Chemistry (BA)

Chemistry is a diverse and growing field that is full of academic and career opportunities for undergraduate students. Our two degree programs offer flexibility in choosing the appropriate academic path to fulfill your interest and career goals.

The **Bachelor of Arts (B.A.) in Chemistry** is built around the core subdisciplines of chemistry with the addition of elective coursework in a chosen field. This program is designed to train you for a career outside of traditional laboratory work.

The **Bachelor of Science (B.S.) in Chemistry** program is certified by the American Chemical Society and trains you for entry in the chemical workforce or graduate school in the chemical sciences.

The Chemistry Honors Program offers students a challenging program of advanced study where they can develop independence, collaborative skills and a deeper understanding of chemistry required for careers in both industry and graduate school.

Outside of the classroom, students in Chemistry actively share their passion for chemistry with others, including the next generation of scientists. Opportunities in this area are possible through participation in our student groups:

- Alpha Chi Sigma professional co-ed chemistry fraternity; benefits students not only by helping with their studies but also by providing projects and activities that teach the roles of leadership and management
- American Chemical Society the student chapter of the ACS takes part in activities including tours of local research facilities, trips to national and regional conferences, and presentations by guest speakers
- **Cosmetic Chemistry Club** open to all students interested in learning about cosmetics and the industry behind them; connects students to the cosmetic industry through guest speakers, company visits, and other activities

Undergraduate research can be one of the most rewarding aspects of your academic experience at NC State. Research offers opportunities to make pioneering discoveries at the forefront of science, using instrumentation and techniques far more sophisticated than those you would encounter in standard laboratory courses. Students often **co-author publications** in peer-reviewed journals and **present their research** at conferences. For more information on getting involved, please contact our Undergraduate Research Coordinator.

For more information about this program, visit our website (https:// chemistry.sciences.ncsu.edu/undergraduate/programs/).

Contact

Undergraduate Programs in Chemistry chemistry-dup@ncsu.edu

Dr. Kirsten Kramer

Co-Director of Undergraduate Programs 919.515.6322 kdaykin@ncsu.edu

Dr. Marion Martin

Co-Director of Undergraduate Programs

919.515.3836

mmarti24@ncsu.edu (mmarti24@ncsu.edu)

Ms. Taylor Clodfelter

Undergraduate Programs Coordinator 919.515.2561 chemundergradoffice@ncsu.edu (chemundergradoffice@ncsu.edu)

Dr. Tatyana Smirnova

Undergraduate Research Coordinator tismirno@ncsu.edu

Dr. Ana Ison

Chemistry Honors Program Director aison@ncsu.edu

Plan Requirements

Code	Title	Hours
Orientation		
COS 100	Science of Change ²	2
Writing and Spe	aking	
ENG 101	Academic Writing and Research ¹	4
Advanced Writing	(p. 2)	3
Communication	S	
Communications	Requirement (p. 2) ³	3
Basic Math & Sc	iences ¹	
Select one of the	following Physics I courses:	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory	
PY 211	College Physics I	
Select one of the	following Physics II courses:	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	
PY 212	College Physics II	
MA 131	Calculus for Life and Management Sciences A	3-4
or MA 141	Calculus I	
MA 231	Calculus for Life and Management Sciences B	3-4
or MA 241	Calculus II	
Statistics (p. 2) 5		3
Chemistry Core	Courses ¹	
CH 103	General Chemistry I for Students in Chemical Sciences	3
CH 104	General Chemistry Laboratory I for Students in Chemical Sciences	1
CH 203	General Chemistry II for Students in Chemical Sciences	3
CH 204	General Chemistry Laboratory II for Students in Chemical Sciences	ı 1
CH 225	Organic Chemistry I for Students in Chemical Sciences	3
CH 226	Organic Chemistry Laboratory I for Students in Chemical Sciences	1
CH 227	Organic Chemistry II for Students in Chemical Sciences	3

CH 228	Organic Chemistry Laboratory II for Students in Chemical Sciences	1
CH 315	Quantitative Analysis	3
CH 316	Quantitative Analysis Laboratory	1
CH 331	Introductory Physical Chemistry	4
CH 401	Systematic Inorganic Chemistry I	3
Chemistry Advar	nced Elective (p. 2) ⁹	6

Advised Electives

Advised Electives ⁴

Advised Electives are designed to allow students to concentrate in areas related to their professional goals. Advised Electives will be planned by the student in consultation with their academic advisor. At least 15 credit hours must be at the 300 level or higher with remaining credit hours being fulfilled by courses at the 200 level or above (exceptions to the 200 level course restriction include BIO 181, BIO 183, and FL* 1** courses that are not in your language of proficiency). Courses used to meet GEP requirements cannot also be used to meet Advised Electives requirements.

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/)	6
GEP Health and Exercise Studies (http://catalog.ncsu.edu/ undergraduate/gep-category-requirements/gep-health-exercise- studies/)	2
GEP Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	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)	
GEP Foundations of American Democracy (http://catalog.ncsu.edu/ undergraduate/gep-category-requirements/gep-fad/) (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) ⁶	14
Free Elective courses can NOT be CH 100, C 111, MA 100,	
MA 101, MA 103, MA 107, MA 108, MA 111, MA 121, MA 131,	
MA 231, PY 131, PY 211, PY 212, ENG 100. 100-level World	
Language Courses (WL*) can be used if not satisfying the	
language proficiency requirement.	

Total Hours

Chemistry Advanced Electives

Code	Title	Hours
CH 335	Principles of Green Chemistry	4
CH 403	Systematic Inorganic Chemistry II	3
CH 415	Analytical Chemistry II	3
CH 435	Introduction to Quantum Chemistry	3
CH 441	Forensic Chemistry	3
CH 495	Special Topics in Chemistry	3

Proteomics	3
Advanced Inorganic Chemistry I: Structure and Bonding	3
Advanced Inorganic Chemistry II: Applications of Group Theory to Bonding and Spectroscopy	3
Organometallic and Inorganic Reaction Mechanism	3
Advanced Organic Chemistry I	3
Advanced Organic Chemistry II	3
Physical Methods in Organic Chemistry	3
Biological Mass Spectrometry	3
Advanced Physical Chemistry	3
Advanced Physical Chemistry in Biological Applications	3
Spectroscopic Methods in Chemical Biology	3
Magnetic Resonance in Chemistry	3
Quantum Chemistry	3
Electrochemistry	3
Chemical Separation	3
Organic Reaction Mechanisms	3
Chemistry of Materials	3
Bioinorganic Chemistry	3
Solid State Chemistry	3
Special Topics in Chemistry	3
	 Advanced Inorganic Chemistry I: Structure and Bonding Advanced Inorganic Chemistry II: Applications of Group Theory to Bonding and Spectroscopy Organometallic and Inorganic Reaction Mechanism Advanced Organic Chemistry I Advanced Organic Chemistry II Physical Methods in Organic Chemistry Biological Mass Spectrometry Advanced Physical Chemistry in Biological Applications Spectroscopic Methods in Chemical Biology Magnetic Resonance in Chemistry Electrochemistry Chemical Separation Organic Reaction Mechanisms Chemistry of Materials Bioinorganic Chemistry Solid State Chemistry

Advanced Writing

24

Code	Title	Hours
ENG 214	Introduction to Editing	3
ENG 281	Introduction to Creative Nonfiction	3
ENG 287	Explorations in Creative Writing	3
ENG 288	Fiction Writing	3
ENG 289	Poetry Writing	3
ENG 316	Introduction to News and Article Writing	3
ENG 323	Writing in Rhetorical Traditions	3
ENG 331	Communication for Engineering and Technolog	jy 3
ENG 332	Communication for Business and Management	3
ENG 333	Communication for Science and Research	3
ENG 425	Analysis of Scientific and Technical Writing	3

Statistics

120

Code	Title	Hours
ST 311	Introduction to Statistics	3
ST/BUS 350	Economics and Business Statistics	3
ST 370	Probability and Statistics for Engineers	3

Communications

Code	Title	Hours
COM 110	Public Speaking	3
COM 112	Interpersonal Communication	3
COM 201	Introduction to Persuasion Theory	3
COM 202	Small Group Communication	3

COM 211	Argumentation and Advocacy	3
COM 289	Science Communication and Public Engagement	3

¹ No grades below a C- are permitted.

- ² For students that did not enroll in COS 100 during their first semester, a GEP-Interdisciplinary Perspectives course may substitute for COS 100.
- ³ Communications requirement must be selected from COM 110, 112, 201, 202, 211, 289. The Communications requirement may not be used
- to satisfy the GEP requirements; it is taken in addition to the GEP.
 ⁴ Advised Electives are designed to allow students to concentrate in areas related to their professional goals. Advised Electives will be planned by the student in consultation with their academic advisor. At least 15 credit hours must be at the 300 level or higher with remaining credit hours being fulfilled by courses at the 200 level or above (exceptions to the 200 level course restriction include BIO 181, BIO 183, and WL* 1** courses that are not in your language of proficiency). Courses used to meet GEP requirements cannot also be used to meet Cross Discipline Electives requirements.
- ⁵ Statistics requirement must be selected from ST 311, 350 (or BUS 350), 370.
- ⁶ Free Elective courses can NOT be CH 100, C 111, MA 100, MA 101, MA 103, MA 107, MA 108, MA 111, MA 121, MA 131, MA 231, PY 131, PY 211, PY 212, ENG 100. 100-level World Language Courses (WL*) can be used if not satisfying the language proficiency requirement.
- ⁷ The two course sequence: CH 431 plus CH 433 can substitute for CH 331.
- ⁸ Advanced Writing course must be selected from ENG 214, 281, 287, 288, 289, 316, 323, 331, 332, 333, 425. The Advanced Writing course may not be used to satisfy the GEP requirements; it is taken in addition to the GEP.
- ⁹ Choose from among the following: CH 335/PSE 335, CH 403, CH 415, CH 435, CH 441, CH 495, CH 5xx or CH 7xx.

Semester Sequence

This is a sample.

CH 204

First Year		
Fall Semester		
CH 103	General Chemistry I for Students in Chemical Sciences ¹	3
CH 104	General Chemistry Laboratory I for Students in Chemical Sciences ¹	1
MA 131 or MA 141	Calculus for Life and Management Sciences A ¹ or Calculus I	3-4
ENG 101	Academic Writing and Research ¹	4
COS 100	Science of Change	2
	xercise Studies (http://catalog.ncsu.edu/ o-category-requirements/gep-health-exercise-	1
	Hours	14
Spring Semester		
CH 203	General Chemistry II for Students in Chemical Sciences ¹	3

General Chemistry Laboratory II for

Students in Chemical Sciences

MA 231 or MA 241	Calculus for Life and Management Sciences B ¹ or Calculus II	3-4
Communications Re		3
Advised Elective ⁴		3
	http://catalog.ncsu.edu/undergraduate/gep- nts/)	3
	Hours	16
Second Year		
Fall Semester		
CH 225	Organic Chemistry I for Students in Chemical Sciences ¹	3
CH 226	Organic Chemistry Laboratory I for Students in Chemical Sciences ¹	1
PY 205 & PY 206 or PY 211	Physics for Engineers and Scientists I ¹ or College Physics I	4
Statistics (p. 2) ^{1,5}		-
Advised Elective ⁴		3
	ercise Studies (http://catalog.ncsu.edu/	1
	category-requirements/gep-health-exercise-	
	Hours	15
Spring Semester		
CH 227	Organic Chemistry II for Students in Chemical Sciences ¹	3
CH 228	Organic Chemistry Laboratory II for Students in Chemical Sciences ¹	1
CH 315	Quantitative Analysis ¹	3
CH 316	Quantitative Analysis Laboratory ¹	1
PY 208 & PY 209 or PY 212	Physics for Engineers and Scientists II ¹ or College Physics II	2
GEP Requirement (category-requireme	http://catalog.ncsu.edu/undergraduate/gep- nts/)	3
	Hours	15
Third Year		
Fall Semester		
CH 331	Introductory Physical Chemistry ^{1,7}	2
Advanced Writing (p	o. 2) ⁸	3
Advised Elective ⁴		3
Free Elective ⁶		3
GEP Requirement (category-requireme	http://catalog.ncsu.edu/undergraduate/gep- nts/)	3
	Hours	16
Spring Semester		
CH 401	Systematic Inorganic Chemistry I ¹	3
Advised Elective ⁴		3
Advised Elective ⁴		3
Free Elective ⁶		3
	http://catalog.ncsu.edu/undergraduate/gep-	3
category-requireme		15

15

Fourth Year

Fall Semester	
Chemistry Advanced Elective (p. 2) 1,9	3
Advised Elective ⁴	3
Advised Elective ⁴	3
Free Elective ⁶	3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/ undergraduate/gep-category-requirements/gep-interdisciplinary- perspectives/)	3
Hours	15
Spring Semester	
Chemistry Advanced Elective (p. 2) 1,9	3
Advised Elective ⁴	3
Free Elective ⁶	3
Free Elective ⁶	2
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep- category-requirements/)	3
Hours	14

Career Opportunities

Total Hours

Career Titles

- Agricultural Technician
- Agronomist
- Anesthesiologist (MD)
- Biochemist
- Biophysicist
- Cardiologist (MD)
- Chemical Engineer
- Chemical Technicians
- Chemist
- Chemistry Professor
- Conservation Scientist
- Criminalist
- Dairy Technologist
- Dental Laboratory Technician
- Dentist (DDS)
- Environmental Engineer
- Environmental Technician
- Fire Prevention Engineer
- Food & Drug Inspector
- Food Science Technicians
- Food Technologist
- Forensic Science Technicians
- Forest and Conservation Technician
- Fuel Cell Engineers
- General Internists (MD)
- Geneticist
- Geologist
- High School Teacher
- Horticulturist
- Hydrographer

- Hydrologist
- Industrial Air Pollution Analyst
- Industrial Waste Inspector
- Laboratory Tester
- Landfill Inspectors
- Materials Scientist
- Medical and Health Services Managers
- Microbiologist
- Middle School Teacher
- Neurologists
- Nuclear Engineer
- Nuclear Fuels Research Engineer
- Nuclear Medicine Technologist
- Occupational Health and Safety Technicians
- Occupational Safety & Health Inspector
- Pathologist (MD)
- Perfumer
- Petroleum Engineer
- Pharmacist

120

- Pharmacologist
- Plant Breeder
- Radiation Protection Engineer
- Safety Inspector
- Sales Representative (Chemicals & Drugs)
- Sanitary Engineer
- Soil Scientist
- Surgeons (MD)
- Sustainability Specialists
- Technical & Scientific Publications Editor
- Technical Publications Writer
- Toxicologist
- Veterinarian (VMD)

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/explorecareers/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 Chemical Society (http://www.acs.org/content/acs/en/ careers.html)