

Chemical Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

Plan Requirements

First Year

Fall Semester		Hours
CH 101 or CH 103	Chemistry - A Molecular Science ¹ or General Chemistry I for Students in Chemical Sciences	3
CH 102 or CH 104	General Chemistry Laboratory ² or General Chemistry Laboratory I for Students in Chemical Sciences	1
E 101	Introduction to Engineering & Problem Solving ²	1
E 115	Introduction to Computing Environments	1
MA 141	Calculus I ¹	4
ENG 101	Academic Writing and Research ²	4
Hours		14

Spring Semester

CH 201 or CH 203	Chemistry - A Quantitative Science ² or General Chemistry II for Students in Chemical Sciences	3
CH 202 or CH 204	Quantitative Chemistry Laboratory ² or General Chemistry Laboratory II for Students in Chemical Sciences	1
MA 241	Calculus II ¹	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4
Select one of the following Economics Courses:		3
ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	
E 102	Engineering in the 21st Century	2
Hours		17

Second Year

Fall Semester		Hours
CH 221 or CH 225	Organic Chemistry I ² or Organic Chemistry I for Students in Chemical Sciences	3
CH 222 or CH 226	Organic Chemistry I Lab ² or Organic Chemistry Laboratory I for Students in Chemical Sciences	1
CHE 205	Chemical Process Principles ²	4
MA 242	Calculus III ²	4
Hours		12

Spring Semester

CH 223 or CH 227	Organic Chemistry II or Organic Chemistry II for Students in Chemical Sciences	3
CH 224 or CH 228	Organic Chemistry II Lab or Organic Chemistry Laboratory II for Students in Chemical Sciences	1
CHE 225	Introduction to Chemical Engineering Analysis ²	3
MA 341	Applied Differential Equations I ²	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
Hours		14

Third Year

Fall Semester		Hours
CH 315 & CH 316	Quantitative Analysis and Quantitative Analysis Laboratory	4
CHE 311	Transport Processes I ²	3
CHE 315	Chemical Process Thermodynamics ²	3
ECE 331 or MSE 201	Principles of Electrical Engineering or Structure and Properties of Engineering Materials	3
CHE 395	Professional Development Seminar	1
Hours		14

Spring Semester

Chemistry Elective (p. 2)		4
CHE 312	Transport Processes II	3
CHE 316	Thermodynamics of Chemical and Phase Equilibria	3
CHE 330	Chemical Engineering Lab I	4
Hours		14

Fourth Year

Fall Semester		Hours
CHE 331	Chemical Engineering Lab II	2
CHE 446	Design and Analysis of Chemical Reactors	3
CHE 450	Chemical Engineering Design I	3
Technical Elective (p. 2)		3
Hours		11

Spring Semester

CHE 435	Process Systems Analysis and Control	3
CHE 451	Chemical Engineering Design II	3
Technical Elective (p. 2)		3
Hours		9
Total Hours		105

¹ A grade of C or higher is required.

² A grade of C- or higher is required.

Code	Title	Hours	Counts towards
GEP Courses			
	GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	6	
	GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3	
	GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2	
	GEP US Diversity, Equity, and Inclusion (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/)	3	
	GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	3	
	GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)		
	Foreign Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/) (verify requirement)		
Free Electives			
	Free Electives (12 Hr S/U Lmt) ¹	3	
Total Hours		20	

¹ Students should consult their academic advisors to determine which courses fill this requirement.

Chemistry Electives

Code	Title	Hours	Counts towards
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
BCH 451	Principles of Biochemistry	4	
CH 335	Principles of Green Chemistry	4	
CH 437	Physical Chemistry for Engineers	4	
CH 610	Special Topics In Chemistry	1-6	

FS 402	Chemistry of Food and Bioprocessed Materials	4	
FS 502	Chemistry of Food and Bioprocessed Materials	4	
PCC 461	Chemistry of Polymeric Materials	3	
PCC 464	Chemistry of Polymeric Materials Laboratory	1	
PSE 335	Principles of Green Chemistry	4	

Technical Electives

Code	Title	Hours	Counts towards
BAE 322	Introduction to Food Process Engineering	3	
BEC 462	Fundamentals of Bio-Nanotechnology	3	
BEC 463	Fermentation of Recombinant Microorganisms	2	
BEC 488	Animal Cell Culture Engineering	2	
BEC 562	Fundamentals of Bio-Nanotechnology	3	
BEC 563	Fermentation of Recombinant Microorganisms	2	
BEC 577	Advanced Biomanufacturing and Biocatalysis	3	
BIT 463	Fermentation of Recombinant Microorganisms	2	
BIT 464	Protein Purification	2	
BIT 563	Fermentation of Recombinant Microorganisms	2	
BIT 564	Protein Purification	2	
BME 466/566	Polymeric Biomaterials Engineering	3	
CE 214	Engineering Mechanics-Statics	3	

CE 225	Mechanics of Solids	3	CHE 525	Process System Analysis and Control	3
CE 373	Fundamentals of Environmental Engineering	3	CHE 543	Polymer Science and Technology	3
CE 476	Air Pollution Control	3	CHE 546	Design and Analysis of Chemical Reactors	3
CE 477	Principles of Solid Waste Engineering	3	CHE 551	Biochemical Engineering	3
CE 479	Air Quality	3	CHE 562	Fundamentals of Bio-Nanotechnology	3
CE 484	Water Supply and Waste Water Systems	3	CHE 577	Advanced Biomanufacturing and Biocatalysis	3
CHE 460/560	Chemical Processing of Electronic Materials	3	CHE 596	Special Topics in Chemical Engineering	1-3
CHE 461	Polymer Sciences and Technology	3	CHE 597	Chemical Engineering Projects	1-3
CHE 462	Fundamentals of Bio-Nanotechnology	3	E 304	Introduction to Nano Science and Technology	3
CHE 463	Fermentation of Recombinant Microorganisms	2	ECE 331	Principles of Electrical Engineering	3
CHE 465	Colloidal and Nanoscale Engineering	3	ECE 468	Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems	3
CHE 467	Polymer Rheology	3	ECE 568	Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems	3
CHE 468/568	Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems	3	ISE 311	Engineering Economic Analysis	3
CHE 475/575	Advances in Pollution Prevention: Environmental Management for the Future	3	ISE 443	Quality Design and Control	3
CHE 488	Animal Cell Culture Engineering	2	MAE 206	Engineering Statics	3
CHE 495	Honors Thesis Preparation	1	MAE 208	Engineering Dynamics	3
CHE 497	Chemical Engineering Projects I	3	MAE 214	Solid Mechanics	3
CHE 498	Chemical Engineering Projects II	1-3	MAE 406	Energy Conservation in Industry	3
			MAE 421	Design of Solar Energy Systems	3

MEA 479	Air Quality	3
MSE 201	Structure and Properties of Engineering Materials	3
NE 404	Radiation Safety and Shielding	3
NE 419	Introduction to Nuclear Energy	3
PCC 201	Impact of Industry on the Environment and Society	3
PSE 425	Bioenergy & Biomaterials Engineering	3
TE 466/566	Polymeric Biomaterials Engineering	3

Semester Sequence

This is a sample.

First Year

Fall Semester		Hours
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory ¹	4
E 101	Introduction to Engineering & Problem Solving ²	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research ²	4
MA 141	Calculus I ¹	4
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
Hours		15
Spring Semester		Hours
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory ²	4
MA 241	Calculus II ¹	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4
E 102	Engineering in the 21st Century	2
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
Select one of the following Economic Courses:		3
ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	
Hours		18

Second Year

Fall Semester

CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab ²	4
CHE 205	Chemical Process Principles ²	4
MA 242	Calculus III ²	4

Hours 12

Spring Semester

CH 223 & CH 224	Organic Chemistry II and Organic Chemistry II Lab	4
CHE 225	Introduction to Chemical Engineering Analysis ²	3
MA 341	Applied Differential Equations I ²	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4

GEP Requirement (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/>)

Hours 17

Third Year

Fall Semester

CH 315 & CH 316	Quantitative Analysis and Quantitative Analysis Laboratory	4
CHE 311	Transport Processes I ²	3
CHE 315	Chemical Process Thermodynamics ²	3
ECE 331 or MSE 201	Principles of Electrical Engineering or Structure and Properties of Engineering Materials	3

GEP Requirement (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/>)

CHE 395 Professional Development Seminar 1

Hours 17

Spring Semester

Chemistry Elective (p. 2)		4
CHE 312	Transport Processes II	3
CHE 316	Thermodynamics of Chemical and Phase Equilibria	3
CHE 330	Chemical Engineering Lab I	4
Free Elective		3

Hours 17

Fourth Year

Fall Semester

CHE 331	Chemical Engineering Lab II	2
CHE 446	Design and Analysis of Chemical Reactors	3
CHE 450	Chemical Engineering Design I	3
Technical Elective (p. 2)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3

Hours 14

Spring Semester

CHE 435	Process Systems Analysis and Control	3
CHE 451	Chemical Engineering Design II	3
Technical Elective (p. 2)		3

GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
Hours	15
Total Hours	125

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² A grade of C- or higher is required.

Career Opportunities

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.