

MAJOR IN CHEMICAL AND BIOLOGICAL ENGINEERING, SUSTAINABLE ENGINEERING CONCENTRATION

Requirements Effective Fall 2024

Students may enroll in either the standalone major or (at most) one of the concentrations under the Major in Chemical and Biological Engineering.

Freshman

		AUCC	Credits
CBE 160	MATLAB for Chemical and Biological Eng		1
CHEM 111	General Chemistry I (GT-SC2)	3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)	3A	1
CHEM 113	General Chemistry II		3
CHEM 114	General Chemistry Lab II		1
CO 150	College Composition (GT-CO2)	1A	3
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	4
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	4
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	5
Select one group from the following:			3
Group A:			
CBE 101	Introduction to Chemical and Biological Engr		
Group B:			
CBE 101A	Introduction to Chemical and Biological Engr. Lecture		
CBE 101B	Introduction to Chemical and Biological Engr. Laboratory		
Group C:			
CBE 104A	Study Abroad--Denmark: Intro to Chemical and Biological Engineering		
Total Credits			33

Sophomore

CBE 201	Material and Energy Balances		3
CBE 205	Fundamentals of Biological Engineering		3
CBE 210	Thermodynamic Process Analysis		3
CHEM 341	Modern Organic Chemistry I		3
CHEM 343	Modern Organic Chemistry II		3
CHEM 344	Modern Organic Chemistry Laboratory		2
MATH 261	Calculus for Physical Scientists III		4
MATH 340	Intro to Ordinary Differential Equations		4
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	5
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)			3
Total Credits			33

Junior

BC 351	Principles of Biochemistry		4
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CBE 310	Molecular Concepts and Applications		3
CBE 320	Chemical and Biological Reactor Design		3
CBE 330	Process Simulation		3
CBE 331	Momentum Transfer and Mechanical Separations		3
CBE 332	Heat and Mass Transfer Fundamentals		3
CBE 393	Professional Development Seminar		1
Bioscience Elective (see list below)			
Technical Elective (see list below)			
Advanced Writing (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)		2	3
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3

Total Credits**32****Senior**

CBE 333	Chemical and Biological Engineering Lab I		2
CBE 430	Process Control and Instrumentation		3
CBE 442	Separation Processes		4
CBE 443	Chemical and Biological Engineering Lab II		2
CBE 451	Chemical and Biological Engineering Design I	4A,4B,4C	3
CBE 452	Chemical and Biological Engineering Design II	4A,4B,4C	3
Engineering Elective (see list below)			
Technical Elective (see list below)			
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Social and Behavioral Sciences (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sceinces)		3C	3

Total Credits**32****Program Total Credits:****130****Bioscience Electives**

Select a minimum of 3 credits from the following.

Code	Title	Credits
LIFE 320	Ecology	3
MIP 432/ESS 432	Microbial Ecology	3

Technical Electives

Select a minimum of 6 credits from the following or select additional credits from the Bioscience Electives or Engineering Electives lists.

Code	Title	Credits
CHEM 338	Environmental Chemistry	3
CHEM 355	Foundations of Sustainable Chemistry	3
CHEM 465	Chemistry of Sustainable E-Waste Management	1
CHEM 555	Chemistry of Sustainability	3
CIVE 371	Study Abroad–Peru: Grand Challenges in Engineering in Peru	3
ENGR 382B	Study Abroad–Netherlands: Engineering and Sustainability	3
ERHS 320	Environmental Health–Water Quality	3

ERHS 410	Environmental Health–Air and Waste Management	3
ERHS 446	Environmental Toxicology	3
ERHS 448	Environmental Contaminants	3
ESS 311	Ecosystem Ecology	3
ESS 312	Sustainability Science	3
ESS 330	Quantitative Reasoning for Ecosystem Science	3
ESS 440	Practicing Sustainability	4
ESS 501	Principles of Ecosystem Sustainability	3
ESS 524	Foundations for Carbon/Greenhouse Gas Mgmt	3
GES 362	Systems Thinking and Sustainability	3
GES 441	Analysis of Sustainable Energy Solutions	3
GES 465/MSE 465	Sustainable Strategies for E-Waste Management	3
GES 528/CIVE 528	Assessing the Food, Energy, Water Nexus	3
GES 542	Biobased Fuels, Energy, and Chemicals	3
NR 319	Introduction to Geospatial Science	4
NR 323/GR 323	Remote Sensing and Image Interpretation	3

SOCR 322	Principles of Microclimatology	3
SOCR 375	Soil Biogeochemistry	3

Engineering Electives

Select a minimum of 3 credits from the following.

Code	Title	Credits
ATS 555	Air Pollution	3
CIVE 330	Ecological Engineering	3
CIVE 438	Fundamentals of Environmental Engr	3
CIVE 442	Air Quality Engineering	3
MECH 403	Energy Engineering	3
MECH 436/MSE 436	Green Engineering--Materials and Environment	3
MECH 516	Life Cycle and Techno-Economic Assessment	3
SYSE 530	Overview of Systems Engineering Processes	3
SYSE 532/ECE 532	Dynamics of Complex Engineering Systems	3