

CHEMISTRY MAJOR

Dr. Mark Watson, Program Director

- Excellent preparation for employment, research or professional school.
- Strong emphasis on skill acquisition and the ability to perform independent research
- Hands-on laboratory experiences
- UC Student Chapter of the American Chemical Society

From the Faculty

“The mission of the chemistry program is to educate each student on the nature of chemistry and biochemistry, and to prepare the student with sufficient knowledge and skills to pursue productive work in chemistry, or to attend graduate school in chemistry, or to attend professional school in the health sciences, and to enable students in the use of chemistry to interpret everyday life in the pursuit of enlightened living and community involvement.”

Admission Requirements

Students must gain general admission to the University of Charleston. A visit to campus to meet with Admissions personnel and program faculty is strongly encouraged.

Program Outcomes

The graduate will:

1. Apply the major concepts, principles and theories of chemistry to solve problems.
2. Demonstrate safe and ethical laboratory and synthesis skills to obtain accurate results.
3. Search the chemical literature, perform research, and create new scientific knowledge.
4. Evaluate data and communicate the findings of a chemical research project.

What You Will Study

The major in chemistry consists of 125-130 credits, including 46 credits of required and elective chemistry courses, 24 credits of required mathematics and physics courses, 7 credits in natural science and biology, and about 27 credits of courses to achieve the General Education requirements. In order to graduate, a student must complete at least 120 credits and receive a minimum grade of “C” for each of the courses.

The science and mathematics curriculum for the chemistry major is shown in the table below:

REQUIRED CHEMISTRY COURSES – 46 CREDIT HOURS		
CHEM 101	General Chemistry I and Lab	4 credits
CHEM 102	General Chemistry II and Lab	4 credits
CHEM 201	Organic Chemistry I and Lab	4 credits
CHEM 202	Organic Chemistry II and Lab	4 credits
CHEM 251	Quantitative Analysis and Lab	4 credits
CHEM 362	Instrumental Analysis and Lab	4 credits
CHEM XXX	300 or 400-Level Electives	6 credits
CHEM 410	Biochemistry	4 credits
CHEM 412	Physical Chemistry I	3 credits
CHEM 413	Physical Chemistry II	3 credits
CHEM 414	The Chemist's Toolbox	1 credit
CHEM 494	Proposal Writing in Chemistry	1 credit
CHEM 495	Research in Chemical Science	3 credits
CHEM 496	Seminar in Chemical Science	1 credit
REQUIRED MATHEMATICS COURSES – 16 CREDIT HOURS		
MATH 123	Pre-Calculus	4 credits
MATH 201	Calculus I	4 credits
MATH 202	Calculus II	4 credits
MATH 203	Calculus III	4 credits
REQUIRED PHYSICS COURSES – 8 CREDIT HOURS		
PHSC 201	Introductory Physics I and Lab	4 credits
PHSC 202	Introductory Physics II and Lab	4 credits
REQUIRED BIOLOGY COURSE – 4 CREDIT HOURS		
BIOL 130	Introductory Biology for Majors and Lab	4 credits
REQUIRED NATURAL SCIENCE COURSE – 3 CREDIT HOURS		
NSCI 220	Statistics in Science and Research	3 credits

An AP score of 4 or higher may be used to fulfill the CHEM 101 and CHEM 102 requirement. The initial course in MATH and eligibility to take CHEM 101 will be determined based on SAT and/or ACT Math Scores.

Typical four-year schedule: elective courses to be determined after consultation with your academic advisor

FRESHMAN YEAR			
FALL SEMESTER		SPRING SEMESTER	
CHEM 101 General Chemistry I and lab (STEM Flex)	4	CHEM 102 General Chemistry II and lab	4
BIOL 130 Intro BIOL and Lab	4	SPCH 103 Fundamentals of Speech	3
COMM 101 Writing I*	3	COMM 102 Writing II	3
MATH 123 Pre-Calculus (STEM Flex)	4	MATH 201 Calculus I	4
UNIV 104 College Motivation	3	UNIV 105 Foundations	3
TOTAL CREDITS	18	TOTAL CREDITS	17

SOPHOMORE YEAR			
FALL SEMESTER		SPRING SEMESTER	
CHEM 201 Organic Chemistry I and lab	4	CHEM 202 Organic Chemistry II and lab	4
CHEM 251 Quantitative Analysis and lab	4	CHEM 362 Instrumental Analysis and lab	4
MATH 202 Calculus II	4	MATH 203 Calculus III	4
PHSC 201 Introductory Physics I and lab (Elective Flex)	4	PHSC 202 Introductory Physics II and lab (Elective Flex)	4
TOTAL CREDITS	16	TOTAL CREDITS	16

JUNIOR YEAR

FALL SEMESTER		SPRING SEMESTER	
CHEM 412 Physical Chemistry I	3	CHEM 413 Physical Chemistry II	3
NSCI 220 Statistics	3	SSCI Flex (Recommend HIST)	3
HUMN Flex (Recommend Art)	3	HUMN Flex (Recommend ENGL)	3
CHEM 411 Advanced Organic	3	Elective	3
SSCI Flex (Recommend PSYC)	3	Elective	3
TOTAL CREDITS	15	TOTAL CREDITS	15

SENIOR YEAR

FALL SEMESTER		SPRING SEMESTER	
CHEM 494 Proposal Writing in Chemistry	1	CHEM 420 Advanced Biochemistry	3
CHEM 410 Biochemistry	4	CHEM 496 Seminar in Chem. Science	1
CHEM 495 Research in Chem. Science	3	UNIV 459 or 460 University Capstone	3
Elective	3	Elective courses up to 6 hours	6
Elective	3	CHEM 414 The Chemist's Toolbox	1
TOTAL CREDITS	14	TOTAL CREDITS	14

Please note that many chemistry and biology classes have a lab. Although the lab is registered for as a separate class, the credit hour totals above include the lab hours. The student must pass both the lecture and lab portion of the class in order to receive any of the credits.

It may be possible to obtain a Chemistry degree in 3 years. Please contact your academic advisor for planning.

Additional Requirements

Students must meet all General Education Requirements required for graduation from the University of Charleston. Students should take care to fulfill prerequisites for upper division courses as noted in the course descriptions.

Successful completion of American Chemical Society (ACS) examinations may be required as part of the course assessments.

Chemistry majors should follow the Research Timeline described above in the section about Natural Sciences & Mathematics Department Requirements.

CHEMISTRY MINOR

Students can earn a minor in Chemistry by completing 18 credit hours of Chemistry classes (six of the 18 hours may be classes required for other degrees) in required classes. The required classes are:

CHEM 201, CHEM 202, CHEM 412, CHEM 414, CHEM 251, CHEM 251L, CHEM 496 and CHEM 410 or CHEM 411.

Please note that BIOLOGY Pre-Professional majors must choose CHEM 411 because CHEM 410 is already required for their degree. Majors outside the Natural Science and Mathematics department may be required to take additional hours as prerequisite and co-requisite classes.

CHEMISTRY DATA ANALYTICS CONCENTRATION

Dr. Mark Watson, Advisor

BS in Chemistry Data Analytics Concentration

This track will enhance the BS Chemistry degree by providing the graduate with a strong background in mathematical analysis as applied to chemical data. Graduates will be able to use computer science, mathematics and statistics, as well as their knowledge of chemistry and cheminformatics, to analyze chemical data. The emphasis will be on retrieving data in the chemical literature for analysis of properties related to structure and reactivity.

While BS Chemistry majors typically do a laboratory-based research project for their Capstone Experience in the major (CHEM 495), Data Analytics track students will do a collaborative chemistry/data analytics project for their Capstone.

Graduates will be well-prepared to enter graduate school in chemistry or work in the pharmaceutical or chemical industries where the interdisciplinary nature of this skill set is valued.

Required classes:

REQUIRED CHEMISTRY COURSES - 49 CREDIT HOURS		
CHEM 101	General Chemistry I and Lab	4 credits
CHEM 102	General Chemistry II and Lab	4 credits
CHEM 201	Organic Chemistry I and Lab	4 credits
CHEM 202	Organic Chemistry II and Lab	4 credits
CHEM 251	Quantitative Analysis and Lab	4 credits
CHEM 362	Instrumental Analysis and Lab	4 credits
CHEM XXX	300 or 400-Level Electives	6 credits
CHEM 340	Cheminformatics (NEW CLASS)	3 credits
CHEM 410	Biochemistry	4 credits
CHEM 412	Physical Chemistry I	3 credits
CHEM 413	Physical Chemistry II	3 credits
CHEM 414	The Chemist's Toolbox	1 credit
CHEM 494	Proposal Writing in Chemistry	1 credit
CHEM 495	Research in Chemical Science	3 credits
CHEM 496	Seminar in Chemical Science	1 credit

REQUIRED MATHEMATICS COURSES – 19 CREDIT HOURS

MATH 123	Pre-Calculus	4 credits
MATH 201	Calculus I	4 credits
MATH 202	Calculus II	4 credits
MATH 203	Calculus III	4 credits
MATH 230	Linear Algebra	3 credits
MATH 225	Discrete Mathematics (recommended, not required)	3 credits

REQUIRED PHYSICS COURSES – 8 CREDIT HOURS

PHSC 201	Introductory Physics I	4 credits
PHSC 202	Introductory Physics II	4 credits

REQUIRED DATA SCIENCE COURSES – 8 CREDIT HOURS

COSC 101	Introduction to Scientific Programming	4 credits
DASC 101	Introduction to Data Science	3 credits

REQUIRED STATISTICS COURSES – 10 CREDIT HOURS

NSCI 220	Statistics in Science and Research	3 credits
STAT 101	Introduction to Statistics	4 credits
STAT 120	Introduction to Probability for Data Science	3 credits

Typical Schedule for 4-year completion of BS CHEM Data Analytics Concentration**FRESHMAN YEAR**

FALL SEMESTER		SPRING SEMESTER	
CHEM 101 General Chemistry I and lab (STEM Flex)	4	CHEM 102 General Chemistry II and Lab	4
COMM 101 Writing I*	3	COMM 102 Writing II	3
		SPCH 103 Fundamental of Speech**	3
MATH 123 Pre-Calculus (STEM Flex)	4	MATH 201 Calculus I (Elective Flex)	4
UNIV 104 College Motivation	1	UNIV 105 The University Experience	2

DASC 100 Introduction to Scientific Programming (Elective Flex)	3	DASC 101 Introduction to Data Science	3
TOTAL CREDITS	17	TOTAL CREDITS	19

SOPHOMORE YEAR

FALL SEMESTER		SPRING SEMESTER	
CHEM 201 Organic Chemistry I and Lab	4	CHEM 202 Organic Chemistry II and Lab	4
MATH 202 Calculus II	4	MATH 203 Calculus III	4
PHSC 201 Introductory Physics I and Lab	4	PHSC 202 Introductory Physics II and Lab	4
STAT 101 Introduction to Statistics	4	STAT 120 Introduction to Probability	3
TOTAL CREDITS	16	TOTAL CREDITS	15

JUNIOR YEAR

FALL SEMESTER		SPRING SEMESTER	
CHEM 412 Physical Chemistry I	3	CHEM 413 Physical Chemistry II	3
SSCI Flex (Recommend PSYC)	3	SSCI Flex (Recommend HIST)	3
NSCI 220 Statistics	3	HUMN Flex (Recommend ENGL)	3
CHEM 411 Advanced Organic	3	Elective	3
CHEM 251 Quantitative Analysis	4	Elective	3
TOTAL CREDITS	16	TOTAL CREDITS	15

SENIOR YEAR

FALL SEMESTER		SPRING SEMESTER	
CHEM 494 Proposal Writing in Chem.	1		
CHEM 495 Research Capstone	3	CHEM 496 Seminar	1
CHEM 410 Biochemistry	4	CHEM 420 Advanced Biochemistry	3
		MATH 225 Discrete Math (optional)	3
HUMN Flex (Recommend Art)	3	Elective	3
Elective	3	CHEM 414 The Chemist's Toolbox	1
TOTAL CREDITS	14	TOTAL CREDITS	14

Chemistry-Biology Dual-Major (BIOCHEM) Program

This specially designed BS degree program allows interested students to obtain a dual major in chemistry and biology within a four-year timeframe, representing a very efficient and vigorous learning approach. Possessing a strong knowledge base in both chemistry and biology gives science students, particularly Pre-Pharmacy and Pre-Professional students, a competitive edge.

Please see the section the section of this *Academic Catalog* describing the Chemistry-Biology Dual Major Plan for further details.