CHEMISTRY (BS)

CIP: 40.0501

Program Description

Chemistry is the study of molecules, how they are created from atoms, how their structures affect their chemical and physical properties, and how they unite or assemble to form the matter that makes up the physical and natural world. Knowledge of chemistry is fundamental to an in-depth understanding of all materials in the natural world and the structural properties and biochemical reactions that define living systems. Chemistry interfaces with biology, physics, mathematics, computer science, and engineering.

Modern chemistry's range of applications is broad, spanning many aspects of human activities such as the improvement of agriculture, the utility of alternative and renewable energies, the discovery of new drugs and medical diagnostics, and the creation of new materials by learning how molecules are assembled and how they recognize one another. Chemistry is at the heart of sustainability—meeting the needs of the present without compromising the ability of the earth to provide for future generations. It also drives the exciting interdisciplinary fields of nanotechnology, materials science, biotechnology, polymers, environmental science, forensics, and chemical biology to name several examples.

The Chemistry major builds on the Foundations of Science program and offers students the opportunity to pursue their interests in the traditional sub-disciplines of chemistry: organic chemistry, inorganic chemistry, physical chemistry, and analytical chemistry. The major offers elective courses that explore the interdisciplinary areas of biochemistry, computational chemistry, chemical biology, and materials science. A degree in Chemistry prepares students for graduate work and rewarding careers in all sectors of scientific life, from basic research to commercial product development. It also enables the pursuit of exciting careers in education, law, medicine, business, and government.

Students majoring in chemistry will achieve a factual and theoretical understanding of the physical world and the atoms and molecules that comprise it; they will understand the important role of chemistry as the central science and the integration of chemistry with the other disciplines; will conduct laboratory experiments effectively and safely; will solve problems through a rigorous scientific approach; will be able to search and use the peer-reviewed scientific literature effectively; demonstrate effective communication in oral and written form; will learn how to work effectively in a multidisciplinary team; they will practice ethics and conduct themselves responsibly with an awareness of the role of chemistry in society.

Chemical Sciences Track

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Medical Sciences Track

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Specialization

Biophysics

For Natural Science majors.

The Biology, Chemistry, and Physics majors offer a specialization in Biophysics which emphasizes the crosstalk between these three disciplines in understanding biological function.

Everything obeys the laws of physics, and biological systems are no exception. The complexity of biological systems, however, is compounded by the fact that they span a broad range of interacting spatial scales from a few atoms to global ecosystems, and that life inherently functions far from the equilibrium. This complexity poses problems for physicists, chemists, and biologists that are at once interesting and challenging. Biophysics addresses these problems through an interdisciplinary approach that builds on strengths in physics, chemistry, and biology.

Chemistry majors who elect to complete the Biophysics specialization must complete all courses required for the Chemistry majors, three required Biophysics courses, and one elective selected from the list below. No more than two of these courses can be used to satisfy the elective requirement for the Chemistry major. The other two would be in addition to the minimum elective requirements for the major.

Study Away

The study away pathway can be found on the NYUAD Student Portal at students.nyuad.nyu.edu/pathways (https://bulletins.nyu.edu/undergraduate/abu-dhabi/programs/chemistry-bs/students.nyuad.nyu.edu/pathways/). Students with questions should contact the Office of Global Education. The program strongly recommends that not more than one chemistry elective be taken while studying away.

Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html).

Program Requirements

Students must choose a track: **Chemical Sciences** or **Medical Sciences**

Course	Title	Credits
General Education Requirements		
Physical Education (2 courses)		
Quantitative Reasoning (1 course)		
Experimental Inquiry (1 course)		
Islamic Studies (1 course)		
First-Year Writing Seminar		4
Colloquia		4
Field Colloquia (2 J-Term courses)		6
Core Competencies		
Arts, Design, and Technology		4
Cultural Exploration Analysis		4
Data and Discovery		4
Structures of Thought and Society		4
Foundations of Science Courses		
Foundations of Science 1-6 (see list below)		26
Common Required Courses		

MATH-UH 1012Q	Calculus with Applications to Science and Engineering	4
MATH-UH 1020Q	Multivariable Calculus with Applications to Science and Engineering	4
CHEM-UH 2010	Organic Chemistry 1	5
CHEM-UH 3010 & CHEM-UH 3050	Organic Chemistry 2 and Organic Chemistry 2 Lab	5
CHEM-UH 3011	Physical Chemistry: Thermodynamics and Kinetics	4
CHEM-UH 3015	Inorganic Chemistry	4
CHEM-UH 3020	Biochemistry: Macromolecular Structure and Function	4
CHEM-UH 3090	Research Seminar in Chemistry	2
Required Track (16 credits)		**16**
Chemical Sciences Track		
CHEM-UH 3012	Physical Chemistry Laboratory: Thermodynamics and Kinetics	
CHEM-UH 3013	Physical Chemistry: Quantum Mechanics and Spectroscopy	
CHEM-UH 3014	Physical Chemistry Laboratory: Quantum Mechanics and Spectroscopy	
CHEM-UH 3016	Analytical Chemistry	
Complete 1 Chemical Sciences elective (see list below)		
Medical Sciences Track		
PSYCH-UH 1001	Introduction to Psychology	
or PSYCH-UH 1003E	Biopsychology	
BIOL-UH 2010	Human Physiology	
Complete 1 Medical Sciences Lecture elective (see list below)		
Complete 1 Medical Sciences Lab elective (see list below)		
Optional: Medical Sciences recommended electives (see list below)		
Capstone		
CHEM-UH 4001	Capstone Project in Chemistry 1	4
CHEM-UH 4002	Capstone Project in Chemistry 2	4
Other Electives		
Complete enough courses to reach the minimum overall required 128 credits		16
Total Credits		**128**

Foundations of Science

Foundations of Science 1-6 courses

Code	Title	Credits
SCIEN-UH 1121EQ	Foundations of Science 1-2: Physics	1.5
SCIEN-UH 1122EQ	Foundations of Science 1-2: Chemistry	3
SCIEN-UH 1123EQ	Foundations of Science 1-2: Biology	1.5
SCIEN-UH 1124C	Foundations of Science 2 Lab: Chemistry	1
SCIEN-UH 1124P	Foundations of Science 1 Lab: Physics	1
SCIEN-UH 1341Q	Foundations of Science 3-4: Physics	3
SCIEN-UH 1342Q	Foundations of Science 3-4: Chemistry	3
SCIEN-UH 1343	Foundations of Science 3-4: Biology	2
SCIEN-UH 1344BE	Foundations of Science 4 Lab: Biology	1
SCIEN-UH 1344CE	Foundations of Science 3 Lab: Chemistry	1
SCIEN-UH 1561Q	Foundations of Science 5-6: Physics	3
SCIEN-UH 1563	Foundations of Science 5-6: Biology	3
SCIEN-UH 1564BE	Foundations of Science 5 Lab: Biology	1
SCIEN-UH 1564EP	Foundations of Science 6 Lab: Physics	1

Electives

Chemical Sciences Electives

Code	Title	Credits
CHEM-UH 2201	Advanced Materials	4
CHEM-UH 3021	Biochemistry: Metabolism	4
CHEM-UH 3022	Biochemistry: Experimental Biochemistry	4
CHEM-UH 3201	Interdisciplinary Magnetic Resonance	4
CHEM-UH 3260	Special Topics in Chemistry	4
CHEM-UH 4212	Advanced Organic Chemistry	4

Medical Sciences Lecture Electives

Course	Title	Credits
CHEM-UH 2201	Advanced Materials	4
CHEM-UH 3021	Biochemistry: Metabolism	4
CHEM-UH 3201	Interdisciplinary Magnetic Resonance	4
CHEM-UH 3260	Special Topics in Chemistry	4
CHEM-UH 4212	Advanced Organic Chemistry	4

Medical Sciences Lab Electives

Course	Title	Credits
BIOL-UH 3213	Applied Molecular Biology Techniques	4
CHEM-UH 3012 & CHEM-UH 3014	Physical Chemistry Laboratory: Thermodynamics and Kinetics and Physical Chemistry Laboratory: Quantum Mechanics and Spectroscopy	4
CHEM-UH 3016	Analytical Chemistry	4
CHEM-UH 3022	Biochemistry: Experimental Biochemistry	4

Medical Sciences Recommended Electives (Optional)

Course	Title	Credits
BIOL-UH 2114	Genetics	4
BIOL-UH 3116	Immunology	4
BIOL-UH 3120	Biostatistics	4
MATH-UH 2011Q	Probability and Statistics	4
PHIL-UH 1118	Bioethics	4
PSYCH-UH 2210	Developmental Psychology	4
PSYCH-UH 3620EQ	Lab in Clinical Neuropsychology	4

Medical Shadowing (Summer Course), collaboration with the CDC: Shadowing at a UAE hospital at any stage of their studies at NYUAD. (Subject to availability)		0

Specialization Requirements

Biophysics (for Chemistry majors)

Course	Title	Credits
Biophysics Required Courses		
BIOL-UH 3130	Biophysics	4
CHEM-UH 3130		4
PHYS-UH 3219	Biological Physics: From single molecules to the cell	4
Biophysics Electives		
Complete 1 Biophysics elective from the following:		4
BIOL-UH 2010	Human Physiology	
BIOL-UH 2114	Genetics	
BIOL-UH 3116	Immunology	
BIOL-UH 3218	Synthetic Biology	
BIOL-UH 3220	Experimental Systems Biology & Complex Human Disorders	
PHYS-UH 3014	Statistical Mechanics and Thermodynamics	

Sample Plan of Study

(Chemical Sciences Track)

Course	Title	Credits
1st Semester/Term		
First-Year Writing Seminar		4
Core Competency		4
Core Competency		4
General Elective		4
Physical Education		
	Credits	**16**
2nd Semester/Term		
Field Colloquia (J-Term)		3
	Credits	**3**
3rd Semester/Term		
SCIEN-UH 1121EQ	Foundations of Science 1-2: Physics	1.5
SCIEN-UH 1122EQ	Foundations of Science 1-2: Chemistry	3
SCIEN-UH 1123EQ	Foundations of Science 1-2: Biology	1.5
SCIEN-UH 1124C	Foundations of Science 2 Lab: Chemistry	1
SCIEN-UH 1124P	Foundations of Science 1 Lab: Physics	1
MATH-UH 1012Q	Calculus with Applications to Science and Engineering	4
Colloquia		4
Physical Education		
	Credits	**16**
4th Semester/Term		
SCIEN-UH 1341Q	Foundations of Science 3-4: Physics	3
SCIEN-UH 1342Q	Foundations of Science 3-4: Chemistry	3
SCIEN-UH 1343	Foundations of Science 3-4: Biology	2
SCIEN-UH 1344BE	Foundations of Science 4 Lab: Biology	1
SCIEN-UH 1344CE	Foundations of Science 3 Lab: Chemistry	1
MATH-UH 1020Q	Multivariable Calculus with Applications to Science and Engineering	4
Core Competency		4
	Credits	**18**
5th Semester/Term		
Field Colloquia (J-Term)		3
	Credits	**3**
6th Semester/Term		
SCIEN-UH 1561Q	Foundations of Science 5-6: Physics	3
SCIEN-UH 1563	Foundations of Science 5-6: Biology	3
SCIEN-UH 1564BE	Foundations of Science 5 Lab: Biology	1
SCIEN-UH 1564EP	Foundations of Science 6 Lab: Physics	1
CHEM-UH 2010	Organic Chemistry 1	5
	Credits	**13**
7th Semester/Term		
CHEM-UH 3010 & CHEM-UH 3050	Organic Chemistry 2 and Organic Chemistry 2 Lab	5
CHEM-UH 3011 & CHEM-UH 3012	Physical Chemistry: Thermodynamics and Kinetics and Physical Chemistry Laboratory: Thermodynamics and Kinetics	6
CHEM-UH 3015	Inorganic Chemistry	4
	Credits	**15**
8th Semester/Term		
CHEM-UH 3013 & CHEM-UH 3014	Physical Chemistry: Quantum Mechanics and Spectroscopy and Physical Chemistry Laboratory: Quantum Mechanics and Spectroscopy	6
CHEM-UH 3016	Analytical Chemistry	4
CHEM-UH 3020	Biochemistry: Macromolecular Structure and Function	4
CHEM-UH 3090	Research Seminar in Chemistry	2
	Credits	**16**
9th Semester/Term		
CHEM-UH 4001	Capstone Project in Chemistry 1	4
Core Competency		4
Major Elective		4
General Elective		4
	Credits	**16**
10th Semester/Term		
CHEM-UH 4002	Capstone Project in Chemistry 2	4
General Elective		4
General Elective		4
	Credits	**12**
	Total Credits	**128**

Learning Outcomes

Students who complete the major in chemistry are expected to achieve an understanding of the basic principles of chemistry and master problem-solving skills, chemical literature skills, laboratory safety skills, communication skills, team skills, and ethics. These program learning outcomes are in line with the guidelines for bachelor's degree programs in chemistry set forth by the American Chemical Society.

Students are expected to be able to do the following:

1. Demonstrate factual and theoretical knowledge of our present understanding of the physical world and the atoms and molecules that comprise it, including an understanding of the fundamental concepts underpinning organic, inorganic, physical, analytical, and biochemistry;
2. Understand the important role of chemistry as the central science and the integration of chemistry with the physical sciences, the life sciences, mathematics, and engineering;
3. Conduct laboratory experiments effectively and safely by understanding and applying the concepts of safe laboratory practices, including responsible disposal techniques, use of material

safety data sheets (MSDS), recognizing and minimizing potential hazards, and handling emergencies effectively;
4. Solve problems through defining a problem clearly, forming testable hypotheses, designing and executing experiments, analyzing data, and drawing appropriate conclusions;
5. Search and use the peer-reviewed scientific literature effectively and evaluate papers and other media critically;
6. Demonstrate effective communication in oral and written form and be able to present information in a clear and organized manner, write concise reports, and use technology, such as presentation, word processing, and structure-drawing software;
7. Work effectively in a multidisciplinary team to solve scientific problems; and
8. Practice ethics and conduct themselves responsibly with an awareness of the role of chemistry in contemporary social and global issues.

Policies

Program Policies

Foundations of Science Grading Policy

While each level of Foundations of Science is an integrated course, separate grades are provided for various components as a means to allow students to document their completion of the specific disciplinary and laboratory content that makes up these courses. Consistent with this integrated approach, students must earn an average grade of C for the components of each level of Foundations of Science to continue into the next level or to use the course to satisfy the prerequisites for other courses outside of Foundations of Science. Additionally, students majoring in biology, chemistry, or physics, must have grades of at least C in all Foundations of Science components in their specific, respective major fields. Finally, although continuation into other courses is based on the average performance in each level of Foundations of Science, students earn academic credits only for those graded components they pass or, for students subject to the transcript policy (see Academic Policies), only for those components with grades of at least C−. The number of earned credits for Foundations of Science components is particularly important for all engineering majors who must earn at least 16 credits in science.

NYU Abu Dhabi Policies

A full list of relevant policies can be found on NYU Abu Dhabi's undergraduate academic policies page (https://bulletins.nyu.edu/undergraduate/abu-dhabi/academic-policies/).

NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).