COLLEGE OF ENGINEERING | THE UNIVERSITY OF UTAH

Department of Chemical Engineering

UNDERGRADUATE STUDENT GUIDE

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I. What is Chemical Engineering?

A chemical engineer applies chemical and engineering knowledge to several fields—environmental protection, pollution prevention, biotechnology, electronics, petroleum, medicine, and law. Chemical engineers are involved in research, development (taking a process from bench scale to full scale), design and evaluation (how should the process work), plant design (how should the chemical plant be built), plant operation, sales, management, and academics.

Chemical engineers are responsible for making useful products from raw materials. They have developed the synthetic rubber used for tires, translated laboratory breakthroughs in the drug industry to large-scale, low-cost production facilities, and changed daily life with the development of plastics and synthetic fabrics. Chemical engineers in the fertilizer industry are helping in the fight against world hunger. The chemical engineer is flexible, and possesses a fundamental background and a highly developed ability to analyze and solve new problems. This training and knowledge enable the chemical engineer to enter entirely new areas of research and development with success. The chemical engineering profession is moving into several nontraditional areas that require engineers to have an even broader background in chemistry, mathematics, physics, and biology. These areas include biotechnology and biomedicine; electronic, photo optic, and recording materials and devices; and microstructured materials such as ceramics, polymers, and composites. Each of these specialties utilize chemical engineering principles and expertise to provide better health, improve the environment, develop more efficient chemical production methods, and fabricate new materials.

Every chemical engineer is an environmental engineer and a process safety engineer. Our graduates must regularly consider the safety and environmental consequences of the production and use of chemical, biological, forest and food products, and of fuels and power. Many chemical engineers work in environmental control agencies and in consulting and control firms. Interested chemical engineering undergraduates may choose to specialize in environmental engineering and satisfy their B.S. Chemical Engineering elective requirements by taking courses in environmental engineering (see the section below on Technical Electives).

Unlimited opportunities for development of interests in either scientific or applied pursuits are offered in the chemical engineering field. Chemical engineers are vital players in improving our standard of living and initiating social change. Employment opportunities for our graduates are excellent, and salaries are among the highest for B.S. engineers.

II. Welcome and General Information

It is our pleasure to welcome you to the University of Utah and to our Department. We hope that the pursuit of your degree will be an exciting and rewarding experience for you. This guide is designed to answer most of your questions regarding the policies and procedures of the University and the Department. We also recommend that you make an appointment with an advisor in Chemical Engineering so that you can plan your education and understand the requirements. Our advisors are listed below.

Advisor	Telephone	E-mail
Megan McAllister	801.585.7175	megan.mcallister@utah.edu
Geoff Silcox	801.581.8820	geoff@chemeng.utah.edu

You can also find answers using the web sites listed below.

University of Utah	http://www.utah.edu
College of Engineering	http://www.coe.utah.edu
Department of Chemical Engineering	http://www.che.utah.edu

The Bachelor of Science Degree in Chemical Engineering at the University of Utah is accredited. In the 2015-2016 accreditation cycle, the Chemical Engineering Program was granted the NGR (Next General Review) Status by the Engineering Accreditation Commission of ABET, www.abet.org.

There are many opportunities for undergraduate student to interact directly with the faculty, both inside and outside of class. The Department provides an excellent undergraduate and graduate-level education. The department's faculty have diverse research interests, are internationally known for their engineering, teaching, and scientific contributions, and some have extensive industrial experience.

Research is an important part of the department and offers the undergraduate student an opportunity to work individually with a professor on a specific engineering problem. This can be done as either a H.B.S. senior thesis, or as part of the University's Undergraduate Research Program. Much of the research that is performed in the department reflects the strengths of the broader industrial and academic community in Utah. Interests include energy and fuels, environmental, engineering education, biological and biomedical engineering, multi-scale simulation, nano-materials and technology, catalysis and reaction engineering, interfacial science, and process control.

The department participates in several university research centers that enable students to collaborate with other students and professors throughout campus on interdisciplinary problems.

Mission

The mission of the Department of Chemical Engineering is to graduate high quality chemical engineers, perform and disseminate groundbreaking research, and provide service to the profession and community at large.

Objectives

The department and its constituencies have developed the following educational objectives. The objectives describe the career and professional accomplishments that the program is preparing graduates to achieve.

1) Graduates will contribute to their profession and succeed in their chosen careers.
2) Graduates will continue to learn and refine their critical thinking skills.
3) Graduates will be aware of issues that affect society and the world and will use that knowledge to strengthen their profession and contribute to the well-being of society.
4) Graduates will behave ethically and promote a culture of safety and inclusion.

III. Admission Policy

All students are encouraged to meet with a departmental advisor to review program requirements and to ensure understanding of what is needed to make satisfactory progress toward degree completion. Initial meetings with an advisor often occur as part of the University's orientation program. The program requirements are summarized in the Undergraduate Student Handbook. It is available on the web (http://www.che.utah.edu/undergraduate/academic_program.php) and in hardcopy.

MAJOR STATUS

Students with and without transfer credit, who are admitted to the U of U, will be admitted to Chemical Engineering with major status provided that they meet the requirements for registering in CH EN 1703, Introduction to Chemical Engineering. Those requirements are, as they appear in the current General Catalog, “Corequisites: C or better in ((MATH 1210 OR 1310 OR 1311 OR 1220 OR 1320 OR 1321) AND (CHEM 1210 OR AP CHEM score of at least 4)”.

Students who are awarded major status will be eligible for an account on the Chemical Engineering computer network. Please contact Megan to apply for major status (megan.mcallister@utah.edu). See the section, Computing in Chemical Engineering, for information on how to apply for a computer account.

To keep major status, Chemical Engineering students need to maintain an overall U of U GPA of at least 2.5. Students who lose major status will be able to request a permission code in order to repeat courses. The granting of permission codes will be decided by the Undergraduate Committee. Students who lose major status will have at most two semesters to raise their overall GPA to 2.5 or higher.

IV. Students with Disabilities

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the Chemical Engineering Program, reasonable prior notice needs to be given to the Center for Disability & Access, http://disability.utah.edu/, 162 Olpin Union Building, 801-581-5020. CDS will work with you and your instructors to make arrangements for accommodations. All written information in your courses can be made available in alternative format with prior notification to the Center for Disability Services.

V. Degree Requirements

In order for a student to obtain a B.S. degree in Chemical Engineering at the University of Utah, he or she must satisfy the University-wide degree requirements and the Departmental degree requirements. The University of Utah degree requirements are stated in the *General Catalog*. Many of these requirements are fulfilled through the departmental requirements. The departmental requirements are listed below and many of these are explained in detail in the following sections.

1. Completion of the course requirements listed under the departmental program of study below that includes the minimum number of Undergraduate Seminar courses (1) and the required technical elective credits (12). All required courses, including those taken to satisfy technical elective requirements, must be taken for letter-grade credit.
2. The semester in which you first register for CH EN 1703 sets the catalog year for the handbook that governs your graduation requirements. The catalog year for a transfer student is set by the semester in which he or she started at the University of Utah, provided he or she met the co-requisite requirements for CH EN 1703. The catalog year appears on the front cover of this Undergraduate Student Handbook.
3. The University of Utah requires a minimum of 122 semester hours for a bachelor's degree of which 40 must be 3000 level or above. The program of study for a B.S. degree in Chemical Engineering requires 123 or 124 semester hours with well over 40 semester hours in the 3000 level or above category.
4. Satisfactorily completing the General Education and Bachelor's Degree Requirements for the University. The University has a Lower Division Writing requirement that is normally filled by completing Writing 2010 with a grade of C- or better, and an Upper-Division Communications/Writing requirement, which is normally filled by completing CH EN 3700, Technical Communication in Chemical Engineering. The Quantitative Reasoning requirement (QA and QB) can be satisfied with Calculus. The two B.S. Quantitative Intensive classes (QI) are normally filled by completing the required chemical engineering and chemistry classes. Students are responsible for fulfilling the Diversity requirement, the American Institutions requirements, the Intellectual Explorations requirements, and the International Requirement. There are five classes that will fulfill both the International Requirement and a technical elective requirement: ATMOS 3100, ECON 3500, MGT 4900, MKTG 4840, and PHYS 3150.
5. Meeting the University's residency requirement: of the total hours for graduation, at least 30 must be earned in courses taken in residence at the University (correspondence courses, courses earned by exam or petition do not count). Twenty of the student's last 30 hours must be earned in residence at the University.
6. Degree candidates must have a minimum cumulative GPA of 2.5 Transfer GPA is not combined with U of U GPA for this requirement. All courses must be taken for letter grades, with the exception of Undergraduate Seminar, CH EN 2953, 2955, and other courses that are only available on a credit/no-credit basis.
7. The minimum acceptable grade for a required course, including science, math, and technical electives, is "C". This requirement includes transfer credit. General education courses will

not be included in this requirement. Failure to earn at least a "C" will prevent students from registering for subsequent Chemical Engineering courses.

8. When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on a student's record count as having taken the class. Chemical Engineering also enforces these guidelines for mathematics and science courses. If a course is taken at the University of Utah and subsequently repeated at another institution, the grade from that second attempt will not replace the prior grade from the University of Utah. After two unsuccessful attempts of any required math, science or engineering course, students will be dismissed from the Chemical Engineering Major.
9. It is recommended, but not required, that students take the Fundamentals of Engineering (FE) Chemical Exam. The exam is administered by the State and is nationally composed and graded. This exam is given throughout the year and can be taken in the senior year or at the end of the junior year. Some companies required a passing score on the FE as a condition of employment.
10. Transfer students are not required to complete CH EN 1705, Chemical Engineering Design & Innovation, provided they have completed the physics labs (PHYS 2215, 2225) and the organic chemistry lab (CHEM 2315). Transfer students who have not completed these labs elsewhere may take them at the University of Utah. A transfer student is defined as someone who has completed 2/3 of their first-year requirements at another school.
11. Completion of the senior exit interview is a requirement for graduation. This is enforced through the Degree Audit by making participation in the Senior Exit Interview a graduation requirement.
12. Students who are twice found to have engaged in academic misconduct, as defined in the Student Code, in Chemical Engineering courses, and who have exhausted their appeals, as described in the Student Code, will have their major status revoked; they will not be allowed back into the Chemical Engineering Program and will not be able to request permission codes.

Departmental Program of Study

The Departmental Four Year Program of Study is listed in Table 1. Although some students are able to complete the necessary course work in four years, some are not, primarily because of other commitments, such as family and work. We have included a Five Year Program in Table 2 as a guide for those students. To avoid unnecessary loss of time, the student should make sure the prerequisites indicated under course descriptions in the University General Catalog are met. Note that the minimum acceptable grade in required chemical engineering and technical elective courses is C and that the minimum acceptable grade in required science and mathematics courses is C.

Table 1. Four – Year Program of Study in Chemical Engineering 2021-2022 Catalog Year

FIRST YEAR				
Fall Semester	Units		**Spring Semester**	Units
MATH 1310 or 1311 Eng Calculus I[1]	4		MATH 1320 or 1321 Eng Calculus II	4
CHEM 1210 General Chemistry I	4		CHEM 1220 General Chemistry II	4
CHEM 1215 General Chemistry Lab I	1		CHEM 1225 General Chemistry Lab II	1
WRTG 2010 Intermediate Writing	3		PHYS 2210 Phycs For Scien & Eng I	4
CH EN 1703 Intro to Chem Eng	2		CH EN 1705 ChemE Design & Innov[2]	3
General Education/Bachelor Req	3		CH EN 2955 Undergraduate Seminar	0.5
Total	17		Total	16.5
SECOND YEAR				
Fall Semester	Units		**Spring Semester**	Units
MATH 2250 Diff Eqm & Lin Algebra[3]	4		Technical Elective[4]	3
PHYS 2220 Phycs For Scien & Eng II	4		CH EN 2450 Numerical Methods	3
CH EN 2300 Thermodynamics I	2		CH EN 2800 Fund. of Process Eng	3
CH EN 2953 Undergraduate Seminar	0.5		CHEM 2310 Organic Chemistry I	4
CH EN 2550 Stats for ChemE	3		General Education/Bachelor Req	3
General Education/Bachelor Req	3			
Total	16.5		Total	16
THIRD YEAR				
Fall Semester	Units		**Spring Semester**	Units
CH EN 3353 Fluid Mechanics	3		CH EN 3603 Mass Transfer & Separations	3
CH EN 3453 Heat Transfer	3		CH EN 3553 Chemical Reaction Eng	3
CH EN 3853 Chemical Eng Thermo	3		CH EN 5103 Biochemical Engineering	3
CH EN 3700 Technical Communication	3		CH EN 3702 Projects Lab II	2
CH EN 3701 Projects Lab I	2		General Education/Bachelor Req	3
Total	14		Total	14
FOURTH YEAR				
Fall Semester	Units		**Spring Semester**	Units
CH EN 4701 Projects Lab III	1		CH EN 4707 Capstone Project II	2
CH EN 4706 Capstone Project I	2		CH EN 5253 Process Design II	3
CH EN 4253 Process Design I	3		CH EN 3253 Chemical Process Safety	3
CH EN 4203 Process Control	3		Technical elective	3
Technical Electives	6		General Education/Bachelor Req	3
Total	15		Total	14
Grand Total Hours	123			
or	124			

1. Students who are transferring to the U with a traditional calculus sequence, such as MATH 1210 (Calculus I), 1220 (Calculus II), should plan on taking MATH 2210 (Calculus III), if they have not already done so, before taking MATH 2250 (Differential Equations and Linear Algebra).

2. Transfer students may replace 1705 with PHYS 2215 and 2225 (Physics Lab for Scien and Eng I & II) and CHEM 2315 (Org Chem Lab I). A transfer student is defined as someone who has completed 2/3 or more of their first-year requirements at another school. If 1705 is replaced by physics and chemistry labs, those labs may not be used as technical electives.

3. Students who plan to attend graduate school are encouraged to follow MATH 2250 with MATH 3140 Vector Calc and PDEs or MATH 2210 Vector Calculus and MATH 3150 PDEs.

4. To fulfill this first technical elective requirement, students who are completing their first two years at another college or university may take an approved 1000- or 2000-level technical elective at that school. Examples of approved courses include BIOL 2020, 2030, CHEM 2320, ECE 2210, CS 1410. Students who are completing their first two years at the U should choose one of three courses: MSE 3210 Electronic Prop Solids (3 hr) or ECE 3200 Semicond Device Phys (3 hr) or CHEM 3060 Quantum Chem (4 hr). Transfer students can delay taking one of these three until their third or fourth year. All students are required to complete one of these three. MSE 3210 is offered only in fall.

Table 2. Five – Year Program of Study in Chemical Engineering 2021-2022 Catalog Year

FIRST YEAR					
Fall Semester	Units		**Spring Semester**	Units	
MATH 1310 or 1311 Eng Calculus I[1]	4		MATH 1320 or 1321 Eng Calculus II	4	
CHEM 1210 General Chemistry I	4		CHEM 1220 General Chemistry II	4	
CHEM 1215 General Chemistry Lab I	1		CHEM 1225 General Chemistry Lab II	1	
WRTG 2010 Intermediate Writing	3		PHYS 2210 Phycs For Scien & Eng I	4	
CH EN 1703 Intro to Chem Eng	2		CH EN 1705 ChemE Design & Innov[2]	3	
			CH EN 2955 Undergraduate Seminar	0.5	
Total	14		Total	16.5	
SECOND YEAR					
Fall Semester	Units		**Spring Semester**	Units	
MATH 2250 Diff Eqm & Lin Algebra[3]	4		CH EN 2450 Numerical Methods	3	
PHYS 2220 Phycs For Scien & Eng II	4		CH EN 2800 Fund. of Process Eng	3	
CH EN 2300 Thermodynamics I	2		CHEM 2310 Organic Chemistry I	4	
CH EN 2953 Undergraduate Seminar	0.5		General Education/Bachelor Req	3	
General Education/Bachelor Req	3				
Total	13.5		Total	13	
THIRD YEAR					
Fall Semester	Units		**Spring Semester**	Units	
CH EN 3353 Fluid Mechanics	3		MSE 3210 Elect Prop Solids	3	Choose
CH EN 3853 Chemical Eng Thermo	3		ECE 3200 Semicond Device Phys	3	one of
CH EN 2550 Stats for ChemE	3		CHEM 3060 Quantum Chemistry	4	three
General Education/Bachelor Req	3		Technical Elective	3	
			General Education/Bachelor Req	3	
Total	12		Total	9	10
FOUTH YEAR					
Fall Semester	Units		**Spring Semester**	Units	
CH EN 3453 Heat Transfer	3		CH EN 3603 Mass Transfer & Separations	3	
CH EN 3700 Technical Communication	3		CH EN 3553 Chemical Reaction Eng	3	
CH EN 3701 Projects Lab I	2		CH EN 5103 Biochemical Engineering	3	
			CH EN 3702 Projects Lab II	2	
			General Education/Bachelor Req	3	
Total	8		Total	14	
FIFTH YEAR					
Fall Semester	Units		**Spring Semester**	Units	
CH EN 4701 Projects Lab III	1		CH EN 4707 Capstone Project II	2	
CH EN 4706 Capstone Project I	2		CH EN 5253 Process Design II	3	
CH EN 4253 Process Design I	3		CH EN 3253 Chemical Process Safety	3	
CH EN 4203 Process Control	3		Technical elective	3	
Technical Elective	3				
Total	12		Total	11	
Grand Total Hours	123				
or	124				
1. See note (1) on previous page.					
2. See note (2) on previous page.					
3. See note (3) on previous page.					

Some factors to be considered in planning your course work are

- Table 3 lists the prerequisite for required classes. The Department's policy on prerequisites is given in the section, Policy on Prerequisites, in this guide.
- Chemistry 1220 and CH EN 2300 are prerequisites to Chemical Engineering 2800.
- Upper- and lower-division chemical engineering courses are offered only once each year and are restricted to students who have met the prerequisites.

Undergraduate Seminar

All chemical engineering candidates must take at least 1.0 credit hours of undergraduate seminar (CH EN 2953, 2955; 0.5 credit hours each) during their tenure. This seminar course, which is offered every semester for 0.5 credit hours, meets once a week and is designed to discuss topics in chemical engineering and professional development. It is organized by the instructor and by the Student Chapter of AIChE and provides useful information about the chemical engineering profession, finding employment, employment opportunities, and student organizations. The Student Chapter organizes tours of local industries.

Table 3. Prerequisites for Courses Required by the Chemical Engineering Department

Year / Semester	Course (Department, Number, Title)	Prerequisites	Coreq	Minimum Grade in Requisites
Year 1/Fall	MATH 1310 Eng Calculus I	MATH 1050 and 1060 or 1080		C
Year 1/Fall	CHEM 1210 Gen Chem I	MATH 1050		C
Year 1/Fall	CHEM 1215 Gen Chem Lab I		CHEM 1210	C
Year 1/Fall	CH EN 1703 Intro Chemical Eng		MATH 1310, CHEM 1210	C
Year 1/Spring	MATH 1320 Eng Calculus II	MATH 1310		C
Year 1/Spring	CHEM 1220 Gen Chem II	CHEM 1210		C
Year 1/Spring	CHEM 1225 Gen Chem Lab II	CHEM 1215	CHEM 1220	C
Year 1/Spring	PHYS 2210 Physics for Sci & Eng I	MATH 1310		C
Year 1/Spring	CH EN 1705 Des and Innov in ChemE	MATH 1310, CH EN 1703, major status in CH EN		C
Year 2/Fall	MATH 2250 Diff Eq and LA	MATH 1320		C
Year 2/Fall	PHYS 2220 Physics for Sci & Eng II	MATH 1320, PHYS 2210		C
Year 2/Fall	CH EN 2300 Thermo I	PHYS 2210, MATH 1320, major status in CH EN		C
Year 2/Fall	CH EN 2550 Statistics for Chemical Engineers	CH EN 1703, PHYS 2210	MATH 2250	C
Year 2/Fall	CH EN 2450 Num Methods	CH EN 1703, major status in CH EN	MATH 2250	C
Year 2/Spring	CH EN 2800 Fund of Process Eng	CHEM 1220, CH EN 2300, major status in CH EN		C
Year 2/Fall	MSE 3210, ECE 3200, CHEM 3060	CHEM 1220, PHYS 2220, MATH 2250		C
Year 2/Spring	CHEM 2310 Organic Chem I	CHEM 1220		C
Year 3/Fall	CH EN 3353 Fluid Mechanics	MATH 2250, PHYS 2220, CH EN 2300, 2450, 2800, major status in CH EN		C
Year 3/Fall	CH EN 3453 Heat Transfer	MATH 2250, PHYS 2220, CH EN 2300, 2450, 2800, major status in CH EN		C
Year 3/Fall	CH EN 3853 Chemical Eng Thermo	MATH 2250, PHYS 2220, CH EN 2300, 2450, 2800, major status in CH EN		C
Year 3/Fall	CH EN 3700 Technical Communication for Chemical Engineers	WRTG 2010 or EAS 1060 or HONOR 2211, major status in CH EN		C
Year 3/Fall	CH EN 3701 Projects Lab I	CH EN 2550, 2450, 2800 and major status in CH EN	CH EN 3353, 3453, 3700, 3853	C
Year 3/Spring	CH EN 3603 Mass Transfer and Sep	CH EN 3353, 3453, 3853, major status in CH EN		C
Year 3/Spring	CH EN 3553 Chem Reaction Eng	CH EN 3353, 3453, 3853, major status in CH EN		C
Year 3/Spring	CH EN 3702 Projects Lab II	Major status in CH EN	CH EN 3553, 3603, 5103	C
Year 3/Spring	CH EN 5103 Biochem Eng	Major status in CH EN	CH EN 3553, 3603	C
Year 4/Fall	CH EN 4701 Projects Lab III	Major status in CH EN	CH EN 4203	C
Year 4/Fall	CH EN 4706 Capstone Project I	CH EN 3701, 3702, major status in CH EN	CH EN 4701	C
Year 4/Fall	CH EN 4253 Process Design I	CH EN 3603, 3553, major status in CH EN		C
Year 4/Fall	CH EN 4203 Process Control	CH EN 3603, 3553, major status in CH EN		C
Year 4/Spring	CH EN 3253 Chem Process Safety	CH EN 3353, 3453, 3853, major status in CH EN	CH EN 3553, 3603	C
Year 4/Spring	CH EN 4707 Capstone Project II	CH EN 4706 and major status in CH EN		C
Year 4/Spring	CH EN 5253 Process Design II	CH EN 4253, 4701, 4706, major status in CH EN		C

Emphasis in Energy Engineering

Three of the major challenges facing humanity are limitations in the supplies of food, water, and energy. The emphasis in energy engineering is meant to give undergraduates in Chemical

Engineering a suite of technical electives that will equip them with the engineering and professional skills required to address the need for clean and secure energy. Environmental protection, energy use, and energy production are included in the emphasis. The emphasis will appear on students' transcripts.

The emphasis requires 15 units; this satisfies the requirement of 12 hours of technical electives in Chemical Engineering and includes one additional course to give 15 units. Table 4 lists the core electives. Students will complete at least 9 units from this list.

Table 4. Core Classes for Emphasis in Energy Engineering (9 units required)		
Course	Title	Units
CH EN 4870	Industrial Energy Analysis	3
CH EN 5151	Combustion Engineering (not offered every year)	3
CH EN 5153	Fundamentals of Combustion (not offered every year)	3
CH EN 5158	Energy and Society	3
CH EN 5165	Midstream and Downstream Petroleum Engineering	3
CH EN 5205	Smart Systems	3
CH EN 5305	Air Pollution Control Engineering	3
CH EN 5310	Renewable Energy (not offered every year)	3

Students may choose to complete up to 6 units of supporting courses from Table 5. These provide a broad overview of energy related topics including climate change, sustainability, and geology. The supporting courses also include nuclear engineering and the design of thermal systems for power plants. Please note the prerequisites and co-requisites that are included below.

Finally, as part of the technical elective requirement in Chemical Engineering, students must complete one of three courses: MSE 3210 Electronic Prop Solids (3 hr) or ECE 3200 Semicond Device Phys (3 hr) or CHEM 3060 Quantum Chem (4 hr). Those courses have been added to Table 5.

Table 5. Supporting Classes for Emphasis in Energy Engineering			
Course	Title	Units	Prerequisites and Comments
ATMOS 3100	Atmospheric Chemistry and Air Pollution	3	CHEM 1210, MATH 1220; fulfills IR
CHEM 3060	Quantum Chemistry	4	PHYS 2220 and MATH 2250
ECE 2210	Electrical and Computer Eng for Non-majors	3	PHYS 2210; MATH 2250 co-req
ECE 3200	Intro to Semiconductor Device Physics	3	Permission from ECE
ECE 3600	Introduction to Electric Power Engineering	3	ECE 2210
GEO 5220	Seismology II: Exploration and Engineering Seismology	3	Recommended: GEO 5210 and 5320
GEO 5240	Physical Fields II: Electrical Methods	3	Recommended: MATH 3150 and PHYCS 2220
GEO 5370	Contaminant Partitioning for Scientists & Engineers	3	CHEM 1210, 1220
GEO 5390	Solute Transport and Subsurface Remediation	3	GEO 3080, 3090, 3400, 5350, 5360, 5370, 5385, 5500 or instructor's consent.
GEO 5690	Aqueous Geochemistry for Engineers & Scientists	3	CHEM 1210, 1220
GEO 5760	Stratigraphy and Sedimentary Processes	4	GEO 3090. Recommended: GEO 3060.
GEO 5920	Special Topics in Fundamentals of Applied Earth Science	1.5	Instructor's consent.
MATH 5600	Survey of Numerical Methods	4	MATH 1321 and 2250
ME EN 5800	Sustainable Energy Engineering	3	CH EN 2300, 3453, instructor's consent
ME EN 5810	Thermal Systems Design	3	CH EN 2300, 3453, instructor's consent
MSE 3210	Electronic Properties of Solids	3	Permission from MSE
NUCL 3000	Nuclear Principles in Engineering and Science	3	PHYS 2220, CHEM 1220, MATH 1320
NUCL 3100	Radiation Interactions	3	NUCL 3000
NUCL 3200	Radiochemistry with Laboratory I	3	CHEM 1220, PHYS 2220
NUCL 4000	Nuclear Laboratory	1	NUCL 3000, 3100
PHYS 3150	Energy and Sustainability: A Global Perspective	3	Fulfills IR. MATH 1310, PHYS 2210

Technical Electives

Bachelor's degree candidates must complete 12 hours of approved technical electives. Three or four of these units must include one of CHEM 3060 (Quantum Chemistry), ECE 3200 (Semiconductor Device Physics), and MSE 3210 (Electronic Properties of Solids). Table 6 lists technical elective classes in Chemical Engineering and Nuclear Engineering. Table 7 lists approved courses in other subjects. **Although not required, students may choose to take most of their electives in one specialty**. Table 8 lists approved courses, listed by specialty. A brief description of the various specialties is given in Table 9. A student needs to petition the faculty, through the Undergraduate Committee (contact the Chair, Geoff Silcox), if she or he wants to use a course not listed in Tables 6 and 7 as a technical elective. Students are responsible for completing any prerequisites or co-requisites for technical elective classes.

Table 6. Approved classes for technical electives in CH EN and NUCL Classes *

Course	Title	Hours	Prerequisite(s)
CH EN 4870	Industrial Energy Analysis	3	Instructor's consent
CH EN 4973	Undergraduate Thesis	1 - 3	Instructor's consent
CH EN 4975	Chem Engineering Clinic	1 – 3	Instructor's consent
CH EN 4977	Co-op	1 – 3	Instructor's consent
CH EN 4980	Undergraduate Research	3	Instructor's consent
CH EN 4999	Honors Thesis	3	Instructor's consent
CH EN 5151	Combustion Engineering	3	CH EN 3353, 3453, major status
CH EN 5153	Fundamentals of Combustion	3	CH EN 3603, 3553, major status
CH EN 5158	Energy and Society	3	CH EN 2300, 2800, major status
CH EN 5165	Midstream & Downstream PE	3	CH EN 3353, 3453, 3853, major status
CH EN 5203	State Space Control	3	CH EN 4203, major status
CH EN 5205	Smart Systems	3	CH EN 3353, 3453, major status
CH EN 5230	Biomedical Devises and Sensors	3	
CH EN 5305	Air Pollution Control Engineering	3	CH EN 2300, 2800, major status
CH EN 5310	Renewable Energy	3	CH EN 2300, 2800, major status
CH EN 5810	Nanoscience	3	CHEM 1220, PHYS 2220
CH EN 5950	Independent Study	1 – 5	Instructor's consent
CH EN 5960	Special Topics	3	Instructor's consent
NUCL 3000*	Nuclear Princ in Eng & Sci	3	Calc I & II, 1-yr chem and physics
NUCL 3100	Introduction to Neutron-Based Engineering	3	NUCL 3000
NUCL 3200	Radiochemistry with Lab I	3	First year chem and physics
NUCL 4000	Nuclear Labratory	1	NUCL 3000, 3100

*A minor in Nuclear Engineering is available. See https://www.nuclear.utah.edu/minor/.

Table 7. Other Approved Technical Electives

Course	Title	Semester Hours	Prerequisite(s)
ATMOS 3100	Atmospheric Chem & Air Pollution	3	CHEM 1210, MATH 1220; Fulfills IR
ATMOS 5000	Introduction to Atmospheric Science	3	MATH 1220 and PHYS 2210
ATMOS 5400	The Climate System	3	MATH 1050
BIOL 2020	Principles of Cell Biology	3	BIOL 1210 and 2010, CHEM 1210
BIOL 2030	Genetics	3	BIOL 2020
BIOL 3510	Biological Chem I	3	BIOL 2020 and 2030, CHEM 2320
BIOL 3520	Biological Chem II	3	BIOL 3510 or CHEM 3510
BIOL 5495	Biophysical Ecology	4	BIOL 2010, CHEM 1220, MATH 1220, PHYS 2210
CHEM 2315	Organic Chemistry Laboratory I	2	Co-requisite CHEM 2310
CHEM 2320	Organic Chemistry II	4	CHEM 2310 *May take CHEM 2320 or 2321, not both*
CHEM 2321	Honors Organic Chemistry II	4	CHEM 2311 *May take CHEM 2320 or 2321, not both*
CHEM 2325	Organic Chemistry Laboratory II	1	Co-requisite CHEM 2320 or 2321
CHEM 3060	Quantum Chemistry	4	PHYS 2220, MATH 2250
CHEM 3070	Thermodynamics and Chemical Kinetics	4	MATH 2210, PHYS 2220 and CHEM 1220 or 1221
CHEM 3090	Physical Chemistry for Life Sciences	4	MATH 2210 and PHYS 2220 and CHEM 1220 or 1221
CHEM 3100	Inorganic Chemistry	5	CHEM 1220
CHEM 5720	Adv. Physical Chemistry Lab	2	CHEM 3060
CHEM 5730	Adv. Inorganic Chemistry Lab	2	
CH EN 4978	Co-op	1 – 3	Instructor's consent
CS 1410	Object-Orient Prog	4	Instructor's consent
CS 3200	Intro Scientific Comp	3	CS 1410
CVEEN 3610	Intro. to Environ. Engineering I	3	CHEM 1220, CH EN 3353
CVEEN 5605	Water Treatment Design	3	CVEEN 3610
ECE 2210	ECE for Nonmajors	3	PHYS 2210, MATH 2250
ECE 3200	Semiconductor Phys	3	PHYS 2220, MATH 2250
ECON 3500	International Economics	3	ECON 2010 and 2020 Fulfills IR

ENGIN 5030	Patent Law and Strategy	3	None
ENGIN 5790	The Business of Entrepreneurship	3	None
ENGIN 5791	Launching Technology Ventures	3	None
ENGIN 5792	Emerging Technologies and Engineering Entrepreneurship	3	None
GEO 5350	Groundwater	3	MATH 1220
HNKLY 4900	Internship, Local	3	None
HNKLY 4901	Internship, Utah State Legislature	3	None
HNKLY 4902	Internship, Washington, D.C. National	3	None
HNKLY 4903	Internship, International	3	None
HNKLY 4909	Internship, Community Engaged Learning	3	None
MATH 3140	Vector Calc & PDEs	4	MATH 1320 & 2250
MATH 3150	PDEs of Eng	2	MATH 2210 or 2310 & 2250
MATH 3080	Applied Statistics II	3	MATH 3070
MATH 3180	R Lab II	1	corequisite: MATH 3080
MATH 4100 or COMP 5360	Intro to Data Science	3	MATH 1210 or 1250 or 1310 or 1311
MATH 5600	Survey of Numerical Analysis	4	MATH 2210, 2250
MATH 5620	Intro to Numerical Analysis II	4	MATH 5610
ME EN 5000	Engineering Law and Contracts	3	Major Status
ME EN 5050	Fund. of Micromachining Processes	3	Major Status
ME EN 5055	Microsystem Design & Characterization	3	Major Status
ME EN 5250	Programming for Interactive Systems	3	CS 1000 or 1001 or CH EN 1703
ME EN 5620	Fundamentals of Microscale Eng	3	Major Status
MET E 5260	Physical Metallurgy I	3	
MGT 3000	Principles of Management	3	

MGT 3680	Human Behavior in Organizations	3	
MGT 4900	International Management	3	Fulfills IR
MGT 5600	Business Ethics	3	Instructor consent
MKTG 4840	International Marketing	3	MKTG 3010 or 3011. Fulfills IR.
MSE 3061	Transport Phenomena in MSE	3	Major Status in ChE
MSE 3210	Electronic Properties of Solids	3	PHYS 2220, MATH 2250
MSE 3310	Introduction to Ceramics	3	
MSE 3410	Intro to Polymers	3	
MSE 5040	Intro to Modern Biomaterials	4	
MSE 5475	Introduction to Composites	3	
MSE 6001	Engineering Materials	3	Need permission code from MSE
PHIL 4540	Engineering, Ethics, and Society	3	Fulfills Humanities General Education Requirement.
PHYS 2215	Physics Lab for Scientists & Eng. I	1	PHYS 2210
PHYS 2225	Physics Lab for Scientists & Eng. II	1	PHYS 2210 and 2215
PHYS 3150	Energy and Sustainability: a Global Perspective	3	PHYS 2010 or 2020 or 2110 or 2120 and Math 1310. Fulfills International Requirement
PHYS 3610	Electronics for Instrumentation	3	PHYS 2220 and 2225
PHYS 3740	Intro. to Quantum Theory & Relativity	3	PHYS 2220, MATH 2250
PHYS 3760	Principles of Thermo. & Stat. Mech.	3	PHYS 2220, MATH 2250
PHYS 5510	Solid State Physics I	3	CHEM 3060 and PHYS 3740
POL S 3320	Intro. to Public Policy & Analysis	3	
POL S 5211	Constitutional Law	3	
POL S 5322	Environmental & Sustainability Policy	3	

Table 8. List of Approved Courses for Technical Electives by Area

Area	Recommended Courses	Additional Approved Courses
Process Control	CH EN 5203	CH EN 4973, 4975, 4977, 4978 PHYS 2215, 2225, 3610

		MATH 3070, 3080, 5600
Emphasis in Energy Eng	CH EN 4870, 5151, 5153, 5205, 5305, 5307, 5310	CH EN 4973, 4975, 4977, 4978, 5203 & supporting classes for Emphasis
Applied Mathematics and Physical Sciences	BIOL 2020 CH EN 5810 CHEM 2315, 2320, 2325, 3100, 5720, 5730 PHYS 3610, 3740, 3760	CH EN 4973, 4975, 4977, 4978, 5203 MATH 3080, 5620
Biochemical Engineering and Living Systems	BIOL 2020, CH EN 5810	BIOL 2030, 3510, 3520 CHEM 2315, 2320, 2325, 3100, 3090 CH EN 4973, 4975, 4977, 4978 MSE 5040, PHYS 3610
Entrepreneurship	ENGIN 5030, 5790, 5791, 5792	
Environmental Engineering	CH EN 5305, 5307, 5310	ATMOS 3100, 5000 BIOL 2020 CH EN 4973, 4975, 4977, 4978 CVEEN 3610, 5605 GEO 5350 MATH 3070 PHYS 3610
Management, Policy, and Law	CH EN 5305, 5307, 5310	CH EN 4973, 4975, 4977, 4978 ECON 3500 ENTP 3700, 4560, 5770, 5780, 5791 HNKLY 4900, 4901, 4902, 4903, 4909 MATH 3070 ME EN 5000 MGT 3000, 3680, 4900, 5600 MKTG 4840 PHYS 3610 POL S 3320, 5211, 5322
Materials and Nuclear	MSE 3210, 3410, 6001 NUCL 3000, 3100, 3200, 4000	CH EN 4973, 4975, 4977, 4978, 5655 MATH 3070 MET E 5260 MSE 3061, 3210, 3310, 3410, 5040, 5475 PHYS 3610, 3620
Silicon Chip Processing	CH EN 5205, ECE 3200, MSE 3210	ME EN 5050. 5055, 5620, PHYS 5510
Data Science for Engineers	CH EN 5205	MATH 4100, CS 1410, 3200; MATH 3070, 3080, 3170, 3180; ME EN 5250; MET E 5690

Table 9. Specializations for Technical Electives.

Applied Math and Physical Sciences:

The Applied Mathematics and Physical Sciences option is intended to provide students with deep understanding in fundamental sciences; mathematics, physics, chemistry and biology. Students intending to pursue graduate school options may want to consider courses in mathematics to build up their applied mathematics background. Students wanting to go to medical school may want to consider additional courses in biology and biological chemistry. Students wanting to complete the science and math series required of them in the basic curriculum may also choose this area.

Biochemical Engineering and Living Systems:

With recent developments in biotechnology and genetics, it is apparent that chemical engineers will be needed in the future to design and develop systems that will produce biochemical/biomedical products more efficiently and economically. The objective of this emphasis area is to give the student an opportunity to learn more about biological systems and how chemical engineering principles are applied in biotechnology. Applications range from the biomedical field to bioprocessing to bioremediation. The required course, CH EN 5103, gives the student an introduction to biochemical engineering. The Projects Labs, 4903 and 4905, include projects where the student will perform biological and biochemical experiments. Biology 2020 is strongly recommended to provide background on cell structure and other biological basics and is a prerequisite to CH EN 5103.

Environmental Engineering:

The courses listed for this area were selected for students with a strong interest in the environmental area. The courses are designed to give the student more, in depth, information on the wide-range of environmental subjects. Topics covered include environmental aspects of fuels, air pollution, bioremediation, groundwater flow as well as introductory courses in environmental engineering.

Energy Engineering:

Three of the major challenges facing humanity are limitations in the supplies of food, water, and energy. The emphasis in energy engineering is meant to give undergraduates in Chemical Engineering a suite of technical electives that will equip them with the engineering and professional skills required to address the need for clean and secure energy. Environmental protection, energy use, and energy production are included in the emphasis. The emphasis will appear on students' transcripts.

Management, Policy, and Law:

Engineers frequently encounter challenges in scientific, legal, administrative, and public policy areas. The logical problem solving skills inherent in engineering lend themselves to good approaches to management, policy, and law. This option allows the student to build the skills necessary to develop and manage their own projects. Specifically, this curriculum includes course work in strategic planning, statistical quality control, and financial modeling. The suggested curriculum also includes classes that explore public policy, law, and the allocation of human resources. Engineering students who complete

this option will enter their first job knowing that it takes more than just science and mathematics to complete successfully any project.
Materials and Nuclear: The Materials and Nuclear option provides students interested in engineering and/or nuclear materials an opportunity to explore these important areas of chemical engineering. Courses expose students to the fundamentals of materials properties as well as engineering application of materials, including metals, ceramics, polymers, electronic, and composite materials. Emphasis is placed on chemical engineering aspects of materials processing as well as materials properties and selection for applications in chemical engineering. A minor in Nuclear Engineering is available; see http://www.nuclear.utah.edu/minor.html.
Process Control: Today, process engineers have software and hardware capabilities to implement multivariable model-based control, and to build accurate empirical and semi-empirical models, perform process optimization, fault detection, process monitoring, etc. The limiting factor in a wide-spread application of the advanced process control and data analysis methods is the limited set of skills obtained by chemical engineering within the traditional chemical engineering education. This emphasis area is aimed at developing a guideline on the sequence of elective classes for the students who wish to obtain a more in-depth knowledge of Process Control and related fields.
Si-chip Processing The silicon processing industry seeks graduates who have a basic understanding of photolithography, silicon etching, thin film deposition and etching, statistical design of experiments, and solid-state physics.
Data Science The preparation of graduates for the future should include data science. Data science includes three components: computing, statistics, and knowledge of relevant physical processes. The later is provided by the requirements of the standard chemical engineering curriculum.

Fundamentals of Engineering (FE) Exam

All chemical engineering students are encouraged to take the Fundamentals of Engineering (FE) CHEMICAL Exam. The FE is developed and administered by the NCEES (National Council of Examiners for Engineering and Surveying). NCEES provides special testing accommodations for people with disabilities or religious convictions that preclude testing on Saturdays. More information on the exam and accommodations can be found at http://www.ncees.org.

A practice exam is available from NCEES, *FE Chemical Practice Exam*, and it can be ordered at https://account.ncees.org/exam-prep/.

The exam is administered by the State and is nationally composed and graded. The exam is given throughout the year and can be taken in the senior year or at the end of the junior year. Recorded review lectures are available on the Chemical Engineering and College of Engineering websites.

VI. Advanced Placement (AP) Credit

Students who take Advanced Placement (AP) courses in high school may receive college credit for certain University courses if they receive a certain minimum score on the AP exam. However the department will only accept credit that appears on your University of Utah transcript showing the tests taken and the test scores. See the General Catalog (http://www.ugs.utah.edu/catalog/) pages for Chemistry, Math, and Physics to determine your placement in those departments' courses based on your AP scores.

VII. Honors in Engineering Program

The Honors in Engineering Program in the College of Engineering is designed to provide a challenging, individualized educational experience to high achieving students and to promote life-long learning throughout their careers. The objective is to challenge top students by offering them access to more advanced levels of study, to facilitate the fullest possible use of their creative abilities, to encourage a sustained interest in advanced education and basic research, as well as to foster leadership and fellowship within the engineering community. Honors in Engineering is an undergraduate student honors program that is an option and not mandatory. Students can also receive Departmental Honors and/or University Honors in addition to Honors in Engineering.

An honors thesis is required as part of the program. This may consist of research conducted with a professor or it may be based on the capstone project in CH EN 4706 & 4707, Capstone Project I & II. In the latter case, the project must be an individual project rather than a team project and the student should register for *one* unit of CH EN 4999 Honors Thesis. In the case of a research project supervised by a professor, the student should register for *three* units of CH EN 4999. The Honors Adviser in Chemical Engineering and the professor who is advising the student must approve the topic of an honors thesis.

For more information, including requirements and admission criteria, please refer to https://www.coe.utah.edu/students/honors-in-engineering-program/.

VIII. Transfer Students

Students planning to transfer to the department from other colleges and universities should contact the transfer student adviser, Prof. Geoff Silcox, 3290 MEB, 801-581-8820, geoff@chemeng.utah.edu.

Transfer students who wish to be admitted to major status and register for courses in Chemical Engineering, and who did not graduate from a State of Utah institution, must complete a Transfer Agreement and meet with an advisor. The advisor must approve the transfer credit by signing the Transfer Agreement. The transfer agreement is not required of students whose credit is all from state of Utah institutions.

Students who are transferring with a traditional calculus sequence, such as MATH 1210 (Calculus I), 1220 (Calculus II), should plan on taking MATH 2210 (Calculus III), if they have not already done so, before taking MATH 2250 (Differential Equations and Linear Algebra).

IX. CO-OP Program

The Cooperative Education Program (Co-op or internship) allows students to earn up to 6 units of academic credit and seeks to provide students with practical experience to complement classroom and lab learning. The industrial exposure that participants obtain is beneficial to those who hope to work in industry or attend graduate school. In many cases, co-op experiences will occur at locations removed from campus with a strong possibility of being out of state. These opportunities are available with employers who have agreed to participate with the University of Utah.

Participants have generally completed (or will shortly complete) their sophomore-level courses and are selected by potential employers from a pool of applicants. The process of recruitment, interviewing, and selection is typically handled by the Career Center (careers.utah.edu).

Once employed in a co-op, students request admittance into CH EN 4977 or 4978. The former, 4977, may be used for up to 3 units of technical elective credit, as can 4978. Students working part-time for an engineering employer during a semester may also apply for admittance to CH EN 4977 or 4978, and receive from 1 to 3 hours credit for their work experience. To receive credit, the student will be required to produce a 15-20 page report each time they register for CH EN 4977 or 4978. The report will describe the engineering activities and work performed, and must meet acceptable academic standards of grammar and detail.

Participation in some co-op programs may require a departure from the suggested departmental program of study. Students may be able to alternate semesters between engineering employment and on-campus study. Co-op participants must commit to their employer and to the department, that they will fulfill their employment obligations and complete full-time study while on-campus *without outside employment*. All students return to the University campus full time for their senior-level courses.

For current co-op opportunities, contact Dr. Kody Powell (kody.powell@chemeng.utah.edu). Co-op opportunities are also posted on the Chemical Engineering website as they arise.

If you will be missing a semester or more of classes due to a co-op, please speak with Megan McAllister, Academic Advisor (megan.mcallister@utah.edu, 585-7175) before the semester begins.

X. Policy on Repeating Courses

When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on a student's record count as having taken the class. Chemical Engineering also enforces these guidelines for mathematics and science courses. After two unsuccessful attempts of any required math, science or engineering course, students will be dismissed from the Chemical Engineering Major. Please contact Megan Mcallister or Geoff Silcox if you plan to repeat a course more than once.

XI. Departmental Scholarships

The Department has a number of scholarships that are available to undergraduate students: https://www.che.utah.edu/undergraduate/scholarships/. Application forms are available on the website and the same application applies to Chemical Engineering and College of Engineering scholarships. College of Engineering scholarships are listed at https://www.coe.utah.edu/students/financial-aid/. In addition, there are a wide variety of University scholarships that are also available to incoming Chemical Engineering students from the Financial Aid & Scholarship Office, such as the Presidential or Honors-at-Entrance scholarships: https://financialaid.utah.edu/index.php.

Loans are available through the College of Engineering.

XII. LEAP and E-LEAP Programs

Engineering-LEAP (E-LEAP) is a year long, small class called a "seminar," focusing on the theme of community building in American and in global settings, and the ethical standards of engineering. This seminar keeps students together with one professor and classmates, while fulfilling the University's diversity requirement and two general education requirements—one in Humanities and one in Social Science. In the first semester, students discuss the American community experience as revealed through American autobiography and fiction. In the second semester, students build on the first semester concepts to consider the role of the engineer as a technical expert in contributing to community decision-making. In addition to its academic content, E-LEAP seminar emphasizes college writing, critical reading, group work, presentation skills, and library research strategies appropriate for engineering majors. Throughout the year, students network with College of Engineering faculty and advisors as well as the LEAP professor and a student advisor to learn more about careers in engineering. They also attend lectures and events about innovations in the engineering field. For more information contact the LEAP office at (801) 581-3811.

XIII. Student Organizations

While your course work should be your top priority, participating in various student organizations and activities on campus can enhance your education at the University of Utah. This will enable you to interact with your colleagues outside of class and in an informal manner as well as acquaint you with all the supporting services the University and the College has to offer. Table 10 lists a few of the U of U student chapters you may want to consider.

Table 10. Engineering Student Organizations for Chemical Engineers

Organization	Location, Tel. Number	Contact

American Institute of Chemical Engineers (AIChE)	3220 MEB 801-587-8461	Prof. Tony Butterfield
Society of Women Engineers (SWE)	1620 WEB 801-581-4683	Ms. April Vrtis
Society of Hispanic Professional Engineers (SHPE)	1620 WEB 801-581-4683	Ms. April Vrtis
Program for Diversity in Engineering (PDE)	1620 WEB 801-581-4683	Ms. April Vrtis
American Indian Science and Engineering Society (AISES) -	1620 WEB 801-581-4683	Ms. April Vrtis
Society of Ethnic Student Engineers(SESE)	1620 WEB 801-581-4683	Ms. April Vrtis
Women and Allies in ChemE	3290B MEB 801-585-7175	Ms. Megan McAllister and Wanda Brown
Chemical Engineering K-12 Outreach Team	3226 MEB 801-587-8461	Prof. Tony Butterfield

XIV. Policy on Prerequisites

Students who do not meet the prerequisites for a Chemical Engineering course must submit a class permission code request through the Chemical Engineering website, www.che.utah.edu. Links to websites to request permission codes for all University of Utah departments are found at http://registrar.utah.edu/register/permission-numbers-requests.php.

XV. Combined BS/MS Program

The Department offers a combined BS/MS degree programs for undergraduate students. The graduate degree may be a course-work, project or thesis MS. Students are expected to be self-funded and may expect to complete the combined degree after five years with the simultaneous conferral of the Bachelor of Science and Master of Science degrees. The BS degree portion of the combined degree requires the completion of 117 or 118 semester credit hours. This is 6 units less than the standard four-year program of study because only 6 units of technical electives are required; however, the University of Utah requires a minimum of 122 for a BS degree and it is up to the candidate to ensure that they have met this requirement.

The MS degree requires the completion of 30 additional hours. Because the BS and MS degrees are conferred at the same time, the BS/MS program is not open to international students since the Form I-20 does not permit two concurrent careers. More information on the requirements for the MS degree are found in the graduate handbook at https://www.che.utah.edu.

The shift from undergraduate to graduate status occurs after completion of required undergraduate Chemical Engineering classes. Students wishing to exit the combined program can apply qualifying coursework toward the traditional BS and MS degree requirements without penalty. No student will be awarded a separate MS degree without satisfying all requirements for the BS degree.

A suggested program of study for the fourth and fifth years of the BS/MS program are outlined below for a coursework- or project-based MS. A thesis-based MS degree is also an option but

that requires that the candidate have a faculty sponsor who guarantees that they will fund the student as a research assistant.

Graduate technical electives are usually 6000-level courses. Student who have completed a 5000-level technical elective course as part of their undergraduate requirements may not take the corresponding 6000-level version if the 5000- and 6000-level courses met together. The tuition benefit program only covers courses that are numbered 6000 and above.

Suggested Fourth and Fifth Years for BS/MS Program

FOURTH YEAR	
FALL SEMESTER CH EN 4701 Projects Lab III (1) CH EN 4706 Capstone Project I (2) CH EN 4253 Process Design I (3) CH EN 4203 Process Control (3) Technical Elective (3) General Education/Bachelor Req (3) TOTAL HOURS: 15	SPRING SEMESTER CH EN 3253 Chemical Process Safety (3) CH EN 4707 Capstone Project II (2) CH EN 5253 Process Design II (3) Grad Technical Electives (6) TOTAL HOURS: 14
FIFTH YEAR	
FALL SEMESTER CH EN 6353 Fluid Mechanics (3) CH EN 6853 Thermodynamics (3) Grad Technical Elective (3) Grad Tech Elective or Project Part I (3) TOTAL HOURS: 12	SPRING SEMESTER CH EN 6553 Chem Reaction Eng (3) CH EN 6603 Multi-component Mass Transfer (3) Grad Technical Elective (3) Grad Tech Elective or Project Part II (3) TOTAL HOURS: 12

APPLICATION / ADMISSION PROCEDURES

The Chair of the Graduate Committee will invite eligible students to consider joining the BS/MS program. Invitations will be sent to undergraduate students who have an overall GPA of at least 3.6, based on all undergraduate work, or work completed in the last two year of study, at the University of Utah. To be invited, students must also be currently enrolled for a least 12 credits, have full major status in Chemical Engineering, be a U.S. Citizen or legal Permanent resident, and if they are a transfer student, have completed at least 24 credit hours at the University of Utah. Invitations will be sent in May of the year in which they are enrolled in CH EN 3603, Mass Transfer and Separations.

Students who are interested in applying to the program even though their GPA is below 3.6 should obtain a letter of recommendation from a professor. That letter should be sent to the Graduate Advisor and the Chair of the Graduate Program.

If a student decides to accept the invitation, he or she will need to submit a BS/MS program of study and complete an application for admission to the Graduate School. Students should apply to the Graduate School by February 1st. This will ensure admission for the summer semester following the semester in which the student completes Projects Lab II and Process Design II.

Students must comply with Admissions Office deadlines. The GRE is waived for students in the BS/MS program.

XVI. Undergraduate Research Scholar Designation

The designation, Undergraduate Research Scholar (URSD), appears in the awards section of the transcripts of graduating students. The following requirements are part of the URSD. More information is available at http://ursd.utah.edu/.

- A student must complete two semesters of research with a faculty mentor.
- A student must participate as a presenter in a campus - wide U of U, state undergraduate research symposium, National Conference on Undergraduate Research or a professional conference.
- A student must publish their work in the U of U Undergraduate Research Abstracts journal, other campus research publication, national, regional or state conference program or proceedings or other professional journal.

Academic credit for doing research may be earned by registering for CH EN 4973 (Undergraduate Thesis), CH EN 4980 (Undergraduate Research), and CH EN 4999 (Honors Thesis). Note that 4980 can be taken twice for a total of six units.

XVII. Undergraduate Courses offered in the Department (CH EN)

A complete list of Chemical Engineering course offerings is available in the online General Catalog. As with all engineering courses, the prerequisites for each class must be completed by the time of registration. The minimum acceptable grade in required CH EN courses is C.

XVIII. Computing in Chemical Engineering

You can read about the student computing and lab facilities at https://www.che.utah.edu/undergradute/facilities. You can create an account for the ChemE computers at https://www.che.utah.edu/undergraduate/forms/icc/. Once you have an account, you can log into any ChemE machine. Remote access is available here: https://connect.chemeng.utah.edu/.