



BS in CHEMICAL ENGINEERING (392150) MAP Sheet

Department of Chemical Engineering

For students entering the degree program during the 2016–2017 curricular year.

UNIVERSITY CORE AND GRADUATION REQUIREMENTS				PROGRAM REQUIREMENTS (102.5-104.5 total hours)																																																																																											
UNIVERSITY CORE REQUIREMENTS				<p>Due to the complex prerequisite relationships and limited scheduling of these courses, students are strongly encouraged to consult with the department about their course scheduling.</p> <p>Complete the following preprofessional courses:</p> <table border="0"> <tr><td>Ch En 170</td><td>Introduction to Chemical Engineering</td><td>2.0</td></tr> <tr><td>Ch En 191</td><td>Preprofessional Seminar</td><td>0.5</td></tr> <tr><td>Ch En 263</td><td>Computational Tools for Chem Engineers</td><td>2.0</td></tr> <tr><td>Ch En 273</td><td>Chemical Process Principles</td><td>3.0</td></tr> <tr><td>EC En 301</td><td>Elements of Electrical Engineering</td><td>3.0</td></tr> <tr><td>Math 112*</td><td>Calculus 1</td><td>4.0</td></tr> <tr><td>Math 113*</td><td>Calculus 2</td><td>4.0</td></tr> <tr><td>Phscs 121*</td><td>Principles of Physics 1</td><td>3.0</td></tr> </table> <p>And complete one of the following options:</p> <p>Either</p> <table border="0"> <tr><td>Chem 111*</td><td>Principles of Chemistry</td><td>4.0</td></tr> <tr><td>Chem 112</td><td>Principles of Chemistry</td><td>3.0</td></tr> </table> <p>Or</p> <table border="0"> <tr><td>Chem 105*</td><td>General College Chemistry</td><td>4.0</td></tr> <tr><td>Chem 106</td><td>General College Chemistry</td><td>3.0</td></tr> <tr><td>Chem 107</td><td>General College Chemistry Lab</td><td>1.0</td></tr> </table> <p>Complete one of the following options:</p> <p>Either</p> <table border="0"> <tr><td>Math 302</td><td>Math for Engineering 1</td><td>4.0</td></tr> <tr><td>Math 303</td><td>Math for Engineering 2</td><td>4.0</td></tr> </table> <p>Or</p> <table border="0"> <tr><td>Math 313</td><td>Elementary Linear Algebra</td><td>3.0</td></tr> <tr><td>Math 314</td><td>Calculus of Several Variables</td><td>3.0</td></tr> <tr><td>Math 334</td><td>Ordinary Differential Equations</td><td>3.0</td></tr> </table> <p>Complete the following professional courses:</p> <table border="0"> <tr><td>Ch En 311</td><td>Chemical Engineering and Society</td><td>3.0</td></tr> <tr><td>Ch En 373</td><td>Chem Engineering Thermodynamics</td><td>3.0</td></tr> <tr><td>Ch En 374</td><td>Fluid Mechanics</td><td>3.0</td></tr> <tr><td>Ch En 376</td><td>Heat and Mass Transfer</td><td>3.0</td></tr> <tr><td>Ch En 378</td><td>Science of Engineering Materials</td><td>3.0</td></tr> <tr><td>Ch En 386</td><td>Chemical Reaction Engineering</td><td>3.0</td></tr> <tr><td>Ch En 391</td><td>Career Skills</td><td>1.0</td></tr> <tr><td>Ch En 436</td><td>Process Control and Dynamics</td><td>3.0</td></tr> <tr><td>Ch En 451</td><td>Ch En Plant Design & Process Synthesis</td><td>4.0</td></tr> <tr><td>Ch En 475</td><td>Unit Operations Laboratory 1</td><td>2.0</td></tr> <tr><td>Ch En 476</td><td>Separations</td><td>3.0</td></tr> <tr><td>Ch En 477</td><td>Unit Operations Laboratory 2</td><td>2.0</td></tr> </table>		Ch En 170	Introduction to Chemical Engineering	2.0	Ch En 191	Preprofessional Seminar	0.5	Ch En 263	Computational Tools for Chem Engineers	2.0	Ch En 273	Chemical Process Principles	3.0	EC En 301	Elements of Electrical Engineering	3.0	Math 112*	Calculus 1	4.0	Math 113*	Calculus 2	4.0	Phscs 121*	Principles of Physics 1	3.0	Chem 111*	Principles of Chemistry	4.0	Chem 112	Principles of Chemistry	3.0	Chem 105*	General College Chemistry	4.0	Chem 106	General College Chemistry	3.0	Chem 107	General College Chemistry Lab	1.0	Math 302	Math for Engineering 1	4.0	Math 303	Math for Engineering 2	4.0	Math 313	Elementary Linear Algebra	3.0	Math 314	Calculus of Several Variables	3.0	Math 334	Ordinary Differential Equations	3.0	Ch En 311	Chemical Engineering and Society	3.0	Ch En 373	Chem Engineering Thermodynamics	3.0	Ch En 374	Fluid Mechanics	3.0	Ch En 376	Heat and Mass Transfer	3.0	Ch En 378	Science of Engineering Materials	3.0	Ch En 386	Chemical Reaction Engineering	3.0	Ch En 391	Career Skills	1.0	Ch En 436	Process Control and Dynamics	3.0	Ch En 451	Ch En Plant Design & Process Synthesis	4.0	Ch En 475	Unit Operations Laboratory 1	2.0	Ch En 476	Separations	3.0	Ch En 477	Unit Operations Laboratory 2	2.0
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<p>Complete the following supporting courses:</p> <table border="0"> <tr><td>Bio 100*</td><td>Principles of Biology</td><td>3.0</td></tr> <tr><td>Chem 351</td><td>Organic Chemistry</td><td>3.0</td></tr> <tr><td>Chem 352</td><td>Organic Chemistry</td><td>3.0</td></tr> <tr><td>Chem 467</td><td>Physical Chemistry for Engineers</td><td>3.0</td></tr> <tr><td>Eng T 231*</td><td>Foundations of Global Leadership</td><td>3.0</td></tr> <tr><td>Engl 316*</td><td>Technical Communication</td><td>3.0</td></tr> <tr><td>Stat 201</td><td>Statistics for Engineers & Scientists</td><td>3.0</td></tr> </table> <p>Complete technical electives (12 hours minimum) satisfying the following requirements:</p> <p>a. Complete 2 hours of chemistry laboratory (Chem 353, 464, or 465).</p> <p>b. Complete 6 hours of approved advanced Engineering course work. In general, these courses are 300-level or above from any of the following departments: Chem Eng., Civil & Environ. Eng., Electrical & Computer Eng., Mechanical Eng., or the School of Technology. For details and exceptions, see the department webpage.</p> <p>c. Complete 4 hours of approved advanced course work from an engineering, math, science, or business (EMSB) department. In general, these courses are 300-level or above from any of the following colleges: Engineering and Technology, Phys. & Math Sciences, Life Sciences, and the Marriott School of Management. For details and exceptions, see the department webpage.</p> <p>d. At least 1 hour, but no more than 4 hours, of the technical electives must be from courses that provide significant experiential or project-centered learning, or focus on creativity and innovation skills. Applicable courses: Ch En 199R, Ch En 400, Ch En 498R, and Eng T 497R. See dept. webpage for full list. A course taken under this requirement will count toward either the adv.engineering or EMSB requirement above, depending on the dept. in which it is listed.</p> <p>Pass a basic competency exam (L3 Exam) administered by the Chemical Engineering Department (see department for details). All students in the chemical engineering program must pass a competency exam based on the foundational principles of chemical engineering that are taught in the program courses. The exam will be administered during the senior year with the specific dates announced each year by the Chemical Engineering Department. Each fall, the department will supply written rules, guidelines, and reference material to help students prepare.</p>				Bio 100*	Principles of Biology	3.0	Chem 351	Organic Chemistry	3.0	Chem 352	Organic Chemistry	3.0	Chem 467	Physical Chemistry for Engineers	3.0	Eng T 231*	Foundations of Global Leadership	3.0	Engl 316*	Technical Communication	3.0	Stat 201	Statistics for Engineers & Scientists	3.0																																																																							
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Requirements	# Classes	Hours	Classes																																																																																												
Religion Cornerstones																																																																																															
Teachings and Doctrine, Book of Mormon	1	2.0	Rel A 275																																																																																												
Jesus Christ & the Everlasting Gospel	1	2.0	Rel A 250																																																																																												
Foundations of the Restoration	1	2.0	Rel C 225																																																																																												
The Eternal Family	1	2.0	Rel C 200																																																																																												
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Citizenship																																																																																															
American Heritage	1–2	3–6.0	from approved list																																																																																												
Global & Cultural Awareness	1	3.0	Eng T 231*																																																																																												
Skills																																																																																															
Effective Communication																																																																																															
First-Year Writing	1	3.0	from approved list																																																																																												
Adv Written & Oral Communication	1	3.0	Engl 316*																																																																																												
Quantitative Reasoning	0–1	0–4.0	Math 112* or Math 113*																																																																																												
Languages of Learning (Math or Language)	1	4.0	Math 112* or Math 113*																																																																																												
Arts, Letters, and Sciences																																																																																															
Civilization 1 and 2																																																																																															
Arts	1	3.0	from approved list‡																																																																																												
Letters	1	3.0	from approved list‡																																																																																												
Scientific Principles & Reasoning																																																																																															
Biological Science	1	3.0	Bio 100*																																																																																												
Physical Science	2	6–7.0	Chem 105* or 111*, and Phscs 121*																																																																																												
Social Science	1	3.0	Eng T 231*																																																																																												
Core Enrichment: Electives																																																																																															
Religion Electives	3–4	6.0	from approved list‡																																																																																												
Open Electives	Variable	Variable	personal choice																																																																																												
GRADUATION REQUIREMENTS:																																																																																															
Minimum residence hours required		30.0																																																																																													
Minimum hours needed to graduate		120.0																																																																																													
*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (16–20 hours overlap)																																																																																															

FOR UNIVERSITY CORE QUESTIONS CONTACT THE ADVISEMENT CENTER ♦ FOR PROGRAM QUESTIONS SEE YOUR FACULTY ADVISOR

‡REDUCTION OF TOTAL CREDITS IS RECOMMENDED by choosing a Civilization 2 course that also double counts for the Arts requirement (if a separate Letters course is taken) or the Letters requirement (if a separate Arts course is taken) — see the University Core list for specifics (core.byu.edu).

BS in CHEMICAL ENGINEERING (392150) 2016–2017

Suggested Sequence of Courses:

FRESHMAN YEAR

1st Semester

Wrtg 150	3.0
Ch En 170 (FW)	2.0
Chem 111(F)	4.0
Math 112 (FWSpSu)	4.0
Religion Cornerstone course	2.0
Total Hours	15.0

2nd Semester

Am Htg	3.0
Ch En 191 (FW)	0.5
Chem 112 (W)	3.0
Math 113 (FWSpSu)	4.0
Phscs 121 (FWSpSu)	3.0
Religion Cornerstone course	2.0
Total Hours	15.5

SOPHOMORE YEAR

3rd Semester

Ch En 263 (FSp)	2.0
Chem 351 (FWSp)	3.0
Stat 201	3.0
Eng T 231	3.0
Math 302 (FW)	4.0
Religion Cornerstone course	2.0
Total Hours	17.0

4th Semester

Bio 100 (F WSpSu)	3.0
Ch En 273 (WSp)	3.0
Chem 352 (FWSpSu)	3.0
Chem Lab elective	2.0
Math 303 (FW)	4.0
Religion Cornerstone course	2.0
Total Hours	17.0

JUNIOR YEAR

5th Semester

Ch En 311 (F)	3.0
Ch En 374 (F)	3.0
Ch En 391 (FW)	1.0
Chem 467 (F)	3.0
Ec En 301 (FWSp)	3.0
Hist of Civ 1	3.0
Total Hours	16.0

6th Semester

Ch En 373 (W)	3.0
Ch En 376 (W)	3.0
Ch En 386 (W)	3.0

(continued in next column)

(continued from previous column)

Engl 316 (FWSpSu)	3.0
Religion elective	2.0
University Core (Letters elective)	3.0
Total Hours	17.0

SENIOR YEAR

7th Semester

Ch En 378 (Fsp)	3.0
Ch En 436 (F)	3.0
Ch En 475 (FSp)	2.0
Ch En 476 (F)	3.0
EMSB elective	4.0
Religion elective	2.0
Total Hours	17.0

8th Semester

Ch En 451 (W)	4.0
Ch En 477 (FSp)	2.0
Engineering elective	3.0
Engineering elective	3.0
University Core (His of Civ 2/Arts elective)	3.0
Religion elective	2.0
Total Hours	17.0

THE DISCIPLINE:

Chemical engineering is the application of chemistry, biology, physics, mathematics, computer skills, and economics to designing, developing, and implementing chemical processes that convert raw materials into more useful, valuable products. Engineering skills are required for design, testing, scale-up, operation, control, and optimization. Applications range in size from the molecular level to large chemical production facilities, with objectives ranging from economic performance to protection of the environment and the safety of workers and consumers. Chemical engineers are engaged in developing and producing a diverse range of products from raw materials to commodity and specialty chemicals. These products include high-performance materials needed for aerospace, automotive, biomedical, electronic, environmental and military applications. Chemical engineers work in a variety of industries, including chemical manufacturing, energy, biotechnology, electronics, food, clothing, paper, healthcare, and business services.

Professional Program Admission Policy:

Admission to the professional program is available to all students in good academic standing with the university who have (a) passed the prerequisite courses for the first-semester professional courses, namely Ch En 273 and Math 302, and (b) submitted to the department an Application for the Chemical Engineering Professional Program.

The Application for the Chemical Engineering

Professional Program requires students to meet with their department advisor for direction and counseling with regard to performance in the preprofessional program courses and successful completion of the professional program.

Academic Standards and Continuance Policy:

The student's academic standing with the university must be "Good" or "Previous" to enroll in professional program courses. Anyone who accumulates chemical engineering grades below C- in excess of 6 hours may not take further chemical engineering courses until he or she has reduced the unacceptable credits to 6 hours or less. A student may not graduate with more than 3 hours below C- in chemical engineering courses.

RESEARCH:

The Department of Chemical Engineering has a highly qualified faculty with a wide range of experience in both industry and research. Many areas of research are being pursued, including: 1) converting coal to clean gaseous fuels; 2) combustion of coals and other fuels as well as rocket propellants; 3) developing new storage batteries; 4) measurement and prediction of physical, chemical, thermodynamic, and transport properties of liquids, gases, and solids; 5) molecular simulations; 6) chemical processes and materials in biological systems, including the human body; 7) catalysis, with emphasis on forming and reforming hydrocarbon fuels; 8) computer control of chemical processes; 9) sustainable energy; and 10) mathematical modeling of chemical processes and phenomena.

INTERNSHIPS, CO-OP EDUCATION

Encouraged

HONORARY SOCIETIES AND CLUBS

American Institute of Chemical Engineers (AIChE), Sigma Xi, Tau Beta Pi.

FINANCING OF EDUCATION

Scholarships, research assistantships, and teaching assistantships are available.

CAREER OPPORTUNITIES

The combination of knowledge about process engineering, math, and chemistry obtained in the chemical engineering curriculum is a versatile preparation that opens a wide variety of opportunities to graduates. This versatility is one reason why chemical engineers have traditionally been among the highest paid professionals in the engineering and science disciplines.

Chemical engineers make a significant difference in our quality of life. Some develop clean, new energy sources to power society. Some develop and produce fertilizers and other agricultural chemicals to feed

mankind. Virtually all pharmaceuticals are produced by chemical engineers to enhance the life of millions. Others study and produce biomedical devices and artificial organs. Still others are involved in development and production of new materials for use in new high-tech products.

Chemical engineers produce chemicals ranging in use from cleaning products to medicines and from man-made fibers for clothing and textiles to plastics for construction and consumer goods. Another large employer of chemical engineers is the semiconductor industry. Chemical engineers assist in the design and manufacturing of semiconductor chips and circuit boards. This work involves significant knowledge of chemistry and related processes. The petroleum industry is a large employer of chemical engineers, requiring their expertise for the discovery, production, and refining of petro-chemicals including fuels, chemicals, and oils.

Many chemical engineers are employed in environmentally related positions, working on ways to improve air and water quality, to reduce acid rain and smog, and to recycle and reduce garbage. Additionally, chemical engineers are employed by universities as teachers and researchers and by government agencies to provide answers for energy, environmental, and defense concerns. Chemical engineers also train to work in the medical, business, and legal professions.

Though chemical engineering career opportunities are diverse, job functions can be categorized more easily. Chemical engineers are usually involved in research, design, development, production, technical sales, or management.

In research, they develop new ideas, new products, and new ways to produce existing products more economically and with less environmental impact. In design, they create the processes that convert raw materials into finished products with emphasis on efficiency, safety, consumer needs, and environmental protection. The development engineer improves existing processes and technology to better meet changing needs. Production engineering involves supervision, quality control, and testing of production processes and operations. Management and technical sales involve decision making with regard to consumer needs and technical capabilities. Chemical engineers are creative problem solvers. Their careers are rewarding not only from an intellectual and financial view, but also from a personal perspective. Affecting the lives of millions, their solutions provides a better lifestyle for mankind.

Note: Students are encouraged to complete an average of 16 credit hours each semester or 32 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the cost and the number of semesters to graduate.

Engineering and Technology Advisement Center
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Brigham Young University, Provo, UT 84602
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Email: engineering_advisement@byu.edu

Chemical Engineering
350 Clyde Building
Brigham Young University Provo, UT 84602
Telephone: (801) 422-2586