

# CHEMICAL ENGINEERING, BACHELOR OF SCIENCE

## College of Engineering

The Department of Chemical Engineering offers two undergraduate programs: Chemical Engineering (p. 1) and Biochemical Engineering (<https://catalog.ucdavis.edu/departments-programs-degrees/chemical-engineering/biochemical-engineering-bs/>).

## Chemical Engineering Undergraduate Program

The Chemical Engineering (BS) program is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>) under the commission's General Criteria and Program Criteria for Chemical, Biochemical, Biomolecular, and Similarly Named Engineering Programs.

Chemical engineers apply the principles of chemistry and engineering to produce useful commodities, ranging from fuels to polymers. Chemical engineers are increasingly concerned with chemical and engineering processes related to the environment and food production. They work in diverse areas ranging from integrated circuits to integrated waste management. Preparation for a career in chemical engineering requires an understanding of both engineering and chemical principles to develop proficiency in conceiving, designing, and operating new processes.

The chemical engineering curriculum has been planned to provide a sound knowledge of engineering and chemical sciences so that you may achieve competence in addressing current and future technical problems.

### Objectives

The objectives of the program in Chemical Engineering are to educate students in the fundamentals of chemical engineering, balanced with the application of these principles to practical problems; to train them as independent, critical thinkers who can also function effectively in teams; to foster a sense of community, ethical responsibility, and professionalism; to prepare them for careers in industry, government, and academia; to illustrate the necessity for continuing education and self-learning; and to help students to learn to communicate proficiently in written and oral form.

Students are encouraged to adhere carefully to all prerequisite requirements. The instructor is authorized to drop students from a course for which stated prerequisites have not been completed.

### Junior & Senior Year Options

The focus in the junior year is on fundamentals such as thermodynamics, fluid mechanics, energy transfer, and mass transfer phenomena. In the senior year, students draw these fundamentals together and apply them in a study of kinetics, process design, and process dynamics and control. The program's requirement of eight chemical engineering elective units allow students to strengthen specific areas in chemical engineering, explore new areas, or pursue new areas of specialization.

### Honors Program

An Honors Program is available to qualified students in the Chemical Engineering & Biochemical Engineering majors. It is a two-year program designed to challenge the most talented students in these majors. Students are invited to participate in their sophomore year. In the upper

division coursework, students will complete either an honors thesis or a project that might involve local industry. Students must maintain a grade point average of 3.500 to continue in the program. Successful completion of the Honors Program will be acknowledged on the student's transcript.

The major requirements below are in addition to meeting University Degree Requirements (<https://catalog.ucdavis.edu/undergraduate-education/university-degree-requirements/>) & College Degree Requirements (<https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/>); unless otherwise noted. The minimum number of units required for the Chemical Engineering Bachelor of Science is 156.

Code	Title	Units
<b>Lower Division Required Courses</b>		
<i>Mathematics</i>		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3-4
or MAT 027A	Linear Algebra with Applications to Biology	
or BIS 027A	Linear Algebra with Applications to Biology	
MAT 022B	Differential Equations	3-4
or MAT 027B	Differential Equations with Applications to Biology	
or BIS 027B	Differential Equations with Applications to Biology	
<i>Physics</i>		
PHY 009A	Classical Physics	5
PHY 009B	Classical Physics	5
PHY 009C	Classical Physics	5
<i>Chemistry</i>		
Choose One:		5
CHE 002A	General Chemistry	
CHE 002AH	Honors General Chemistry	
CHE 004A	General Chemistry for the Physical Sciences & Engineering	
Choose One:		5
CHE 002B	General Chemistry	
CHE 002BH	Honors General Chemistry	
CHE 004B	General Chemistry for the Physical Sciences & Engineering	
Choose One:		5
CHE 002C	General Chemistry	
CHE 002CH	Honors General Chemistry	
CHE 004C	General Chemistry for the Physical Sciences & Engineering	
<i>Chemical Engineering &amp; Programming</i>		
ECH 005	Introduction to Analysis & Design in Chemical Engineering	3
ECH 051	Material Balances	4
ECH 060	Chemical Engineering Problem Solving	4
or ECS 032A	Introduction to Programming	
or ECS 032AV	Introduction to Programming	
ECH 080	Chemical Engineering Profession	1
<i>Engineering</i>		

Choose one:		4
ENG 017	Circuits I	
or ENG 017V	Circuits I	
ENG 035	Statics	
ENG 045	Properties of Materials	
or ENG 045Y	Properties of Materials	
Lower Division Composition/Writing; choose one: a grade of C- or better is required:		4
COM 001	Major Works of the Ancient World	
COM 002	Major Works of the Medieval & Early Modern World	
COM 003	Major Works of the Modern World	
COM 004	Major Works of the Contemporary World	
ENL 003	Introduction to Literature	
or ENL 003V	Introduction to Literature	
NAS 005	Introduction to Native American Literature	
UWP 001	Introduction to Academic Literacies (Recommended)	
or UWP 001V	Introduction to Academic Literacies: Online	
or UWP 001Y	Introduction to Academic Literacies	
Lower Division Required Courses Subtotal		72-74
<b>Upper Division Required Courses</b>		
<i>Chemical Engineering</i>		
ECH 140	Mathematical Methods in Biochemical & Chemical Engineering	4
ECH 141	Fluid Mechanics for Biochemical & Chemical Engineers	4
ECH 142	Heat Transfer for Biochemical & Chemical Engineers	4
ECH 143	Mass Transfer for Biochemical & Chemical Engineers	4
ECH 145A	Chemical Engineering Thermodynamics Laboratory	3
ECH 145B	Chemical Engineering Transport Lab	3
ECH 148A	Chemical Kinetics & Reaction Engineering	3
ECH 148B	Chemical Kinetics & Reaction Engineering	4
ECH 152A	Chemical Engineering Thermodynamics	3
ECH 152B	Chemical Engineering Thermodynamics	4
ECH 155	Chemical Engineering Kinetics & Reactor Design Laboratory	4
ECH 157	Process Dynamics & Control	4
ECH 158AN	Separations & Unit Operations	4
ECH 158BN	Process Economics & Green Design	4
ECH 158C	Plant Design Project	4
<i>Chemistry</i>		
CHE 128A	Organic Chemistry	3
CHE 128B	Organic Chemistry	3
CHE 129A	Organic Chemistry Laboratory	2
<i>Chemical Engineering Technical Electives</i>		
Choose 20 units:		20

1. At least 3 units must be completed in any upper division engineering course(s) not numbered 190C, 192, 198, and 199 (independent study, research, seminar, or internship courses).

2. Remaining 17 units, for a total minimum of 20 units are subject to the following:

a. Units must be completed in science, engineering or business courses carrying one of the following subject designations: ARE, ATM, BIM, BIS, BIT, CHE, EAE, EBS, ECH, ECN, ECI, ECS, EEC, EME, EMS, ENG, FPS, FST, MAT, MCB, MGT, PHY, STA and VEN.

b. A minimum of 9 units must be completed in upper division (100-199) courses.

c. You may receive chemical engineering elective credit up to a maximum of 4 units of ECH 192, ECH 198, and ECH 199 combined (192's/198's/199's from outside the department require a petition, see below item d).

d. Credit for independent studies (199s) or internships (192s) completed outside of the department must be approved by the department's Undergraduate Affairs Committee. Additionally, students applying for these credits must submit an essay of at least 4 pages and no more than 10 pages detailing the engineering and/or science aspects of their work, results or outcomes (figures and graphs may be included), and how the experience relates to their educational program and objectives. The report must be submitted in pdf format and use 1.5 line spacing, 1" margins, and 12pt Times New Roman font. No intellectual property should be contained in the report. Applications must also include a written evaluation of the students' performance by the student's supervisor or faculty advisor.

e. Courses numbered 92, 98, and 99 may not be used to satisfy this requirement.

3. Courses used to satisfy other major requirements cannot be used to satisfy the technical elective requirements.

*Upper Division Composition Requirement; a grade of C- or better is required:*

Choose one: 0-4

UWP 102E Writing in the Disciplines: Engineering

UWP 102F Writing in the Disciplines: Food Science & Technology

UWP 104A Writing in the Professions: Business Writing

or UWP 104AV Writing in the Professions: Business Writing

or UWP 104AY Writing in the Professions: Business Writing

UWP 104E Writing in the Professions: Science

UWP 104T Writing in the Professions: Technical Writing

Passing the Upper Division Composition Exam.

Upper Division Required Courses Subtotal 84-88

**Total Units 156-162**