CHEMICAL ENGINEERING UNDERGRADUATE MAJOR (BS, HBS)

This program is available at the following locations:

- **Corvallis**
- **Ecampus**

The Bachelor of Science and Honors Bachelor of Science in Chemical Engineering degree programs are accredited by the Engineering Accreditation Commission of ABET (https://www.abet.org/), under the commission's General Criteria and Program Criteria for Chemical, Biochemical, and Biomolecular Engineering.

Chemical engineering is the discipline that focuses on the science and engineering of processes to convert raw materials into valued chemicals and products at a manufacturing scale. These include products found in everyday life such as transportation and heating fuels, plastics, pharmaceuticals, household and paper products (soaps, cosmetics, health care and cleaning products, etc.), as well as more advanced products like solar cells, computer chips, and advanced composites for jet aircraft.

Chemical engineers find employment in traditional chemical industries such as pulp and paper manufacturing and petroleum refining, high-tech industries such as semiconductor device manufacturing, biopharmaceutical production, aerospace, and emerging industries, particularly sustainable energy.

The chemical engineering undergraduate curriculum is designed to meet the student objectives through relevant course content, structured collaborative learning experiences, and hands-on laboratory and design experiences at the first year through senior levels. The school has a core curriculum where students from all three programs housed within the school (CHE, BIOE, ENVE) take common courses in the areas of first-year engineering, material and energy balances, thermodynamics, transport phenomena, and senior year laboratory.

Chemical engineering students have opportunities to obtain internships offered through the School of CBEE, and through the Multiple Engineering Cooperative Program (MECOP). Many scholarships are available on a competitive basis for chemical engineering undergraduate students. More detailed descriptions of the curriculum and requirements may be viewed on the CBEE website (https://engineering.oregonstate.edu/Academics/Degrees/Chemical-Engineering).

Program Educational Objectives—Chemical Engineering

The Program Educational Objectives (PEOs) represent the objectives for alumni of the Chemical Engineering program about three years after graduation, and are as follows.

Alumni of the Chemical Engineering program will be future engineers, problem solvers, responsible professionals, and interdisciplinary collaborators. Specifically, based on the needs of the program's constituencies, within a few years of graduation chemical engineering alumni will have:

1. Obtained professional employment in a company, institute or agency within the chemical or related industries, entered a graduate program in chemical engineering or a related field or gained admission to a professional program such as medicine, law, business, or support development of start-up enterprises.
2. Created value for society-at-large by applying appropriate modern engineering tools to the analysis, design, and control of chemical, physical, and/or biological processes, including the hazards associated with these processes.
3. Continued to develop their skills and knowledge through active participation in professional development activities including Engineer-in-Training certifications, memberships in professional organizations, mentoring and continuing education courses in order to fulfill their professional and ethical responsibilities through lifelong learning.
4. Demonstrated leadership through communication skills and effective collaboration in cross-functional team environments comprised of a diverse set of members with varying organizational backgrounds, positions, technical knowledge and geographic locations.

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Upon successful completion of the program, students will be able to:

- Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- Communicate effectively with a range of audiences.
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Code	Title	Credits
ENGR 110 & ENGR 115	+TRANSITIONS and THE OREGON STATE ENGINEERING STUDENT [1]	3
or ENGR 310	+TRANSITIONS	
ENGR 102	+DESIGN ENGINEERING AND PROBLEM SOLVING	3
ENGR 103	ENGINEERING COMPUTATION AND ALGORITHMIC THINKING	3
ENGR 201	ELECTRICAL FUNDAMENTALS I	3
ENGR 330	+INCLUSIVE AND EQUITABLE ENGINEERING	3
CBEE 211	MATERIAL BALANCES AND STOICHIOMETRY	3
CBEE 212	ENERGY BALANCES	3
CBEE 213	PROCESS DATA ANALYSIS	4
CBEE 414	^PROCESS ENGINEERING LABORATORY	3
COMM 114	+*ARGUMENT AND CRITICAL DISCOURSE	3-4
or COMM 111Z	+*PUBLIC SPEAKING	
or COMM 218Z	+*INTERPERSONAL COMMUNICATION	
WR 121Z	+*COMPOSITION I	4
WR 227Z	+*TECHNICAL WRITING	4
MTH 251Z	+*DIFFERENTIAL CALCULUS	4
MTH 252Z	INTEGRAL CALCULUS	4

MTH 254	VECTOR CALCULUS I	4
MTH 256	APPLIED DIFFERENTIAL EQUATIONS	4
MTH 264 & MTH 265	INTRODUCTION TO MATRIX ALGEBRA and INTRODUCTION TO SERIES	4
PH 211	+*GENERAL PHYSICS WITH CALCULUS	4
PH 212	*GENERAL PHYSICS WITH CALCULUS	4
PH 213	*GENERAL PHYSICS WITH CALCULUS	4
CH 331	ORGANIC CHEMISTRY	4
CH 440	PHYSICAL CHEMISTRY	3
CH 441	PHYSICAL CHEMISTRY	3
CH 442	PHYSICAL CHEMISTRY	3
CHE 311	THERMODYNAMICS	3
CHE 312	CHEMICAL ENGINEERING THERMODYNAMICS	3
CHE 320	SAFETY, ENGINEERING ETHICS AND PROFESSIONALISM	3
CHE 331	TRANSPORT PHENOMENA I	4
CHE 332	TRANSPORT PHENOMENA II	3
CHE 333	TRANSPORT PHENOMENA III	3
CHE 334	TRANSPORT PHENOMENA LABORATORY	3
CHE 361	CHEMICAL PROCESS DYNAMICS AND SIMULATION	3
CHE 411	MASS TRANSFER OPERATIONS	4
CHE 415	CHEMICAL ENGINEERING LABORATORY I	3
CHE 431	CHEMICAL PLANT DESIGN I	3
CHE 432	+CHEMICAL PLANT DESIGN II	3
CHE 443	CHEMICAL REACTION ENGINEERING	4
CHE 461	PROCESS CONTROL	3
Biology		
BI 103	+*HUMAN BIOLOGY:#THE HUMAN BODY, HEALTH AND DISEASE	4-5
or BI 221Z	+*PRINCIPLES OF BIOLOGY: CELLS	
or MB 230	+*INTRODUCTORY MICROBIOLOGY	
General Chemistry		
Select one of the following chemistry series:		15
Series 1 [2]		
CH 201 & CH 204	GENERAL CHEMISTRY FOR ENGINEERING APPLICATIONS and +CHEMISTRY FOR ENGINEERING APPLICATIONS LABORATORY I	
CH 202 & CH 205	CHEMISTRY FOR ENGINEERING MAJORS and LABORATORY FOR CH 202	
CH 203	GENERAL CHEMISTRY FOR ENGINEERING APPLICATIONS	
Additional 4-credit chemistry course with lab from the Advanced Chemistry with Lab List		
Series 2		
CH 221Z & CH 227Z	GENERAL CHEMISTRY I and +*GENERAL CHEMISTRY I LABORATORY	
CH 222Z & CH 228Z	GENERAL CHEMISTRY II and *GENERAL CHEMISTRY II LABORATORY	
CH 223Z & CH 229Z	GENERAL CHEMISTRY III and *GENERAL CHEMISTRY III LABORATORY	
Advanced Chemistry		
Select one course from the following:		3-4
BB 350	ELEMENTARY BIOCHEMISTRY	
BB 450	GENERAL BIOCHEMISTRY	
CH 332	ORGANIC CHEMISTRY	
CH 411	INORGANIC CHEMISTRY	
CH 412	INORGANIC CHEMISTRY	
CH 421	ANALYTICAL CHEMISTRY	
CH 422	ANALYTICAL CHEMISTRY	
CH 424	BIOANALYTICAL CHEMISTRY	
CH 450	INTRODUCTORY QUANTUM CHEMISTRY	
WSE 321	WOOD CHEMISTRY	
Advanced Chemistry with Lab		
Select one course from the following:		3-4
CH 324	QUANTITATIVE ANALYSIS	
CH 337	ORGANIC CHEMISTRY LABORATORY	
CHE 417	ANALYTICAL INSTRUMENTATION IN CHEMICAL, BIOLOGICAL, AND ENVIRONMENTAL ENGINEERING	
CHE 444	THIN FILM MATERIALS PROCESSING	
CHE 445	POLYMER ENGINEERING AND SCIENCE	
OC 350	CHEMICAL OCEANOGRAPHY	
Engineering Electives		
Select 7 credits from the following courses:		7
BIOE 351	BIOMATERIALS AND BIOINTERFACES	
BIOE 440	BIOCONJUGATION	
BIOE 445	SURFACE ANALYSIS	
BIOE 457	BIOREACTORS	
BIOE 459	CELL ENGINEERING	
BIOE 462	BIOSEPARATIONS	
CE 412	HYDROLOGY	
CHE 444	THIN FILM MATERIALS PROCESSING	
CHE 445	POLYMER ENGINEERING AND SCIENCE	
CHE 446	POLYMER SYNTHESIS AND PROCESSING	
CHE 450	CONVENTIONAL AND ALTERNATIVE ENERGY SYSTEMS	
CHE 451	SOLAR ENERGY TECHNOLOGIES	
CHE 452	ELECTROCHEMICAL ENERGY SYSTEMS	
ECE 416	ELECTRONIC MATERIALS AND DEVICES	
ECE 417	BASIC SEMICONDUCTOR DEVICES	
IE 355	QUANTITATIVE METHODS FOR SYSTEM ANALYSIS AND IMPROVEMENT	
ENVE 321	ENVIRONMENTAL ENGINEERING FUNDAMENTALS	
or ENVE 322	FUNDAMENTALS OF ENVIRONMENTAL ENGINEERING	
ENVE 421	DRINKING WATER TREATMENT PROCESSES	
ENVE 422	WASTEWATER TREATMENT PROCESSES	
ENVE 425	AIR POLLUTION CONTROL	
ENVE 431	FATE AND TRANSPORT OF CHEMICALS IN ENVIRONMENTAL SYSTEMS	
ENVE 456	SUSTAINABLE WATER RESOURCES DEVELOPMENT	
ECE 418	SEMICONDUCTOR PROCESSING	
IE 356	QUANTITATIVE METHODS FOR SYSTEM MODELING AND EXPERIMENTATION	
MATS 321	INTRODUCTION TO MATERIALS SCIENCE	
MATS 322	MECHANICAL PROPERTIES OF MATERIALS	
+Core Ed: Arts & Humanities General		3-4
+Core Ed: Arts & Humanities Global		3-4
+Core Ed: Difference, Power & Oppression Foundations		3-4
+Core Ed: Social Science		3-4
+Core Ed: Seeking Solutions		3-4
Electives		0-4
Total Credits		**180**

* Baccalaureate Core course. Applies to general education requirements for undergraduate students in a catalog year up to 2024-2025

\+ Core Education course. Applies to general education requirements for undergraduate students in catalog year 2025-2026 and beyond

^ Writing Intensive Curriculum (WIC) course

1 Students who complete CORE 100 or CORE 300 or a non-ENGR Transitions course will use an Engineering elective credit to substitute for ENGR 115

2 Students who take the 201-203 general chemistry sequence will need to take another chemistry or chemical engineering course with a lab

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Degree plans are subject to change and the following is only an example of how students may complete their degree in four years. Students should

consult their advisor to determine the best degree plan for them. Contact details for advisors can be found on the Academic Advising *(*https://catalog.oregonstate.edu/advising/*) page.*

First Year		
Fall		**Credits**
ENGR 110 & ENGR 115 or ENGR 310	+TRANSITIONS or +TRANSITIONS	3
MTH 251Z	+*DIFFERENTIAL CALCULUS	4
WR 121Z	+*COMPOSITION I	4
General Chemistry with Lab		5
	Credits	**16**
Winter		
COMM 114 or COMM 111Z or COMM 218Z	+*ARGUMENT AND CRITICAL DISCOURSE or +*PUBLIC SPEAKING or +*INTERPERSONAL COMMUNICATION	3-4
ENGR 102	+DESIGN ENGINEERING AND PROBLEM SOLVING	3
MTH 252Z	INTEGRAL CALCULUS	4
General Chemistry with Lab		5
	Credits	**15**
Spring		
ENGR 103	ENGINEERING COMPUTATION AND ALGORITHMIC THINKING	3
MTH 254	VECTOR CALCULUS I	4
General Chemistry with Lab		5
Core Ed: Social Science		3-4
	Credits	**15**
Second Year		
Fall		
CBEE 211	MATERIAL BALANCES AND STOICHIOMETRY	3
CH 331	ORGANIC CHEMISTRY	4
MTH 256	APPLIED DIFFERENTIAL EQUATIONS	4
PH 211	+*GENERAL PHYSICS WITH CALCULUS	4
	Credits	**15**
Winter		
CBEE 212	ENERGY BALANCES	3
MTH 264 & MTH 265	INTRODUCTION TO MATRIX ALGEBRA and INTRODUCTION TO SERIES	4
PH 212	*GENERAL PHYSICS WITH CALCULUS	4
Biology Course		4
	Credits	**15**
Spring		
CBEE 213	PROCESS DATA ANALYSIS	4
ENGR 201	ELECTRICAL FUNDAMENTALS I	3
PH 213	*GENERAL PHYSICS WITH CALCULUS	4
WR 227Z	+*TECHNICAL WRITING	4
	Credits	**15**
Third Year		
Fall		
CH 440	PHYSICAL CHEMISTRY	3
CHE 311	THERMODYNAMICS	3
CHE 331	TRANSPORT PHENOMENA I	4
CHE 320	SAFETY, ENGINEERING ETHICS AND PROFESSIONALISM	3
Core Ed: Difference, Power & Oppression Foundations		3-4
	Credits	**16**
Winter		
CH 441	PHYSICAL CHEMISTRY	3
CHE 361	CHEMICAL PROCESS DYNAMICS AND SIMULATION	3
CHE 312	CHEMICAL ENGINEERING THERMODYNAMICS	3
CHE 332	TRANSPORT PHENOMENA II	3
Core Ed: Arts & Humanities General		3-4
	Credits	**15**
Spring		
CH 442	PHYSICAL CHEMISTRY	3
CHE 461	PROCESS CONTROL	3
CHE 333	TRANSPORT PHENOMENA III	3
CHE 334	TRANSPORT PHENOMENA LABORATORY	3
ENGR 330	+INCLUSIVE AND EQUITABLE ENGINEERING	3
	Credits	**15**
Fourth Year		
Fall		
CBEE 414	^PROCESS ENGINEERING LABORATORY	3
CHE 411	MASS TRANSFER OPERATIONS	4
CHE 443	CHEMICAL REACTION ENGINEERING	4
Advanced Chemistry with Lab		4
	Credits	**15**
Winter		
CHE 415	CHEMICAL ENGINEERING LABORATORY I	3
CHE 431	CHEMICAL PLANT DESIGN I	3
Engineering Elective		4
Core Ed: Seeking Solutions		3-4
	Credits	**14**
Spring		
CHE 432	+CHEMICAL PLANT DESIGN II	3
Advanced Chemistry		4
Engineering Elective		3
Core Ed: Arts & Humanities Global		3-4
	Credits	**14**
	Total Credits	**180**

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