be completed. The technical area courses should be discussed with a faculty advisor during faculty advising for the next registration period. The courses listed in each area do not constitute a complete list of technical option area courses but illustrate the types of courses that are generally suitable for a given area. A list of suggested complementary biology, physics, mathematics, and chemistry electives for each of the technical option areas is available from the Chemical Engineering Undergraduate Office and published on the departmental Web page.

Students who are interested in seeking an advanced degree in chemical engineering are encouraged to discuss their plans with the graduate advisor or another faculty member. They should also inquire about undergraduate research positions in the department.

For all areas, CHE 377K or CHE 377L may be counted as chemical engineering electives. CHE 377K may be counted only once toward the degree. For all areas, 3 hours of so-op may be counted as an engineering elective.

Degree-Chemical Engineering (BSChE)

Code	Title	Hours
Degree		
CHE 210	Introduction to Computing	2
CHE 253K	Applied Statistics	2
CHE 253M	Measurement, Control, and Data Analysis Laboratory	2
CHE 264	Chemical Engineering Process and Projects Laboratory	2
CHE 317	Introduction to Chemical Engineering Analysis	3
CHE 319	Transport Phenomena	3
CHE 322	Thermodynamics	3
CHE 338	Biochemical Engineering	3
CHE 348	Numerical Methods in Chemical Engineering and Problem Solving	3
CHE 350	Chemical Engineering Materials	3
CHE 354	Transport Processes	3
CHE 360	Process Control	3
CHE 363	Separation Processes and Mass Transfer	3
CHE 372	Chemical Reactor Analysis and Design	3
CHE 473K	Process Design and Operations	4
CH 302	Principles of Chemistry II	3
CH 204	Introduction to Chemical Practice	2
CH 128K	Organic Chemistry Laboratory	1
CH 328M	Organic Chemistry I	3
CH 128L	Organic Chemistry Laboratory	1
CH 328N	Organic Chemistry II	3
CH 153K	Physical Chemistry Laboratory	1
CH 353	Physical Chemistry I	3
M 408C	Differential and Integral Calculus	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J	Differential Equations with Linear Algebra	4
M 427L	Advanced Calculus for Applications II	4
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
PHY 303K	Engineering Physics I	3
PHY 303L	Engineering Physics II	3
RHE 306	Rhetoric and Writing	3
E S 333T	Engineering Communication	3
Hours chosen from:		4
CH 431	Inorganic Chemistry	
CH X54 & CH X54K	Quantum Chemistry and Spectroscopy and Physical Chemistry Laboratory	

CH X54L & CH X54K	Physical Chemistry II and Physical Chemistry Laboratory
CH 455	Fundamentals of Analytical Chemistry
BCH X69 & CHE X77K	Fundamentals of Biochemistry and Undergraduate Research Project
BCH X69 & CHE X77L	Fundamentals of Biochemistry and Undergraduate Research Project
CH X54 & CHE X77K	Quantum Chemistry and Spectroscopy and Undergraduate Research Project
CH X54 & CHE X77L	Quantum Chemistry and Spectroscopy and Undergraduate Research Project
Total Hours	**93**

Area 1, Process Systems and Product Engineering

The chemical process industry is one of the most advanced in the applications of modern design and control techniques and computer technology. Competence in design, economics, fault detection, optimization, control, and simulation is essential in this industry. Chemical engineers are also frequently involved in the development of new consumer and specialty products, an assignment that requires not only technical skills but also an understanding of the principles of successful marketing and quality control. Chemical engineering courses in this technical focus area cover topics such as optimization and statistical quality control, while courses in mechanical engineering and electrical engineering deal with both theory and applications in statistics, computer control, economic analysis, and operations research.

Code	Title	Hours
CHE 341	Design for Environment	3
CHE 342	Chemical Engineering Economics and Business Analysis	3
CHE 356	Optimization: Theory and Practice	3
CHE 376K	Process Evaluation and Quality Control	3
CHE 379	Topics in Chemical Engineering (Approved topics)	3
ECE 370K	Computer Control Systems	3
ECE 379K	Topics in Electrical Engineering [1]	3
ARE 323K	Project Management and Economics	3
M E 335	Engineering Statistics	3
M E 348F	Advanced Mechatronics II	3
M E 353	Engineering Finance	3
M E 366L	Operations Research Models	3
MKT 320F	Foundations of Marketing	3
Upper-division mathematics course		

Area 2, Materials Engineering

Advances in technology and improvements in our quality of life are linked to the development, processing, and manufacture of engineering materials. Materials span the spectrum from “hard” to “soft” materials and include metals, ceramics, semiconductors, and polymers; all are prepared in carefully controlled chemical processes. These materials are used technologically in objects such as catalysts, fuel cells, microelectronic devices, membranes, solar cells, and high-performance plastics. With advancements in analytical probes and modeling, our understanding of materials has become increasingly more molecular and the traditional boundaries between disciplines have faded to the extent that this is a truly interdisciplinary area. Chemical engineers can assume a creative role in this area when provided with the appropriate fundamentals and applications background.

Code	Title	Hours
CHE 322M	Molecular Thermodynamics	3
CHE 323	Chemical Engineering for Micro- and Nanofabrication	3
CHE 355	Introduction to Polymers	3
CHE 379	Topics in Chemical Engineering (Approved topics)	3
CH 341	Special Topics in Laboratory Chemistry	3
CH 354	Quantum Chemistry and Spectroscopy	3
CH 354L	Physical Chemistry II	3
CH 376K	Advanced Analytical Chemistry	3
ECE 339	Solid-State Electronic Devices	3
M E 349	Corrosion Engineering	3
M E 359	Materials Selection	3
M E 374S	Solar Energy Systems Design	3
PHY 338K	Electronic Techniques	3
PHY 355	Modern Physics and Thermodynamics	3
PHY 375S	Introductory Solid-State Physics	3

Area 3, Environmental Engineering

Chemical engineers are uniquely qualified to contribute to the solution of environmental problems and to design processes and products that minimize environmental hazards. From pollution prevention by process optimization, to new understanding of chemical processes that occur in the environment, to new materials for advanced catalysts and carbon-free energy sources, chemical engineers are creating the “green” technologies needed to sustain the planet.

Code	Title	Hours
CHE 341	Design for Environment	3
CHE 357	Technology and Its Impact on the Environment	3
CHE 359	Energy Technology and Policy	3
CHE 376K	Process Evaluation and Quality Control	3
CHE 379	Topics in Chemical Engineering (Approved topics)	3
C E 341	Introduction to Environmental Engineering	3
C E 342	Water and Wastewater Treatment Engineering	3
C E 364	Design of Wastewater and Water Treatment Facilities	3
C E 369L	Air Pollution Engineering	3
C E 370K	Environmental Sampling and Analysis	3
M E 374S	Solar Energy Systems Design	3
M E 379M	Topics in Mechanical Engineering	3

Area 4, Biochemical, Biomolecular, and Biomedical Engineering

Track A: Cellular and Bioprocess Engineering

Chemical engineers are developing innovative solutions to practical problems in biotechnology and in the biochemical, pharmaceutical, and life science industries. This track is designed to prepare students for a career or research in the areas of applied cellular engineering and bioprocess engineering in the chemicals and pharmaceutical industry. Chemical engineering and elective courses are available that cover chemical engineering principles applied to biological systems and the fundamentals of biomolecular, cellular, and metabolic processes. This track is also suitable for students interested in biofuels.

Code	Title	Hours
CHE 339	Introduction to Biochemical Engineering	3
CHE 339P	Introduction to Biological Physics	3

CHE 379	Topics in Chemical Engineering (Approved topics)	3
BCH 369	Fundamentals of Biochemistry	3
BCH 370	Physical Methods of Biochemistry	3
BIO 325	Genetics	3
MBS 326R	General Microbiology	3
MBS 355	Microbial Biochemistry	3

Track B: Biomedical Engineering

This track is designed to prepare students for careers in the biomedical and pharmaceutical industries that deal with medical systems or improvement of health treatment alternatives. This is also a natural track to be followed by students who plan to attend medical school. Chemical engineering courses and electives are available that cover the application of chemical engineering principles to the design of new medical and therapeutic devices, as well as to the understanding of physiological processes.

Code	Title	Hours
CHE 339	Introduction to Biochemical Engineering	3
CHE 339P	Introduction to Biological Physics	3
CHE 339T	Cell and Tissue Engineering	3
CHE 355	Introduction to Polymers	3
CHE 379	Topics in Chemical Engineering (Approved topics)	3
MBS 320	Cell Biology	3
BIO 325	Genetics	3
MBS 326R	General Microbiology	3
INB 365S	Human Systems Physiology	3
BME 352	Engineering Biomaterials	3
BME 353	Transport Phenomena in Living Systems	3
BME 365R	Quantitative Engineering Physiology I	3
BCH 369	Fundamentals of Biochemistry	3
ECE 374K	Biomedical Electronic Instrument Design	3
M E 354	Introduction to Biomechanical Engineering	3

Area 5, Energy Technologies

The need for energy sustainability and new energy technologies provides some of the most significant scientific and engineering challenges that face society. Chemical engineers are uniquely qualified to address these issues and contribute new solutions to the problem. Technologies include solar energy utilization in the form of photovoltaics, biofuels and solar fuels; new and more efficient ways to extract fossil fuels from existing reservoirs; alternative power sources like wind, geothermal, and nuclear. Policy is also an important and active area that involves chemical engineers. Chemical engineering and other elective courses are available that teach fundamentals of energy technology and policy.

Code	Title	Hours
CHE 323	Chemical Engineering for Micro- and Nanofabrication	3
CHE 339	Introduction to Biochemical Engineering	3
CHE 341	Design for Environment	3
CHE 355	Introduction to Polymers	3
CHE 357	Technology and Its Impact on the Environment	3
CHE 359	Energy Technology and Policy	3
CHE 379	Topics in Chemical Engineering (Approved topics)	3
C E 341	Introduction to Environmental Engineering	3
ECE 339	Solid-State Electronic Devices	3
M E 374S	Solar Energy Systems Design	3
M E 379M	Topics in Mechanical Engineering	3
PGE 430	Drilling and Well Completions	4

Area 6, Engineering Economics and Business Leadership

Chemical engineers who understand the economic and policy issues faced by modern chemical and materials companies are needed to solve the challenges of modern industry. Globalization, sustainability, safety and modern labor practices, intellectual property protection, and the process of innovation are all issues facing modern industry. This focus area is designed to prepare students for business leadership in a technical arena.

Code	Title	Hours
CHE 342	Chemical Engineering Economics and Business Analysis	3
CHE 356	Optimization: Theory and Practice	3
CHE 379	Topics in Chemical Engineering (Approved topics)	3
ARE 323K	Project Management and Economics	3
ECO 304K	Introduction to Microeconomics	3
ECO 304L	Introduction to Macroeconomics	3
ECO 328	Industrial Organization	3
ECO 339K	International Trade and Investment	3
ECO 351K	Current Issues in Business Economics	3
I B 378	International Business Operations	3
M E 353	Engineering Finance	3
M E 366L	Operations Research Models	3
MKT 320F	Foundations of Marketing	3
MKT 460	Information and Analysis	4