

Chemical Engineering (BS): Honors Concentration

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

The Honors Program allows students to gain a deeper understanding of chemical engineering principles than would be acquired by completing the standard CHE curriculum. Admission to the program requires students to have earned a minimum overall GPA of 3.5 and a minimum GPA of 3.5 in CHE 205 Chemical Process Principles and CHE 225 Introduction to Chemical Engineering Analysis. An honors thesis based on a supervised research experience and completion of at least one semester of faculty-supervised research are required for completion of the Honors Program.

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 ¹ 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
Select one of the following Mathematics Electives:		3
MA 401	Applied Differential Equations II	
MA 402	Mathematics of Scientific Computing	
MA 405	Introduction to Linear Algebra	
MA 427	Introduction to Numerical Analysis I	
MA 501	Advanced Mathematics for Engineers and Scientists I	
CHE 395	Professional Development Seminar	1
Hours		14

Spring Semester

Select one of the following Chemistry Electives:		4
PCC 464	Chemistry of Polymeric Materials Laboratory	
BCH 351	General Biochemistry	
BCH 451	Principles of Biochemistry	
CH 437	Physical Chemistry for Engineers	
CH 610	Special Topics In Chemistry	
BIO 183	Introductory Biology: Cellular and Molecular Biology	
FS 402	Chemistry of Food and Bioprocessed Materials	
CHE 312	Transport Processes II	3
CHE 316	Thermodynamics of Chemical and Phase Equilibria	3

CHE 330	Chemical Engineering Lab I	4
ENG 333	Communication for Science and Research	3
Hours		17

Fourth Year**Fall Semester**

CHE 446	Design and Analysis of Chemical Reactors	3
CHE 450	Chemical Engineering Design I	3
CHE 497	Chemical Engineering Projects I	3
Select one of the following:		3
CHE 711	Chemical Engineering Process Modeling	
CHE 713	Thermodynamics I	
CHE 715	Transport Phenomena	
CHE 717	Chemical Reaction Engineering	
Hours		12

Spring Semester

CHE 435	Process Systems Analysis and Control	3
CHE 451	Chemical Engineering Design II	3
Honors Elective (p. 2)		3
CHE 495	Honors Thesis Preparation	1
Hours		10
Total Hours		110

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)

Total Hours **17**

Honors Electives

Code	Title	Hours	Counts towards
CHE 460/560	Chemical Processing of Electronic Materials	3	
CHE 461	Polymer Sciences and Technology	3	
CHE 462/562	Fundamentals of Bio-Nanotechnology	3	
CHE 463/563	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 577	Advanced Biomanufacturing and Biocatalysis	3
CHE 596	Special Topics in Chemical Engineering	1-3
CHE 597	Chemical Engineering Projects	1-3
CHE 711	Chemical Engineering Process Modeling	3
CHE 713	Thermodynamics I	3
CHE 715	Transport Phenomena	3
CHE 717	Chemical Reaction Engineering	3
CHE 718	Advanced Chemical Reaction Engineering	3
CHE 719	Electrochemical Systems Analysis	3
CHE 752	Separation Processes For Biological Materials	3
CHE 761	Polymer Blends and Alloys	3
CHE 796	Special Topics In Chemical Engineering	1-6
CHE 797	Chemical Engineering Projects	1-3
CHE 798	Advanced Chemical Engineering Projects	1-3

Semester Sequence

This is a sample.

First Year

Fall Semester		Hours
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory ^{1,2}	4
E 101	Introduction to Engineering & Problem Solving ³	1

E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research ³	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 ^{2,3}	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

Select one of the following: 3

EC 205	Fundamentals of Economics	
EC 201	Principles of Microeconomics	
ARE 201	Introduction to Agricultural & Resource Economics	

GEP Health and Exercise Studies (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/>) 1

E 102	Engineering in the 21st Century	2
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Hours 18

Second Year

Fall Semester

CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab ^{3,4}	4
CHE 205	Chemical Process Principles ³	4
MA 242	Calculus III ³	4
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3

Hours 15

Spring Semester

CH 223 & CH 224	Organic Chemistry II and Organic Chemistry II Lab ⁴	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
CHE 225	Introduction to Chemical Engineering Analysis ³	3
MA 341	Applied Differential Equations I ³	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3

Hours 17

Third Year

Fall Semester

CH 315 & CHE 316	Quantitative Analysis and Thermodynamics of Chemical and Phase Equilibria	4
CHE 311	Transport Processes I	3
CHE 315	Chemical Process Thermodynamics	3
Select one of the following Mathematics Electives:		3
MA 401	Applied Differential Equations II	
MA 402	Mathematics of Scientific Computing	

MA 405	Introduction to Linear Algebra	
MA 427	Introduction to Numerical Analysis I	
MA 501	Advanced Mathematics for Engineers and Scientists I	
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
CHE 395	Professional Development Seminar	1
Hours		17

Spring Semester

Select one of the following Chemistry Electives: 4

PCC 464	Chemistry of Polymeric Materials Laboratory	
BCH 351	General Biochemistry	
BCH 451	Principles of Biochemistry	
CH 437	Physical Chemistry for Engineers	
CH 610	Special Topics In Chemistry	
BIO 183	Introductory Biology: Cellular and Molecular Biology	
FS 402	Chemistry of Food and Bioprocessed Materials	
CHE 312	Transport Processes II	3
CHE 316	Thermodynamics of Chemical and Phase Equilibria	3
CHE 330	Chemical Engineering Lab I	4
ENG 333	Communication for Science and Research	3
Hours		17

Fourth Year**Fall Semester**

CHE 497	Chemical Engineering Projects I	3
CHE 446	Design and Analysis of Chemical Reactors	3
CHE 450	Chemical Engineering Design I	3
Select one of the following CHE Electives:		3
CHE 711	Chemical Engineering Process Modeling	
CHE 713	Thermodynamics I	
CHE 715	Transport Phenomena	
CHE 717	Chemical Reaction Engineering	
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		15

Spring Semester

CHE 435	Process Systems Analysis and Control	3
CHE 451	Chemical Engineering Design II	3
Honors Elective (p. 2) ⁵		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
CHE 495	Honors Thesis Preparation ⁶	1
Hours		13
Total Hours		127

¹ Grade of C (2.0) or higher is required.² CH 103 General Chemistry I for Students in Chemical Sciences/CH 104 General Chemistry Laboratory I for Students in Chemical Sciences may substitute for CH 101 Chemistry - A Molecular Science/CH 102 General Chemistry Laboratory and CH 203 General

Chemistry II for Students in Chemical Sciences/CH 204 General Chemistry Laboratory II for Students in Chemical Sciences may substitute for CH 201 Chemistry - A Quantitative Science/CH 202 Quantitative Chemistry Laboratory

³ Minimum grade of C- required.⁴ CH 225 Organic Chemistry I for Students in Chemical Sciences/CH 226 Organic Chemistry Laboratory I for Students in Chemical Sciences may substitute for CH 221 Organic Chemistry I/CH 222 Organic Chemistry I Lab and CH 227 Organic Chemistry II for Students in Chemical Sciences/CH 228 Organic Chemistry Laboratory II for Students in Chemical Sciences may substitute for CH 223 Organic Chemistry II/CH 224 Organic Chemistry II Lab.⁵ Honors electives include CHE 460 Chemical Processing of Electronic Materials and above, CHE 5xx, CHE 7xx.⁶ An honors thesis is required for completion of the Honors Program.

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.