

Chemical Engineering (BS)

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.

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

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

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

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

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/)		3

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/)		3
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

¹ A grade of C or higher is required.

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.

Career Titles

- Agricultural Engineer
- Automotive Engineer
- Biochemist
- Biomedical Engineer
- Chemical Engineer
- Chemist
- Dairy Technologist
- Electronics Engineer
- Engineering Professor
- Environmental Engineer
- Fire Prevention Engineer
- Industrial Air Pollution Analyst
- Industrial Waste Inspector
- Laboratory Tester
- Materials Engineer
- Materials Scientist
- Nanosystems Engineers
- Non-Destructive Testing Specialists
- Nuclear Engineer
- Nuclear Fuels Research Engineer
- Occupational Safety & Health Inspector
- Perfumer
- Petroleum Engineer
- Physicist
- Physics Professor
- Product Safety Engineer
- Quality Control Managers
- Radiation Protection Engineer
- Safety Inspector
- Sales Engineers
- Sales Representative (Chemicals & Drugs)
- Soil Engineer
- Solar Energy Systems Engineers
- Sustainability Specialists
- Toxicologist
- Water/Wastewater Engineers

Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required) This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students) A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

American Institute of Chemical Engineers (<https://www.aiche.org/>)

American Chemical Society (<https://www.acs.org/>)

American Oil Chemists' Society (<http://www.aocs.org/>)

National Society of Professional Engineers (<https://www.nspe.org/>)