JOHN AND MARCIA PRICE 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 designs and creates products and processes that are vital to our society using their mastery of chemistry, mathematics, physics, biology, computer science, economics, and more.

Creative - A chemical engineer has a uniquely diverse set of skills in science and technology and applies them as creative tools to benefit humanity. They must know the limits of natural laws, just as a painter knows the limits of their canvas, but each engineering solution is a creative endeavor that can broaden our technological horizons.

Most chemical engineers will be involved in research and development. A product engineer might design a medical diagnostic test, or create new biodegradable plastics. A process engineer might perfect novel recycling methods, or take bench-scale experiments and scale them up to become large industrial processes. They may design a pharmaceutical plant, or take an existing plant process and find creative ways to improve its performance.

Helpful - A chemical engineer studies how the world works with the goal of making the world a better place. Whether they are designing biomedical devices, cleaning up groundwater, or increasing the efficiency of our power plants, the chemical engineer is only doing their job if they are improving the lives of the people around them.

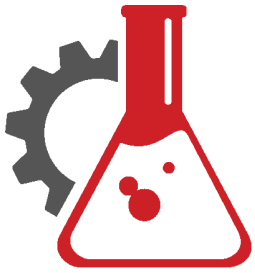
Every chemical engineer must, in a way, be an environmental engineer and a process safety engineer. Our graduates must regularly consider the safety and environmental consequences of society's production and use of chemical, biological, food, energy, and forest products. Many chemical engineers work in alternative/renewable energy, and pollution control.

Versatile - A chemical engineer is a general problem solver, using tools from most every discipline of science. The skills they have can be applied to a wide variety of fields: biotechnology, semiconductors, food industry, petroleum, green energy, medicine, battery technology, consumer products and much more. A chemical engineer may follow their interests into a wide range of industries throughout their career.

The core set of problem-solving skills that a chemical engineer develops makes them well-suited to comfortably adapt to changes in economic pressures or move into emerging technological landscapes. If our students wish to specialize, they can use technical elective courses to focus on areas such as energy, environmental, biochemical, semiconductors, computer modeling and more.

Rewarding - Chemical engineering can be personally rewarding in its creativity and the benefits the profession supplies to society, but it also offers significant financial security. Obtaining a chemical engineering degree is a challenge that is rewarded with salaries that are amongst the highest, on average, for any college degree. Employment opportunities are similarly positive for the chemical engineer. It is a challenging degree, but a degree with many long-term benefits.

II. Welcome and General Information



It is our pleasure to welcome you to the University of Utah, our department, and our student community! This guide is designed to answer the most common 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 navigate the requirements (Advisor contact information may be found on the title page of this guide, or at our department website: https://www.che.utah.edu/).

The Bachelor of Science Degree in Chemical Engineering at the University of Utah is ABET accredited (www.abet.org). In our last accreditation review (2021-2022), our program was specifically commended for our “exceptional” integration of experiential learning. We are well-known for our innovations in chemical engineering education, specifically in our incorporation of hands-on learning throughout our curriculum.

In addition to courses, our students and faculty work together in several ways. Our students have many opportunities to become involved in cutting-edge research. Faculty research programs include energy and fuels, batteries and electrochemistry, environmental engineering, engineering education, biological and biomedical engineering, multi-scale simulation, nano-materials, catalysis and reaction engineering, interfacial science, process control, and more. Students may become involved with research in several ways. Many students work as undergraduate researchers, paid by faculty research programs or as part of the University's Undergraduate Research Opportunity Program (https://our.utah.edu/research-scholarship-opportunities/urop/). Our department participates in several university research centers that enable students to collaborate with other students and professors throughout campus on interdisciplinary problems.

The teaching and research conducted in our department is of the highest caliber. However, we also pride ourselves on promoting the health and vibrancy of our student community. We strive to welcome all students into a supportive department climate. We know that engineering is a profession that relies on human relationships, and we care to support mentoring and comradery among all members of our department: students, staff, and faculty. To that end, our students and faculty work together in a variety of student organizations to promote the well-being of our shared community.

Department 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.

Department 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. Advising Team

Our advising team is here to enhance your undergraduate experience. We offer virtual and in-person appointments to accommodate your busy schedule. During your advising appointment, we can help you build your class schedule, review transfer work from outside institutions, learn the requirements necessary to completing your degree, discover professional development opportunities, access student resources when life events keep you from succeeding, and more.

[Click here to schedule an appointment with the Advising Team]

<hiring> Academic Advisor	**Academic Advisor** We are currently working on hiring a new academic advisor. You can send email to the address below for assistance. 👨🏻‍💼 Merrill Engineering Building, Room 3290 G 📧 cheundergrad@utah.edu 📞

IV. Admission Policy

All new students are encouraged to meet with a departmental advisor early, to review program requirements and 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 this Undergraduate Student Handbook. This handbook and other admission information is available on the department web page:

- https://www.che.utah.edu/undergraduate-advising/
- https://www.che.utah.edu/ugguide/

Good Standing in Chemical Engineering Major

Students must maintain a **2.5 cumulative GPA** and receive **C grade or higher** in all of their Chemical Engineering coursework, including technical electives, as well as in all Math, Chemistry, and Physics courses to maintain good standing in the Chemical Engineering major.

If a student does not have a 2.5 cumulative GPA or receives a C- or lower grade in any attempt of a Chemical Engineering course, they will need to meet with an advisor to discuss modifications to their course planning.

Students with lower than a 2.5 cumulative GPA or with multiple C- or lower grades in one semester will be placed in the Chemical Engineering Academic Recovery Program. Students in the Chemical Engineering Academic Recovery Program will need to meet the conditions specified by the Chemical Engineering Academic Standards Committee. Students will have at most two semesters to raise their cumulative GPA to 2.5 or higher. Students will be required to request a permission code in order to repeat courses. The granting of permission codes will be decided by the Director of Undergraduate Studies and Undergraduate Committee.

V. Degree Information

a) Degree Requirements

In order for a student to obtain a B.S. degree in Chemical Engineering at the University of Utah, they 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 departmental requirements. The departmental requirements are listed below and many of these are explained in detail in the following sections of this guide.

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 they started at the University of Utah, provided they have 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 120 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 120 semester hours with 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.
    a. 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.
    b. The Quantitative Reasoning requirement (QA and QB) can be satisfied with Calculus.
    c. The two B.S. Quantitative Intensive classes (QI) are normally filled by completing the required chemical engineering and chemistry classes.
    d. Students are responsible for fulfilling the Diversity requirement, the American Institutions requirements, the Intellectual Explorations requirements, and the International Requirement.
    e. Some classes may fulfill both the International Requirement and a technical elective requirement.
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.

7. 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.
8. **The minimum acceptable grade for a required chemical engineering, math, chemistry, physics courses and technical electives is "C".** Please note that department standards in departments outside of chemical engineering may be lower than "C". **"C-" grades do not satisfy this requirement.** 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.
9. When a College of Engineering class is taken more than once, only the grade for the latest 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.
10. If a course is taken at the University of Utah and subsequently repeated at another institution, the grade from that attempt will not replace the prior grade from the University of Utah.
11. After three unsuccessful attempts of any required math, science or engineering course, students will be dismissed from the Chemical Engineering Major.
12. 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.
13. 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.

b) Departmental Program of Study

Our program of study for interactive examples of 4-year, 5-year, and BS/MS plans may be found on our site: https://www.che.utah.edu/ugplans/.

The Departmental Four Year Program of Study is shown in Table 1. Click on the links in Table 1 to see the pre- and corequisites for each course. Although most students are able to complete the necessary coursework in four years, some are not, primarily because of other commitments, such as family and work. We hope to be as accommodating as possible to such students. A Five Year Program, with fewer credit hours per semester, is 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 is a "C" in required chemical engineering courses, math courses, science courses and technical electives. "C-" grades do not fulfill these requirements.**

Table 1: *Four-Year Plan.* This table represents a summary of our curriculum with both plans for completing our program in four years. Please consult this guide, the Academic Plans page of our site (https://www.che.utah.edu/ugplans/), and the University Catalog for more complete information, https://catalog.utah.edu/#/courses.

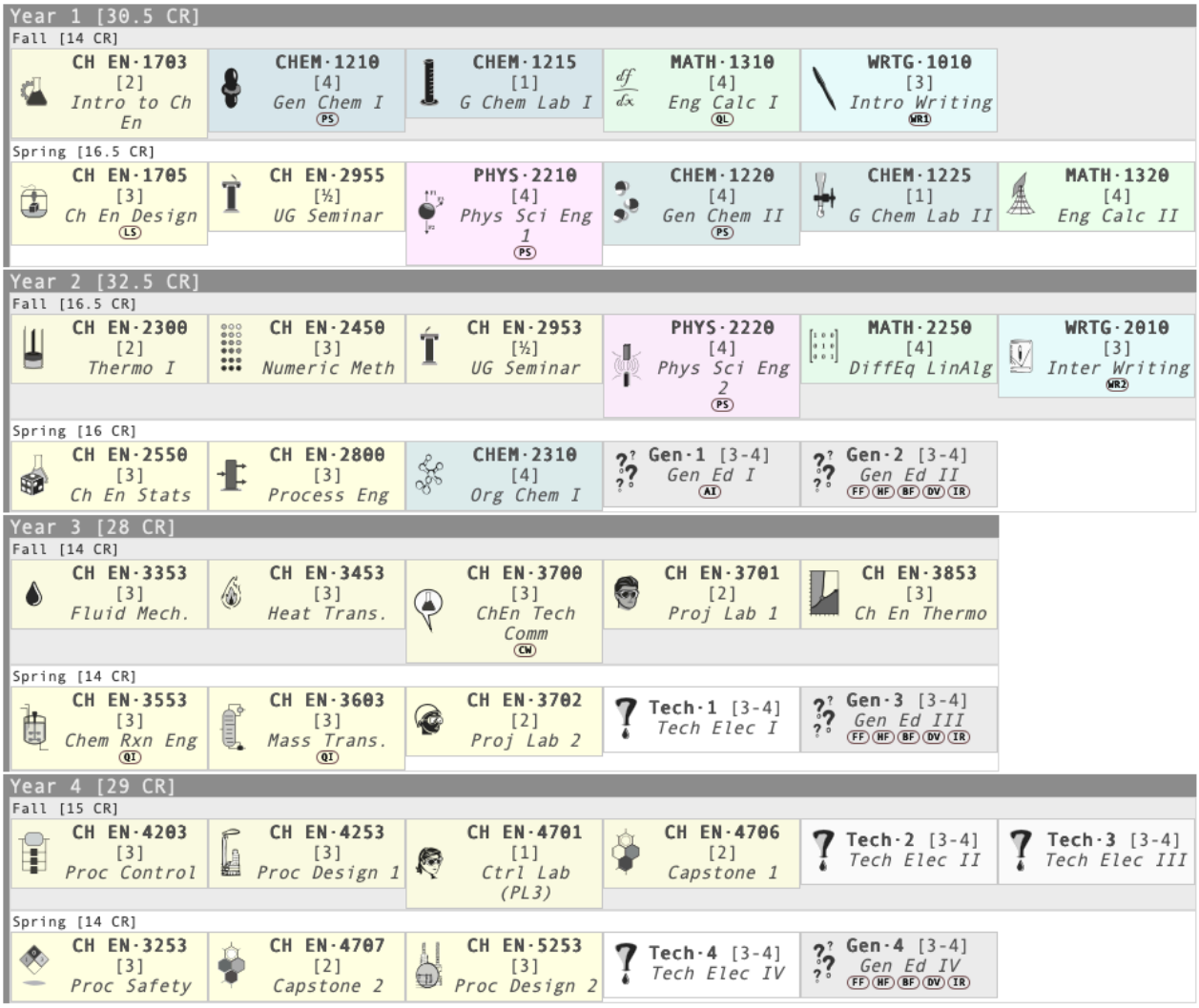
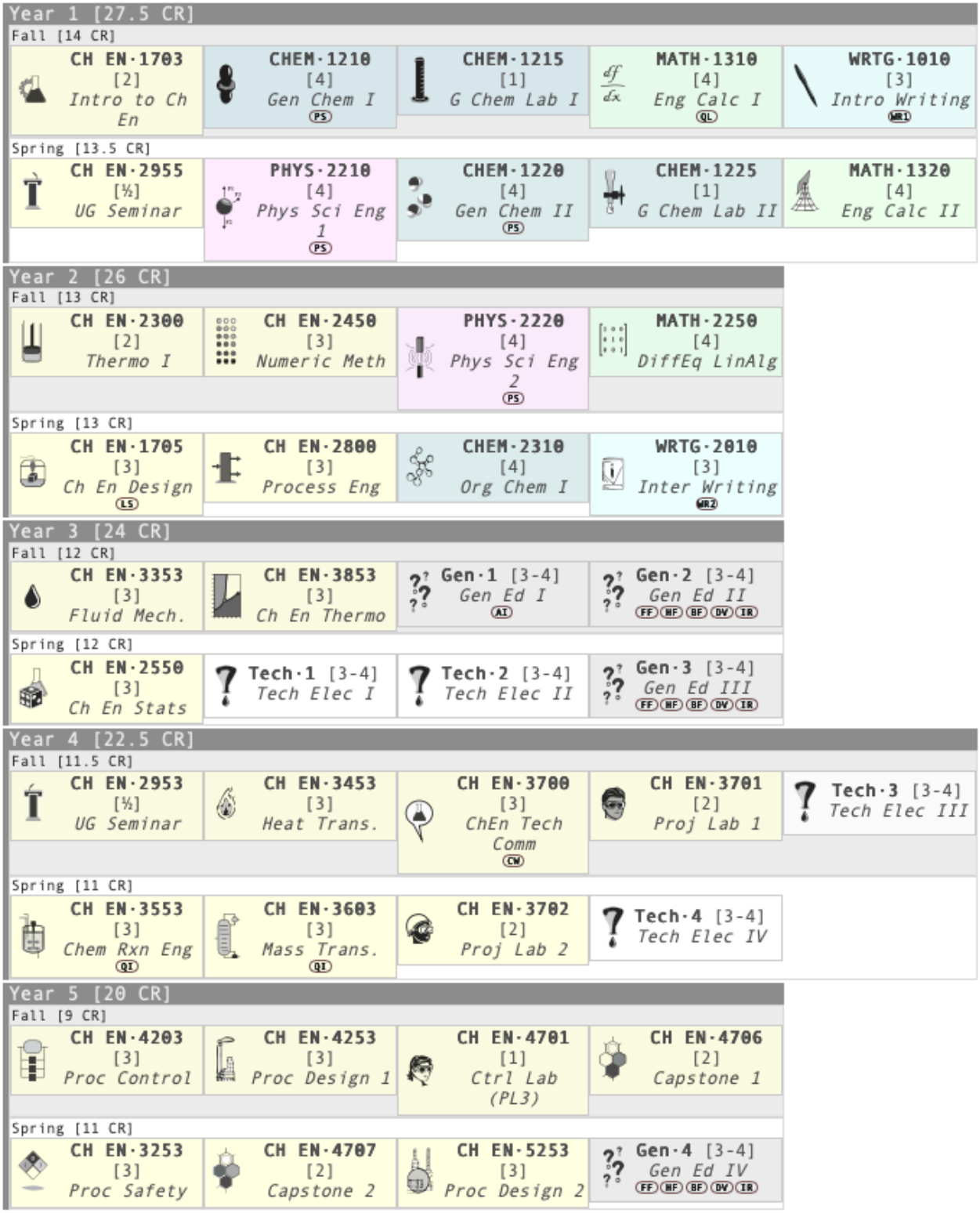


Table 2: *Five-Year Plan.* This table represents a summary of our curriculum with both plans for completing our program in five years. Please consult this guide, the Academic Plans page of our site (https://www.che.utah.edu/ugplans/), and the University Catalog for more complete information, https://catalog.utah.edu/#/courses.



NOTE: There are special considerations with some courses that are detailed in this Undergraduate Student Handbook. To avoid delays in graduation, students should make themselves familiar with the details of all department requirements.

A complete list of Chemical Engineering course offerings is available in the online General Catalog (https://catalog.utah.edu/). As with all courses, the prerequisites for each course must be in progress or completed by the time of registration.

c) Special Considerations in Planning Coursework

All Students:

- Pre and co-requisites for each core chemical engineering course may be found in the university General Catalog (https://catalog.utah.edu/) and on our department website (https://www.che.utah.edu/ugplans/). The Department's policy on taking courses for which a requisite is not met may be found in the section Permission Codes in this guide.
- Chemistry 1220 and CH EN 2300 are requisites to Chemical Engineering 2800.
- Most upper- and lower-division chemical engineering courses are offered only once each year and are restricted to students who have met the prerequisites.

Transfer Students:

- 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).
- Note the requirements for replacing 1705 in the Degree Requirements section of this document.

Students Planning to Attend Engineering Graduate School:

- 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. They are also encouraged to complete a physical chemistry course. Examples of physical chemistry courses are: CHEM 3060, ECE 3200, MSE 3210, and PHYS 4010.

Exceptions to course sequencing or prerequisites

- In special circumstances, chemical engineering courses can be taken out of order or prerequisites may be waived. A petition can be found on the departmental website for chemical engineering courses. (https://utah.sjc1.qualtrics.com/jfe/form/SV_eb1gJUd1jJVnkvl) Once a petition is submitted, it will be reviewed by the advising team and the Director of Undergraduate Studies. The Chemical Engineering Department cannot make exceptions for courses housed in other departments. Students will need to contact the department offering the desired course.

d) Technical Electives

Technical electives allow students to specialize, customize, or broaden the type of engineer they become. Bachelor's degree candidates must complete at least **12 hours** of approved technical electives. Students are responsible for completing any prerequisites or corequisites for technical elective classes; requisite information may be found in the university's course catalog online.

See the Emphasis and Specialization sections of this document for descriptions of the

various areas of chemical engineering on which you might focus. Table 2 lists approved technical elective courses. An interactive version may be found on our site: https://www.che.utah.edu/ugtechelect/. The icons in Table 2 indicate:

- 💡 **= Emphasis · Energy Engineering**
  - Fuels, petroleum, alternative energy. Requires at least 9 units of core electives. See the Energy Emphasis Section of this guide for details.
- ♻️ **= Emphasis · Environmental & Sustainability**
  - Air & water quality, sustainability, alternative energy, improving our processes to protect environmental health & safety.
- 🔋 **= Specialization · Alternative Energy**
  - Solar, wind, geothermal, and energy storage solutions for low-carbon power generation.
- 🦠 **= Emphasis · Biochemical Engineering & Bioprocessing**
  - Use of biology to create useful products, from food to therapeutics.
- 💻 **= Emphasis · Semiconductor Processing**
  - Processes necessary for building processors & flash memory devices.
- ➗ **= Emphasis · AI, Computational Methods & Data Science**
  - Simulation, analysis, and control of complex chemical engineer processes.
- ⛏️ **= Specialization · Mining Processes**
  - Mineral extraction processes and properties of metals.
- 🪙 **= Specialization · Metallurgy & Metal Processing**
  - Mineral extraction processes and properties of metals.
- 🏢 **= Specialization · Business, Law, & Management**
  - The business, law, & management aspects of chemical engineering
- 🧊 **= Specialization · Materials Engineering**
  - Polymers, ceramics, metals, & composites for consumer products, medical devices, & more.
- ☢️ **= Specialization · Nuclear engineering**
  - Nuclear reactor and forensic processes. Interested students should consider using these electives to also obtain a minor in nuclear engineering.

Electives that are core to the area of study have an orange background. Red backgrounds indicate the course is a necessity for the emphasis or specialization.

Table 3: Approved Technical Electives: In the following table you may click on the course title to see its catalog information. To count for emphases or specializations, non-specific courses (e.g. Special Topics, Co-Ops, Undergraduate Research, and Independent Study), must be in the area of the emphasis or specialization, as judged by the Undergraduate Committee.

Course Number	Short Title & Link	Cr	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
CH EN·4870	*I Energy Analysis*	1-3	💡	♻️	🔋	·	·	·	·	·	🏢	·	·
CH EN·4973	*UG Thesis Res*	1-3	·	·	·	·	·	·	·	·	·	·	·
CH EN·4975	*Chem Engr Clinic*	1-3	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
CH EN·4977	*Co-op Educ*	1-3	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
CH EN·4978	*Co-op Educ*	1-3	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
CH EN·4980	*UG Research*	3	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
CH EN·4999	*Honors Thesis*	1-3	·	·	·	·	·	·	·	·	·	·	·
CH EN·5158	*Energy & Soc.*	3	💡	♻️	🔋	·	·	·	·	·	🏢	·	·
CH EN·5203	*State Space Control*	3	·	·	·	·	💻	➗	·	·	·	·	·
CH EN·5205	*Smart Systems*	3	💡	·	·	·	💻	➗	·	·	·	·	·
CH EN·5208	*AI for ChemE*	3	·	·	·	·	·	➗	·	·	·	·	·

CH EN·5230	Bio Devices & Sen.	3	·	·	·	🦠	·	·	·	·	·	🧊	·
CH EN·5305	Air Pollution Ctrl	3	💡	♻️	🔋	·	💻	·	·	·	·	·	·
CH EN·5306	Appl Atmos Model	3	💡	♻️	·	·	·	➗	·	·	·	·	·
CH EN·5308	Battery Tech	3	💡	♻️	🔋	·	💻	·	⛏️	🪙	·	·	·
CH EN·5310	Renewable Energy	3	💡	♻️	🔋	·	·	·	·	·	·	·	·
CH EN·5555	Catalysis Eng	3	💡	·	·	·	·	·	·	·	·	🧊	·
CH EN·5810	Nanoscience	3	·	·	·	🦠	💻	·	·	·	·	·	·
CH EN·5950	Independent Study	1-5	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
CH EN·5960	Special Topics	½-5	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
ATMOS·3100	Atmos Chem	3	💡	♻️	🔋	·	·	·	·	·	·	·	·
ATMOS·5000	Intr Atmos Sci	3	·	♻️	·	·	·	·	·	·	·	·	·
ATMOS·5050	Enviro Instrument	2	·	♻️	·	·	·	·	·	·	·	·	·
ATMOS·5400	Climate System	3	·	♻️	🔋	·	·	·	·	·	·	·	·
BIOL·2020	Princ Cell Bio	3	·	·	·	🦠	·	·	·	·	·	·	·
BIOL·2030	Genetics	3	·	·	·	🦠	·	·	·	·	·	·	·
BIOL·3510	Bio Chem I	3	·	·	·	🦠	·	·	·	·	·	·	·
BIOL·3520	Bio Chem II	3	·	·	·	🦠	·	·	·	·	·	·	·
BIOL·5495	Biophys Ecology	3	·	·	·	🦠	·	·	·	·	·	·	·
BME·3202	Physiol for Eng	4	·	·	·	🦠	·	·	·	·	·	·	·
BME·4250	Biomechanics I	4	·	·	·	🦠	·	·	·	·	·	·	·
BME·4640	Image Processing	3	·	·	·	🦠	·	➗	·	·	·	·	·
BME·5250	Biomechanics II	3	·	·	·	🦠	·	·	·	·	·	·	·
BME·5306	Gene Eng/Synth	3	·	·	·	🦠	·	·	·	·	·	·	·
CHEM·2315	Org Chem Lab I	2	·	·	·	🦠	·	·	·	·	·	·	·
CHEM·2320	Org Chem II	4	·	·	·	🦠	·	·	·	·	·	·	·
CHEM·2321	Org Chem II H	4	·	·	·	🦠	·	·	·	·	·	·	·
CHEM·2325	Org Chem Lab II	2	·	·	·	🦠	·	·	·	·	·	·	·
CHEM·3060	Quantum Chem	4	💡	·	·	·	💻	·	·	·	·	🧊	·
CHEM·3070	Thermo & Kinetics	4	·	·	·	·	💻	·	·	·	·	🧊	·
CHEM·3090	Phys Chem Life Sci	4	·	·	·	🦠	·	·	·	·	·	·	·
CHEM·3100	Inorganic Chem	5	·	·	·	·	·	➗	⛏️	🪙	·	🧊	·
CHEM·5720	Phys Chem Lab	2	·	·	·	·	·	➗	⛏️	🪙	·	🧊	·
CHEM·5730	Inorg Chem Lab	2	·	·	·	·	·	➗	⛏️	🪙	·	🧊	·
CS·1410	Object-Or Prog	4	·	·	·	·	·	➗	·	·	·	·	·
CS·3200	Intro Sci Comp	3	·	·	·	·	·	➗	·	·	·	·	·
CVEEN·3610	Environ Eng I	3	·	♻️	🔋	·	·	·	·	·	·	·	·
CVEEN·5605	H2O Treatment	3	·	♻️	·	·	·	·	·	·	·	·	·

ECE·2210	ECE Nonmajors	3	💡	·	·	·	💻	·	·	·	·	·	·
ECE·3200	Semicond Phys	3	💡	·	·	·	💻	·	·	·	·	🧊	·
ECE·5961	Special Topics	½-6	·	·	·	·	💻	·	·	·	·	·	·
ECON·3500	Intntl Economics	3	·	·	·	·	·	·	·	·	🏢	·	·
ENGIN·5030	Patent Law & Strat	3	·	·	·	·	·	·	·	·	🏢	·	·
ENGIN·5790	Entrepreneurship	3	·	·	·	·	·	·	·	·	🏢	·	·
ENGIN·5791	Tech Ventures	3	·	·	·	·	·	·	·	·	🏢	·	·
GEO·5220	Seismic Img	3	💡	·	·	·	·	·	⛏️	·	·	·	·
GEO·5240	EM Methods	3	💡	·	·	·	·	·	⛏️	🪙	·	·	·
GEO·5350	Groundwater	3	·	♻️	·	·	·	·	⛏️	·	·	·	·
GEO·5368	Energy Choices	3	💡	♻️	🔋	·	·	·	·	·	·	·	☢️
GEO·5370	Contaminants	3	💡	♻️	·	·	·	·	⛏️	·	·	·	·
GEO·5390	Subsurf Remed.	3	💡	♻️	·	·	·	·	⛏️	·	·	·	·
GEO·5450	Ore Genesis/Explor	3	·	·	·	·	·	·	·	·	·	·	·
GEO·5660	Geochemistry	3	💡	♻️	🔋	·	·	·	⛏️	🪙	·	·	·
GEO·5760	Stratigraph & Sed	4	💡	·	·	·	·	·	⛏️	·	·	·	·
GEO·5920	Special Topics	½-5	💡	·	·	·	·	·	⛏️	🪙	·	·	·
HNKLY·4900	Intern: Local	3-12	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
HNKLY·4901	Intern: Legislature	3-12	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
HNKLY·4902	Intern: National	3-12	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
HNKLY·4903	Intern: Int'l	3-12	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
HNKLY·4909	Intern: CEL	3-12	💡	♻️	🔋	🦠	💻	➗	⛏️	🪙	🏢	🧊	☢️
MATH·3080	Applied Stats II	3	·	·	·	·	💻	➗	·	·	·	·	·
MATH·3140	Vect Calc & PDE	4	·	·	·	·	·	➗	·	·	·	·	·
MATH·3150	PDE's for Eng	2	·	·	·	·	·	➗	·	·	·	·	·
MATH·3180	R Lab II	1	·	·	·	·	💻	➗	·	·	·	·	·
MATH·3600	Math in Medicine	3	·	·	·	🦠	·	➗	·	·	·	·	·
MATH·4100	Intro Data Sci	3	·	·	·	·	·	➗	·	·	·	·	·
MATH·4600	Math Phys/Med	4	·	·	·	🦠	·	➗	·	·	·	·	·
MATH·5110	Math Biology I	3	·	·	·	🦠	·	➗	·	·	·	·	·
MATH·5120	Math Biology II	3	·	·	·	🦠	·	➗	·	·	·	·	·
MATH·5600	Surv-Num Analysis	4	💡	·	·	·	·	➗	·	·	·	·	·
MATH·5620	Num Analysis II	4	·	·	·	·	·	➗	·	·	·	·	·
ME EN·2050	F Microsystems	1	·	·	·	·	💻	·	·	·	·	·	·
ME EN·5000	Engineering Law	3	·	·	·	·	·	·	·	·	🏢	·	·
ME EN·5050	Micromachining	3	·	·	·	·	💻	·	·	·	·	🧊	·
ME EN·5055	Microsystems D&C	3	·	·	·	·	💻	·	·	·	·	🧊	·

ME EN·5250	OO Prog for Eng	3	·	·	·	·	·	➗	·	·	·	·	·
ME EN·5620	Fund Micr Eng	3	·	·	·	·	💻	·	·	·	·	·	·
ME EN·5730	Microfluidic Fab	3	·	·	·	·	💻	·	·	·	·	·	·
ME EN·5800	Sus Energy Eng	3	💡	♻️	🔋	·	·	·	·	·	·	🧊	☢️
ME EN·5810	Therm Sys Design	3	💡	·	🔋	·	·	·	·	·	·	·	·
MET E·5260	Phys Metallurgy I	3	·	·	·	·	·	·	⛏️	🪙	·	🧊	·
MET E·5300	Alloy Design	3	·	·	·	·	·	·	⛏️	🪙	·	·	·
MET E·5450	Mech Metallurgy	3	·	·	·	·	·	·	⛏️	🪙	·	·	·
MET E·5670	Mineral Proc I	3	·	·	·	·	·	·	⛏️	🪙	·	·	·
MET E·5680	Mineral Proc II	3	·	·	·	·	·	·	⛏️	🪙	·	·	·
MET E·5700	Hydrometallurgy	3	·	·	·	·	·	·	⛏️	🪙	·	·	·
MET E·5710	High T Chem Proc	4	·	·	·	·	·	·	⛏️	🪙	·	·	·
MET E·5780	Metals Proc	2.5	·	·	·	·	·	·	⛏️	🪙	·	·	·
MGT·3000	Princpl of Manage	3	·	·	·	·	·	·	·	·	🏢	·	·
MGT·3680	Org Human Behave	3	·	·	·	·	·	·	·	·	🏢	·	·
MGT·4900	Intntl Manage	3	·	·	·	·	·	·	·	·	🏢	·	·
MGT·5600	Business Ethics	3	·	♻️	·	·	·	·	·	·	🏢	·	·
MKTG·4840	Int'l Marketing	3	·	·	·	·	·	·	·	·	🏢	·	·
MSE·3061	Transport Phenom	3	·	·	·	·	·	·	·	·	·	🧊	·
MSE·3210	Electron Prop Slds	3	💡	·	·	·	💻	·	·	·	·	🧊	·
MSE·3310	Intro Ceramics	3	·	·	·	·	·	·	·	·	·	🧊	·
MSE·3410	Intro Polymers	3	·	♻️	·	·	·	·	·	·	·	🧊	·
MSE·5040	Intr Biomaterial	4	·	·	·	🦠	·	·	·	🪙	·	🧊	·
MSE·5475	Intro Composites	3	·	·	·	·	·	·	·	·	·	🧊	·
MSE·6001	Eng Mtrls	3	·	·	·	🦠	💻	·	⛏️	🪙	·	🧊	·
NUCL·3000	Nuclear Princi	3	💡	♻️	🔋	·	·	·	⛏️	·	·	·	☢️
NUCL·3100	Rad Interact	3	💡	·	🔋	·	·	·	·	🪙	·	·	☢️
NUCL·3200	Radiochem I	3	💡	·	🔋	·	·	·	·	🪙	·	·	☢️
NUCL·4000	Nuclear Lab	3	💡	·	🔋	·	·	·	·	🪙	·	·	☢️
PHIL·3520	Bioethics	3	·	♻️	·	🦠	·	·	·	·	🏢	·	·
PHIL·4540	Eng Ethics Soc	3	·	♻️	🔋	·	·	·	·	·	🏢	·	·
PHYS·2215	Phys Lab I S & E	1	·	·	·	·	·	·	·	·	·	·	·
PHYS·2225	Phys Lab II S&E	1	·	·	·	·	·	·	·	·	·	·	·
PHYS·2710	Phys & Thermo	4	·	·	·	·	💻	·	·	·	·	·	·
PHYS·3150	Energy & Sustain	3	💡	♻️	🔋	·	·	·	·	·	·	·	·
PHYS·3610	Instrumentation	3	·	·	·	·	💻	➗	·	·	·	·	·
PHYS·3740	Quantum & Rel	3	·	·	·	·	💻	·	·	·	·	·	·

PHYS·3760	*Thermo Stat Mech*	3	·	·	·	·	💻	·	·	·	·	·	·
PHYS·4210	*Optics in Bio*	3	·	·	·	🦠	·	·	·	·	·	·	·
PHYS·4310	*Physics in Bio*	3	·	·	·	🦠	·	·	·	·	·	·	·
PHYS·5510	*Solid-State Phys I*	3	·	·	·	·	💻	·	·	🪙	·	🧊	·
POLS·5322	*Enviro/Sus Policy*	3	💡	♻️	🔋	·	·	·	⛏️	·	·	·	·
SCI·3900	*Human in STEM*	3	·	·	·	·	·	·	·	·	🏢	·	·

Petitioning for alternate technical electives

Generally, a technical elective should:

1. Be an upper division course, 3000 level or higher.
2. Be taken for a letter grade (it cannot be a credit/no credit course)
3. Convey skills and information that may likely be useful to a practicing chemical engineer, which may include a wide variety of disciplines (engineering, science, business management, law, ethics, public policy and more).
4. Result in a grade for the student that is above the department minimum (a “C” or above).

If a student wishes to count a course as a technical elective that is not listed in Table 2, they must petition the department using the appropriate form in the “Undergraduate” section of the department website (https://www.che.utah.edu/technical-elective-petition-form/). The petition will be evaluated through the Undergraduate Committee (Chair, Michael Nigra, nigra@chemeng.utah.edu).

e) Emphases, Certificates, Specialization, & Minors

If a student wishes to specialize in a particular type of chemical engineering, they have several options:

- **Emphasis (Transcripted Emphasis) -** A University of Utah Emphasis has requirements above those for a standard chemical engineering degree. These requirements may be in the form of additional units, certifications, or restrictions on the technical electives that count towards that emphasis. For this additional effort, an emphasis will show on a student's transcripts and indicate to employers that the student has training in a particular area of chemical engineering. Only one emphasis may appear on a student’s transcript. Though many of the technical electives may be taken outside our department, emphases are administered through Chemical Engineering. *When choosing an emphasis, please alert your undergraduate advisor and make sure your emphasis designation appears in the Degree Audit Reporting System*.
- **Specializations** - A specialization has no additional requirements, and does not appear on a student’s transcript. A student demonstrates to employers that they

have specialized in a particular area through the technical electives they select, from those available to all students in the program.

- **Certificates** - Certificates, like emphases, require extra coursework and may appear on a student's transcript. The courses may be drawn from several departments or colleges, but altogether they give "a student a competence worthy of some formal recognition". Many courses in some certificates may count as technical electives in the department of chemical engineering (check our list of pre-approved technical electives). A list of all University certificates and their requirements may be found here: https://certificates.utah.edu/. Common certificates relevant to chemical engineering include:
    - Engineering Entrepreneurship Certificate
    - Climate Change Certificate
    - Data Fluency Certificate
    - Data Science Certificate
    - Professional and Technical Writing
- **Minors & Double Majors** - Some of our students use the coursework in chemical engineering to double major or obtain a Minor from another department. Similar to an Emphasis, extra effort is required and it will show on your transcript. However, unlike an emphasis, the Department of Chemical Engineering would not have an administrative role in a student's path through another department's program. Students seeking Minors or Double Majors should also work with the academic advisors of the other department. With a chemical engineering degree, many minors only require a couple courses to obtain. Common Minors for our students include:
    - Chemistry: https://www.chemistry.utah.edu/degree-options/
    - Mathematics: https://www.math.utah.edu/undergraduate/
    - Physics: https://www.physics.utah.edu/undergraduate-program/majors-emphases-minors/
    - Nuclear Engineering: https://www.civil.utah.edu/nuclear-minor/

i) Department Emphases

The Department of Chemical Engineering has five emphases for undergraduate students. **Each emphasis requires 15 units of technical electives.**

💡Energy Engineering

An emphasis in energy engineering will 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 concerns, energy use, and energy production are included in the emphasis.

The technical electives that are part of the Energy Emphasis are shown with the 💡icon in Table 2. Core emphasis courses have an orange background in Table 2 (💡).

Students will complete *at least* 9 units from the core technical electives.

The remaining technical elective units may include any course from Table 2 with a 💡 icon. These courses 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 corequisites for each course.

♻️ Environmental & Sustainability

The courses listed for this area were selected for students with a strong interest in environmental protection, and improving the impact of our industries on our global health. 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.

The technical electives that are part of the Environmental & Sustainability Emphasis are shown with the ♻️ icon in Table 2. **C.** Core emphasis courses have an orange background in Table 2 (♻️). Students will complete *at least* 9 units from the core technical electives. The remaining 6 technical elective units may include any course from Table 2 with a ♻️ icon.

🦠Biochemical Engineering and Bioprocessing

Chemical engineers are needed to design and develop systems that will produce biochemical/biomedical products, 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. Department lab courses 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.

The 3 unit CH EN 5103 Biochemical Engineering course is required. Core emphasis courses have an orange background in Table 2 (🦠). Students will complete *at least* 6 units from the core technical electives. The remaining 6 technical elective units may include any course from Table 2 with a 🦠 icon.

💻 Semiconductor Processing

Chemical engineers are vital to the production of the computer chips and flash memory that manage our world. The silicon processing industry seeks chemical engineering graduates who have an understanding of photolithography, silicon etching, thin film deposition and etching, statistical design of experiments, and solid-state physics. With this emphasis, our students are well-suited to enter semiconductor industries.

9 units are from the required core courses: CH EN 5655 Silicon-Chip Processing, ME EN 5050 Fundamentals of Micromachining Processes, and ME 5055 Microsystems Design and Characterization. There is one additional 3 unit core course which is chosen from one of the following: CHEM 3060 Quantum Chemistry, ECE 3200 Introduction to Semiconductor and Device Physics, MSE 3210 Electronic Properties of Solids, or PHYS 4760 Thermal and Statistical Physics. The final 3 units for this emphasis are from courses in Table 2 with a (💻) orange icon.

➗ Computational Methods & Data Science

The preparation of graduates for the future of engineering should include understanding of modern data science, and machine learning. Chemical plants produce a vast wealth of data, and to extract meaning and insights from the noise in that information requires unique skills. Data science includes three components: computing, statistics, and knowledge of relevant physical processes. The chemical engineer gains a foundational understanding of the relevant physical processes; with this emphasis, our students gain experience with the statistics and computing aspect of data science.

9 units of core emphasis courses are required. Core emphasis courses have an orange background in Table 3 (➗). The remaining 6 technical elective units may include any course from Table 3 with a ➗ icon.

II) Department Specializations

A specialization in chemical engineering will not appear on a student's academic record, but choosing particular technical electives can be another way to focus a chemical engineering education on the industries in which the student is most interested. Courses associated with each emphasis may be seen in Table 3.

🔋 Alternative Energy

Chemical Engineers develop efficient technologies for solar, wind, hydroelectric, and geothermal power generation, as well as energy storage systems like batteries and fuel cells. Chemical engineers also play a vital role in bioenergy production, optimizing processes for biofuels and biomass conversion. Additionally, they contribute to hydrogen and fuel cell technologies, focusing on efficient hydrogen production and improving fuel cell performance. Chemical engineers drive the development of sustainable and low-carbon solutions, addressing the challenges of climate change and energy sustainability.

🏢 Business, Law, & Management

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 see any engineering project reach a successful conclusion. If you are interested in this specialization, it is recommended that you look into obtaining the Engineering Entrepreneurship Certificate: https://entrepreneurship.coe.utah.edu/.

🧊 Materials Engineering

This specialization focuses on the properties of materials and aspects of chemical engineering used to produce them. A chemical engineer is well-situated to develop new materials for a variety of applications, such as energy production, consumer products, environmental cleanup, and more. 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.

☢️ Nuclear Engineering

This specialization focuses on the properties of materials and the nuclear chemistry aspects of chemical engineering. A chemical engineer is well-situated to develop new materials and use nuclear chemistry for a variety of applications, such as energy production, nuclear medicine, and nuclear forensics. 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.

⛏️ Mining Processes

Chemical engineers play a crucial role in the fields of mining and metallurgy. In mining, they are responsible for designing and optimizing processes that extract valuable minerals from the earth while ensuring the efficient use of resources and minimizing environmental impact. Chemical engineers develop and implement techniques such as leaching, flotation, and solvent extraction to separate desired minerals from ore. They also work on tailings management and waste treatment to mitigate environmental risks associated with mining operations.

🪙Metallurgy & Metal Processing

In metallurgy, chemical engineers are involved in the production and refinement of metals. They contribute to the development of efficient extraction methods, such as smelting and roasting, to obtain pure metals from their ores. Chemical engineers also focus on refining processes, including alloying, purification, and casting, to improve the properties and quality of metals for various industrial applications. They are often

involved in the design and operation of metallurgical plants, ensuring optimal process control, energy efficiency, and product quality.

g) 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 courses you may have earned credit for here: https://admissions.utah.edu/information-resources/prior-learning-credit/advanced-placement-credit/

h) 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. When non-academic emergencies take place, a third attempt must be approved by the Director of Undergraduate Studies, Michael Nigra. Please contact our academic advisors if you plan to repeat a course more than once.

i) Fundamentals of Engineering (FE) Exam

All chemical engineering students who may want to become licensed, Professional Engineers (PE), are strongly 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 particular days. 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 may be available on the Chemical Engineering and College of Engineering websites.

j) Permission Codes

Students who do not meet the prerequisites for a Chemical Engineering course or have been assigned Intermediate Major Status, but wish to take that course must petition the department for a permission code. A student must also obtain a permission code if they wish to register for two courses that overlap in the class schedule. Such a conflict may happen, for example, with slight overlap of a lecture with a lab course. Sometimes this conflict can be accommodated with the cooperation of the lab faculty. To obtain a permission code for chemical engineering courses, submit a class permission code request through the Chemical Engineering website, www.che.utah.edu, under the 'Undergraduate" section of the site. To request permission codes for all other departments see: http://registrar.utah.edu/register/permission-numbers-requests.php.

VI. Transfer Students

Transfer students are a vital and welcome part of our student community. Students planning to transfer to the department from other colleges and universities should contact the transfer student adviser, Dr. David R. Wagner, 4506 MEB, drwagner@chemeng.utah.edu.

Transfer students who wish to be admitted to major status and register for courses in Chemical Engineering must attend New Student Orientation for Transfer Students which is conducted by the The Office of Orientation and Transition and the College of Engineering. Transfer students will meet with a member of the Chemical Engineering Academic Advising Team at Orientation to review transfer work and create an individualized graduation plan. Students may petition courses they completed from other institutions to satisfy major requirements online (Students will need a copy of their syllabi for each course they plan to petition.):

- https://www.che.utah.edu/transfer-course-evaluation-form/

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).

VII. Academic Programs

Our students are encouraged to enhance their undergraduate experience using a variety of department, college, and university programs. Below is a list of common programs in which our students participate.

a) Honors in Engineering

The Honors in Engineering Program in the Price 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 work 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 may be a team project but the honors student must individually produce their capstone final report. 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 (Dr. Anthony Butterfield) 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/.

b) CO-OPs

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 soon 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 facilitated 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.

Dr. Kody Powell (kody.powell@chemeng.utah.edu) manages our co-op program and may be contacted to learn of current co-op opportunities. Co-op opportunities may also be 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 our Academic Advisor (**cheundergrad@utah.edu**) before the semester begins.

c) E-LEAP

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 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 (https://leap.utah.edu/).

d) UG 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 conducting 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.

e) Combined BS/MS

BS/MS Application & Admission

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 years of study, at the University of Utah. To be invited, students must also be currently enrolled for at least 12 credits, have full major status in Chemical Engineering, be a U.S. Citizen or legal Permanent resident. If the student is a transfer student, they must 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 (Wanda Brown) and the Director of Graduate Studies(Prof. Kody Powell).

If a student decides to accept the invitation, they 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 their Capstone Laboratory and Process Design II courses. Students must comply with Admissions Office deadlines.

BS/MS Program of Study

Students considering the BS/MS degree program should be aware of the following.

I. The MS graduate degree may be a course-work, project, or thesis MS.
   A. A thesis-based MS degree requires that the candidate have a faculty sponsor who guarantees that they will fund the student as a research assistant.

II. 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.

III. The BS degree portion of the combined degree requires the completion of 114 or 115 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 120 for a BS degree. It is up to the candidate to ensure that they have met this requirement.

IV. The MS degree requires the completion of 30 additional hours.

V. 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.

VI. The shift from undergraduate to graduate status occurs after completion of required undergraduate Chemical Engineering classes.

VII. Students wishing to exit the combined program can apply qualifying coursework toward the traditional BS and MS degree requirements without penalty.

VIII. No student will be awarded a separate MS degree without satisfying all requirements for the BS degree.

IX. Graduate technical electives are usually 6000-level courses or above.
   A. Students 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 meet together.

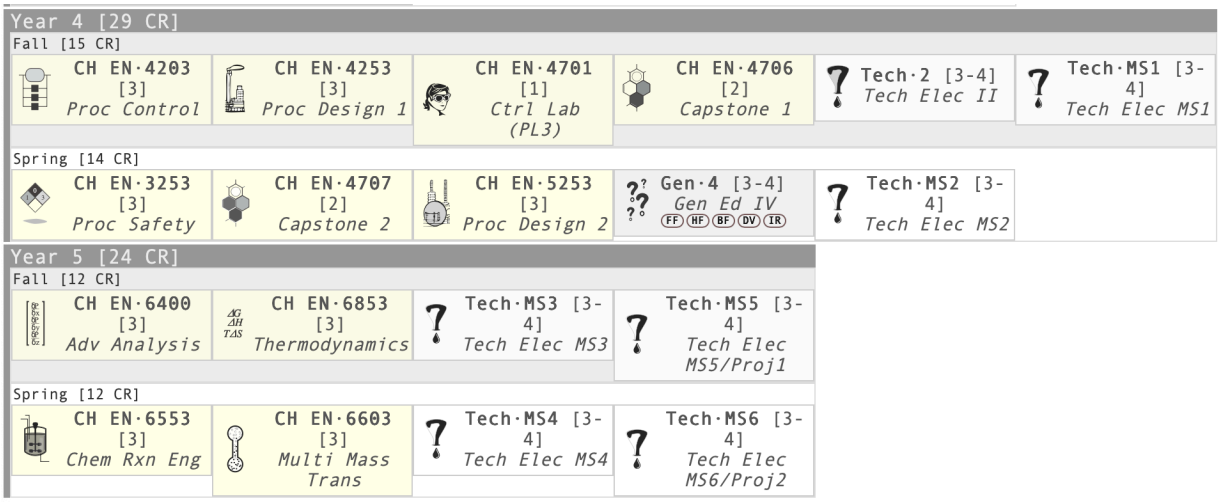
X. The tuition benefit program only covers courses that are numbered 6000 and above.

XI. A suggested program of study for the BS/MS is shown in Table3. BS/MS students would take the same course in the Four-Year Plan in Table 1, with the following exceptions:
   A. Two of the technical electives in the 4th year should be Graduate-level technical electives (6000 or above), likely in the fall and spring semester of senior year. These would replace two technical electives in the standard four-year BS plan.
   B. In fall and spring of the 5th year, students would take two graduate-level technical electives.
      1. Two of those graduate technical electives (6 credit hours) may be used for project hours for students working on a thesis.

C. In fall and spring of the 5th year, students would take two graduate core courses. Core graduate courses include:
    1. CH EN 6400 - Advanced Engineering Analysis
        a) Typically taught in fall.
    2. CH EN 6853- Graduate Thermodynamics.
        a) Typically taught in fall.
    3. CH EN 6603 - Advanced Transport Phenomena
        a) Typically taught in spring.
    4. CH EN 6553- Graduate Chemical Reaction Engineering.
        a) Typically taught in spring.

An academic plan for BS/MS students may be found on our department web site (https://www.che.utah.edu/ugplans/). More information on the requirements for the MS degree are found in the graduate handbook at https://www.che.utah.edu.

Table 3: Suggested 4th & 5th Year for a BS/MS Program.



VIII. Departmental Scholarships

The Department has a significant number of scholarships from generous alumni https://www.che.utah.edu/undergraduate/scholarships/. Our students do not nearly need a perfect academic record to possibly qualify for some scholarship support and all our students are encouraged to apply. Note that some scholarships take into consideration much more than a student's academic achievements and all our students are encouraged to seek scholarship opportunities. Application forms are available on the website and the same application applies to Chemical Engineering and College of Engineering scholarships. Price 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 also available through the Price College of Engineering.

IX. Ethics, Culture, & Standards

a) Chemical Engineering Professional Ethics

An engineer is given the tools, talents, and authority to make significant changes to our society. As such, we are obligated to graduate engineers who will make a positive impact. We know that our students cannot become truly and sustainably successful professionals without a solid foundation of ethics. Our profession's Code of Professional Ethics is detailed and maintained by the American Institute of Chemical Engineers (AIChE) and this code guides our instruction and assessment of our students and the accreditation of our program.

- AIChE Code of Ethics
- AIChE IDEAL Statement

Our department expects our faculty staff and students to adhere to these high professional standards.

b) Department Culture

We are very proud of the friendly and principled community that our students, faculty, and staff nurture in the Department of Chemical Engineering. We expect our students to challenge themselves and employ their talents to become top engineers, but never through deception or at the expense of others. Our department culture promotes collaboration, mentoring, & collegiality among its members. We aim for *every* student to feel a strong sense of belonging when they walk into our offices, laboratories, and classrooms. Ideally, every student should leave our department wealthy in friends, mentors, mentees, and colleagues.

c) Belonging & Fairness

Recently Utah House Bill 261 altered some of the ways in which students are supported on campus. See below for our department's recommendations for students regarding these changes.

Students most directly experience the social climate within their chosen department. *All* members of this department are expected to contribute to a kind, welcoming, equitable, fair, and inclusive environment for *every* other member of the department. Our particular department gladly aspires to AIChE's Code of Professional Ethics and AIChE's IDEAL commitment. We know that ethical and successful engineering relies on a diversity of human backgrounds, experiences, and ideas. We work to make our department a place where *everyone* will feel included, and where everyone will be treated humanely, fairly, and with dignity. We want all students, staff, visitors, and faculty in our department to feel they are a welcome member of a healthy and friendly community.

We also know inclusion and justice are not only matters of professional ethics, they are matters of professional success for our students. For any professional engineer, it is a vital career skill to be able to work harmoniously with a diversity of individuals, draw out their unique strengths, and connect with them on an authentic human level. We

welcome and rely on individuals of all ages, races, backgrounds, veteran status, ethnicities, neurodiversity, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, abilities, and other visible and nonvisible differences. We are grateful for and hope to learn from the variety of perspectives, experiences, and backgrounds in our student body.

Please let us know if any member, structure, or institution of our community falls short of our professional ethics.

- Report an incident of bias or harassment: https://safeu.utah.edu/how-do-i-report/
- FAQ about reporting and university policy: https://oeo.utah.edu/faq/index.php

Be aware that, if you report an incident through the University links above, the department may not learn about it. To alert the department, you must contact trusted faculty or staff directly.

d) Students with Disabilities

The University of Utah and the Department of Chemical Engineering 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. CDA 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 and Access.

Please let our department know if we can aid you in finding a successful academic path, through improvements to our instruction or facilities.

e) Mental Health

We know our students' mental acuity is built on a foundation of their mental health. The following resources may be helpful if you or someone you know is experiencing a mental health crisis.

- SafeU app: This app may be installed on your phone and used to reach most all services and report concerns: https://safeu.utah.edu/app/
- Students may find campus counseling resources directly here: https://counselingcenter.utah.edu/.
- If a peer needs help, you may alert campus resources using the SafeU app or here: https://safeu.utah.edu/how-do-i-report/
- Dedicated Price College of Engineering counseling service: https://www.price.utah.edu/2020/10/30/mental-health-counseling-for-students

Our department strongly encourages students experiencing a mental health crisis to seek help from qualified professionals.

Department Support: If a student requires academic accommodations due to a mental health crisis, and they do not wish to discuss arrangements or their situation with each faculty member, they may request that those discussions be taken up by Prof. Anthony

Butterfield (tony@chemeng.utah.edu). To relieve some burden from the student, Prof. Butterfield may then work with other department faculty to help negotiate a path to completion of chemical engineering courses. We know such discussions can be a barrier to getting help and hope to lower that barrier as much as we can.

f) Academic Misconduct

Academic misconduct demonstrates a willingness to deceive, and take illegitimate advantage over peers. It is clearly contrary to our professional code of ethics. If unaddressed, academic misconduct could also lead to the graduation of dangerously unqualified and unethical engineers.

Students who are *twice* found to have engaged in academic misconduct, as defined in the Student Code, and who have exhausted their appeals, as described in the Student Code, will have their major status in Chemical Engineering revoked; they will not be allowed back into the Chemical Engineering Program and will not be able to request permission codes.

- Report an incidence of academic misconduct to the department: Prof. James Sutherland (james.sutherland@utah.edu)
- Report an incidence of academic misconduct to the university: https://safeu.utah.edu/how-do-i-report/ (near the bottom of the page)
- University Academic Misconduct Process: https://deanofstudents.utah.edu/accountability/misconduct-process.php

Machine Learning & Artificial Intelligence Tools

We purposefully do not have an all-encompassing policy regarding these tools. Each faculty may have a unique policy for each class, and you should clarify that policy with each professor.

Like the slide-rule, calculator, and personal computer, ML tools have inevitably found their way into the workflow of professional engineers and you should become informed on their use, misuse, and limitations in order to excel in the future workplace. While we encourage you to learn about and use ML tools and they will be integrated into some of our courses, be aware that these tools often give wrong answers in a very confident tone. Even when they give you the correct solution, you must be certain you understand that solution. Like a calculator, they should only speed up what you already know how to do.

g) Behavioral Misconduct

Students who train to become chemical engineers at the University of Utah are expected to learn and demonstrate a commitment to the Code of Professional Ethics of the American Institute of Chemical Engineers (the “Ethics Code”). The Ethics Code recognizes, among other things, that successful engineers must “*treat all colleagues and co-workers fairly and respectfully, recognizing their unique contributions and capabilities by fostering an environment of equity, diversity and inclusion.*” The Ethics Code also recognizes that successful engineers must “*never tolerate harassment*” and must “*conduct themselves in a fair, honorable and respectful manner.*”

Behaviors such as belittling, bullying, name-calling, intimidating, and other types of harassment will not be permitted. A student who exhibits inappropriate behaviors toward their peers, faculty, and department staff will receive an academic consequence that may include reduction of a course grade or the requirement to author an academic reflection. Repeated failures may result in academic consequences up to and including suspension or dismissal from the Department. A student who is dismissed from the Department will not be allowed to reapply. Behaviors which are particularly egregious may also result in referral to the University's Dean of Students' Office for behavioral misconduct consequences.

- Report an incidence of behavioral misconduct: https://safeu.utah.edu/how-do-i-report/
- University of Utah Behavioral Misconduct Process: https://deanofstudents.utah.edu/accountability/misconduct-process.php

Be aware that, if you report an incident through the University links above, the department may not learn about it. To alert the department, contact department leadership, trusted faculty, or your academic advisors directly.

X. Student Organizations

Our department proudly supports several chemical engineering student groups. While academics are a top priority, these groups promote the health of our community and help our students build networks of friendship and support. These groups are also effective means to gain experiences that are valuable in the engineering workplace, such as leadership, mentoring, and networking. To get involved with these organizations, use the contact information below for the student leadership or relevant faculty.

Department Student Organizations

a) American Institute of Chemical Engineers (AIChE)

AIChE Student Organization at the University of Utah

This organization is the student chapter of the professional group that represents chemical engineers across the globe. Our AIChE student chapter focuses on the professional development of our students: organizing industry dinners, arranging tours of local companies, aiding their peers with resume and interview preparation, and so on. Leadership of this organization typically represents our department at the AIChE regional conference in spring and at the national conference in the fall.

- Contact: aiche.president@chemeng.utah.edu
- Advisors: Anthony Butterfield, tony@chemeng.utah.edu and David R. Wagner, david.ray.wagner@utah.edu

b) Undergraduate Student Advisory Committee (SAC)

Our UG SAC facilitates the partnership between department faculty, staff, and students in maintaining an exemplary chemical engineering curriculum and department culture. This student committee acts as a representative for their peers and promotes the health of our department community by:

- Advising faculty and staff on existing and emerging issues impacting our department, from a student's perspective
- Communicating to faculty and staff the concerns brought to them by their peers
- Conveying important information to their peers through announcements in core chemical engineering classrooms.
- Evaluating faculty who are in the retention promotion and tenure (RPT) process and authoring reports for RPT committees.
- Periodically representing their peers at department undergraduate committee meetings, when topics requiring student feedback are on the agenda.
- Conduct student town halls to solicit input from the entire student body.

SAC committee members are elected from each year of our 4-year academic program (First-Year, Sophomore, Junior, and Senior), plus a representative from our transfer student population, if transfer students are not represented in the other four members. A Junior SAC member is also the Chair-Elect of SAC and will become the Chair of SAC in the following year (their senior year), to maintain continuity.

- Faculty Advisor: Michael Nigra, nigra@chemeng.utah.edu

c) ChemE Car Team

This organization gives students a great opportunity to develop their hands-on laboratory skills and learn from each other. The ChemE Car team competes at the AIChE Spring Regional Conference and, if they are successful at the regional conference, at the Fall Annual AIChE Meeting. Student teams build a small car that is powered by some chemical reaction. The car must then move a certain distance and stop, based on precise timing of a chemical reaction.

- AIChE ChemE Car: https://www.aiche.org/students/chem-e-car-competitionr
- Faculty Advisor: Anthony Butterfield, Tony@chemeng.utah.edu

d) Community Outreach Team

Our Community Outreach Team travels to K-12 schools and community events throughout the

region to educate the public about chemical engineering as a career option. Our team of outreach mentors also competes in the AIChE K-12 Outreach Module Competition at the annual national conference. This organization focuses on reaching students who have been traditionally underrepresented in STEM fields, and periodically travels out of the Salt Lake Valley to reach rural populations that are often overlooked by large institutions.

- Contact: Outreach@chemeng.utah.edu
- Advisors: Anthony Butterfield, Tony@chemeng.utah.edu and Stacy Firth, stacy.firth@utah.edu

College of Engineering Student Organizations

The COE hosts a wide variety of STEM focussed student groups. A list of all College of Engineering student organizations may be found here:

- All COE Clubs: https://getinvolved.utah.edu/organizations?categories=12885

Of special note, several college clubs focus on providing support and community for students who have traditionally been underrepresented in engineering.

- Society of Women Engineers (SWE) uofuswe@gmail.com
- American Indian Science & Engineering Society (AICEC) uutahaises@gmail.com
- National Society of Black Engineers (NSBE) nsbeattheuofu@gmail.com
- Disability & Access in STEM (DASTEM) uofudastem@gmail.com
- Society Of Hispanic Professional Engineers (SHPE) uofushpe@gmail.com
- Out in STEM (oSTEM, Queer community & allies) ostemutah@gmail.com
- Women in Computing (WIC) uofuwic@gmail.com

XI. Useful Campus Resources

The University of Utah offers many valuable resources and support for its students that we, as a department, encourage you to put to full use. Please see their current web pages for more information.

Important Student Information

- **Campus Map:** https://www.map.utah.edu/
- **Student Code:** http://regulations.utah.edu/academics/6-400.php
- **Accommodation Policy (see Section Q):** http://regulations.utah.edu/academics/6-100.php

General Student Services

- **Report a Problem & Find Resources:** https://safeu.utah.edu/
- **Student Services:** https://www.utah.edu/students/services.php

- **Counseling Services:** https://counselingcenter.utah.edu/
- **PCE Counselor:** https://www.price.utah.edu/2020/10/30/mental-health-counseling-for-students
- **Financial Wellness Center:** https://www.asuupmmc.utah.edu/
- **Career & Professional Development Center:** https://careers.utah.edu/
- **University IT Help Desk:** https://it.utah.edu/help/

Specialized Academic Resources

- **Chemistry Help:** https://chem.utah.edu/undergraduate/resources/index.php
- **Math Help:** https://www.math.utah.edu/undergraduate/mathcenter.php
- **Writing Help:** https://writingcenter.utah.edu/
- **Physics Help:** https://www.physics.utah.edu/undergraduate-program/tutoring-resources/
- **Coding Help:** https://www.physics.utah.edu/undergraduate-program/tutoring-resources/

Specialized Student Supports

- **Victim-Survivor Advocacy:** https://wellness.utah.edu/victim-survivor-advocacy/
- **Native Excellence Student Affairs:** https://nativeexcellence.utah.edu/
- **Center for Child Care & Family Resources:** https://childcare.utah.edu/
- **Trio Program:** https://trio.utah.edu// (assists "low-income individuals, first-generation college students, and individuals with disabilities")
- **Campus Food Pantry:** https://union.utah.edu/resources-spaces/feed-u-pantry/hours-about-us/
- **Basic Needs Collective:** https://basicneeds.utah.edu/
- **Disability Services:** https://disability.utah.edu/
- **Veterans Support Center:** https://veteranscenter.utah.edu/
- **International Student and Scholars Services:** https://isss.utah.edu/

Do you know of a campus resource that should be on this list that isn't? Please let us know!

Changes in Student Resources Due to HB 261

Specialized Student Supports & HB 261

Our students have noted that several specialized student supports that are typically available at a US university are not listed above. Due to Utah House Bill 261, the following specialized student resources were removed from the University of Utah July 1, 2024:

- **Women's Resource Center**
- **LGBTQ+ Resource Center**
- **Black Cultural Center**
- **Office of Equity & Diversity**

If you have relied on these student supports in the past or would have as a new student at the U, they are intended to be offered through:

- **Center for Student Access & Resources:** https://studentresources.utah.edu/
- **Center for Cultural and Community Engagement:** https://culture.utah.edu/

At last look, these nascent organizations were still coming into existence and their web sites were under construction. We will try to update students on new developments. See below for our department's recommendations in this time of flux.

Language & HB 261

This new law also has implications for the language faculty and staff might be comfortable using with you (See the bill, faculty FAQ, and branding guidance for more details on the limitations placed on faculty and staff). You may, for instance, notice faculty avoiding the use of words like "equity" "diversity" and "inclusion" in their work, whereas you may have been accustomed to such language being unremarkable in past semesters. Creating programs that are entitled or merely referred to by those terms will also likely be avoided.

Instead, the University encourages the use of alternative words like: "student success" "social mobility" "differing viewpoints" and so on. As such, you may notice such terms becoming more common indicators of where you might find student supports on campus with the skillsets you would once find offered through programs entitled with the discouraged terms mentioned above.

Furthermore, it may also be reasonable to assume that, even if faculty and staff very much desire to be equitable and inclusive in their interactions with students and colleagues, some may feel it is too risky to state that clearly. Simply, you should not assume hesitation to discuss topics of diversity, inclusion, and equity are born out of personal hostility to these ideals on the part of the faculty or staff.

Our Department & Changes Due to HB261

The leadership of the Department of Chemical Engineering wants to assure our students that we remain firmly committed to the work needed to be a welcoming community for the students affected by HB261 and for *all* students. This commitment is also a professional obligation for all chemical engineers and engineering educators (AIChE Ethics Code, AIChE's IDEAL Commitment, ASEE's Code of Ethics).

Ensuring equal opportunity for persons of all backgrounds is well recognized by chemical engineering professionals as key to successful engineering endeavors and successful engineering teams. To satisfy our core mission of producing successful engineers and remain accredited as a chemical engineering program, we know that we must rely on a diversity of backgrounds, support each student according to their particular needs, and treat all of our students fairly. We will do that to the best of our abilities.

While in transition to this new university model, please know that some of our faculty have some fraction of the expertise that was once found in the student centers being remade by HB261 and we encourage you to let us know when those supports are needed. Our academic advisors should be able to direct you to appropriate specialized student supports within our department. If we are missing that skillset in our department, we will work to find people who can help you become the best engineer you can be.

Our department would also suggest that students impacted by HB261 connect with relevant student-led groups (search here). Our academic advisors can also be of help finding student communities, in engineering or more broadly, that can provide some of the help that may be obscured through this transition.

XII. Department Infrastructure

A map of Chemical Engineering Department spaces in the Merrill Engineering Building (MEB) is shown on the last page of this guide.

Teaching Laboratories

Our department houses three primary teaching laboratory spaces.

1. **The Meldrum Innovation Laboratory (AKA "MIL"):** This lab is in the South-East corner of the 1st floor of MEB (Room 1292). This lab is primarily used in our first-year design laboratory, but it also finds use by our junior and senior lab courses. In general, the MIL is oriented towards the product design aspects of chemical engineering. MIL's Starley Makerspace houses many 3D printers, a laser cutter, a CNC, soldering equipment, and various machining tools. Once students are trained on the equipment and lab safety, they may use the makerspace for personal projects (contact the lab manager to receive training). MIL also houses the Job Wet Lab, which contains several pieces of analytical equipment (a scanning electron microscope and UV-Visual spectrophotometer).
2. **The Medrum Process Technology Lab (AKA "MPTL" "Junior Lab"):** The Projects Lab takes up a large portion of the East side of MEB's 2nd floor (Room 3520). This space houses process engineering equipment that is primarily focussed on thermodynamics, reaction engineering, heat transfer and fluid dynamics. The space also houses a great deal of bench space for group work.

3. **The Projects Laboratory (AKA "Senior Lab"):** The Projects Lab takes up a large portion of the East side of MEB's 3rd floor (Room 3520). This lab is typically used by both juniors and seniors in our program. It contains larger pieces of our unit operations and process engineering equipment in its central Unit-Ops lab. It also has several satellite labs: the Wet Lab, the Biochemical Engineering Lab, the Reactor Lab, and the Analytical Lab.

Study Spaces

1. **Teaching laboratory spaces:** All our teaching laboratories (MIL, MPTL, & PL) contain tables which are usable for student team or individual work. As long as the space is not reserved for a course or an event, our laboratory spaces may be used by students as an individual work space or for study groups.
2. **The Dougall Student Center, MEB 2285 (AKA "DSC"):** This student study/social space is on the 2nd floor of MEB in the South East corner (Room 2285). The DSC contains several computers; it has circular tables for group work and places for students to just relax and socialize. TAs and faculty often use this space for office hours.
3. **The Starley Computer Laboratory, MEB 3250 (AKA "The Starley Lab"):** This lab is at the back of the Project Laboratory on the 3rd floor. It contains the majority of our department computers and is arranged to be a quiet area for individual work.
4. **The 4th Floor Study Room, MEB 4520:** This is a conference room with one long table meant for student group work or for team presentation practice.
5. **The 4th Library, MEB 4550:** This space holds chemical engineering texts and can be used as a reservable conference room for presentations. It is also usable for a study room, when it is not reserved.

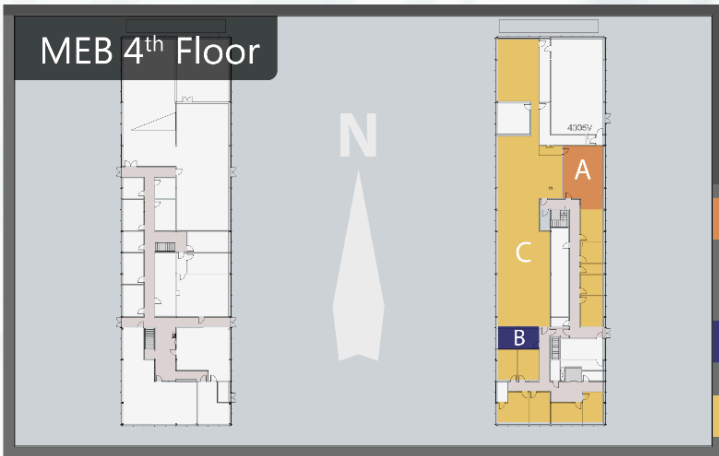
Department Computing Facilities

While it is advantageous for students to own a laptop for use in classes, our department and college maintain a collection of computers for student use on campus. Furthermore, laptops may be borrowed from the Marriott Library (link below). You can read about the student computing and lab facilities at https://www.che.utah.edu/undergradute/facilities. The majority of department computers for student use may be found in DSC, MIL, and the Starley Lab. To log into department computers, you must first create an account (link below). With your account, you may also remotely access department virtual machines and department software off-campus.

- Library Equipment Checkout: https://lib.utah.edu/coronavirus/checkout-equipment.php
- Account Creation: https://www.che.utah.edu/forms/comp/
- Department Remote Access: https://connect.chemeng.utah.edu/

Department Map

The department of Chemical Engineering has offices and research laboratories in several buildings throughout the north side of University of Utah's campus. However, the majority of department resources are found in the Merrill Engineering Building (50 S. Central Campus Drive, Salt Lake City, Utah, 84112).



Chemical Engineering
University Of Utah
Merrill Engineering Building
Department Map

A. 4th Floor Library (MEB 4550)

Holds chemical engineering texts and can be used as a reservable conference room for presentations. Also usable for a study room.

B. 4th Floor Study Room (MEB 4520)

A smaller student study area for group work.

C. Grad Student Offices (MEB 4560)

D. Projects Lab (MEB 3520)

Contains larger chemical engineering process equipment and several satellite labs. Work benches are available for use by students for study space..

E. Starley Computer Lab (MEB 3520F)

Holds department computers for student use. The space is a quiet work area that is accessed through the Projects Lab (MEB 3520).

F. Department Offices (MEB 3290)

Department front desk, leadership, staff, academic advisors, career coaching.

G. Williams Conference Room (MEB 3291)

Conference room is primarily for faculty use.

H. Meldrum Process Technology Laboratory (MEB 2550)

Hosts many of our upper division lab courses. When labs are not occurring, may also be used as a student study area and workspace.

I. Dougall Student Center (MEB 2285)

Meant for all our students to use for work and socializing. Contains department computers, monitors, and couch. The space is also used periodically for courses and office hours.

Building Restrooms: *Note that the NE Women's room on the 2nd floor is next to a lactation room and the 1st floor NE restrooms have showers and may lock for added privacy.*

J. Meldrum Innovation Laboratory (MEB 1292)

Starley Makerspace, Job Wet Lab, and Williams Design Studio. The laboratory & makerspace equipment is available for student use after training, and the design studio is available for group work when labs are not scheduled.

Legend

- Student Study Areas
- Teaching Laboratories
- Conference Rooms
- Faculty & Staff Offices
- Faculty Research Labs
- M Restroom (Men)
- W Restroom (Women)