

## Bachelor of Science

# Chemistry with a Major in Chemistry-Research (BS)

## Requirements

### Lower-Division General Education

Written Communication ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written</a> )	6
Oral Communication ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral</a> )	3
Mathematics ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math</a> )	3
Language and Culture ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language</a> )	0-6
Information Literacy and Research ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information</a> )	3
Human Behavior ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior</a> )	3
Human Creativity ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity</a> )	3
Interpreting the Past ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret</a> )	3
Literature ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature</a> )	3
Philosophy and Ethics ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy</a> )	3
The Nature of Science ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature</a> )	8
Impact of Technology ( <a href="http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact">http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact</a> )	3

Written Communication: Grade of C or better required in both courses

Oral Communication: COMM 101R

Mathematics: MATH 163 and STAT 130M required

Information Literacy and Research: satisfied in the major by CHEM 160G

The Nature of Science: PHYS 231N-PHYS 232N required

### Upper-Division General Education

- Option A. Approved Disciplinary Minor (a minimum of 12 hours determined by the department), or second degree or second major.
- Option B: Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
- Option C. An approved Certification Program such as teaching licensure
- Option D. Two Upper-Division Courses from outside the College of Sciences and not required by the major (6 hours)

## Requirements for Graduation

Requirements for graduation include the following:

- Minimum of 120 credit hours.
- Minimum of 30 credit hours overall and 12 credit hours of upper-level courses in the major program from Old Dominion University.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward the major.

- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward a minor.
- Completion of ENGL 110C, ENGL 211C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better. The W course must be taken at Old Dominion University.
- Completion of Senior Assessment.

## Chemistry Core

### Required Courses

CHEM 121N	Foundations of Chemistry I Lecture (cannot earn credit for both 121N and 105N)	3
CHEM 122N	Foundations of Chemistry I Laboratory	1
CHEM 123N	Foundations of Chemistry II Lecture	3
CHEM 124N	Foundations of Chemistry II Laboratory	1-2
or CHEM 125	Foundations of Chemistry II Lab with Introduction to Chemical Research	
CHEM 160G	Introduction to Chemistry and Biochemistry Research and Careers	3
CHEM 211	Organic Chemistry I Lecture	3
CHEM 212	Organic Chemistry I Laboratory	2
CHEM 213	Organic Chemistry II Lecture	3
CHEM 214	Organic Chemistry II Laboratory	2
or CHEM 216	Advanced Organic Chemistry Laboratory	
CHEM 321 & CHEM 322	Analytical Chemistry Lecture and Analytical Chemistry Laboratory	5
CHEM 351	Inorganic Chemistry	3
CHEM 331	Physical Chemistry Lecture I	3
CHEM 332W	Experimental Physical Chemistry I	2
CHEM 333	Physical Chemistry Lecture II	3
CHEM 334W	Experimental Physical Chemistry II	2
CHEM 421 & CHEM 422	Instrumental Analysis Lecture and Instrumental Analysis Laboratory	6
CHEM 441	Biochemistry Lecture	3
CHEM 485	Chemistry and Biochemistry Seminar	1
Select two CHEM Electives from the following:		6
CHEM 415	Intermediate Organic Chemistry	
CHEM 439	Introduction to Pharmaceutical Chemistry	
CHEM 443	Intermediate Biochemistry	
CHEM 449	Environmental Chemistry	
CHEM 451	Advanced Inorganic Chemistry	
CHEM 453	Essentials of Toxicology	
Select one CHEM Laboratory from the following:		2-4
CHEM 352	Inorganic Chemistry Laboratory	
CHEM 442W	Biochemistry Laboratory	
<b>Other required courses</b>		
MATH 211	Calculus I	4
MATH 212	Calculus II	4
<b>Total Credit Hours</b>		<b>65-68</b>

Chemistry majors must have a C or better in all courses required for the major, including prerequisite courses, and must complete a minimum of 12 credits in upper-level (300/400) chemistry courses at Old Dominion University. Written permission by the chief departmental advisor or chair is required prior to taking upper-level chemistry courses at other institutions.

## Chemistry-Research Major

Students with an interest in pursuing chemical research after graduation or in graduate school or those seeking a deeper understanding of chemical research and applications may pursue a major in Chemistry-Research. Courses taken for the chemistry-research major will substitute for courses in the regular curriculum; please consult the chief departmental advisor for specific information on substitutions. Additionally, all regular BS-

Chemistry degree requirements must be met (with the exception of approved substitutions).

### General Education

Complete lower-division requirements 38-44

Complete upper-division requirements (minimum of 6 credit hours) 6

### Chemistry Core

Complete chemistry core 65-68

### Research Major

CHEM 490 Senior Thesis I 1

CHEM 499 Senior Thesis II 2

Select two of the following research-oriented courses: 3-5

CHEM 125 Foundations of Chemistry II Lab with Introduction to Chemical Research

CHEM 216 Advanced Organic Chemistry Laboratory

CHEM 497 Independent Study

CHEM 498 Independent Study

**Total Credit Hours 115-126**

### Elective Credit

Elective credit may be needed to meet the minimum requirement of 120 credit hours.

## Honors in Chemistry

The honors program provides qualified students the opportunity for supervised individual study in their areas of interest. Admission to the program requires a cumulative GPA of 3.25 or higher and a GPA of 3.50 or higher in the major. Students must take two upper-division courses designated by the department to be honors courses. These are termed "Contract Honors Courses." A description of the procedures for these contract courses is found in the Honors College section of this Catalog.

## Degree Program Guide

The Degree Program Guide is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Course	Title	Credit Hours
<b>Freshman</b>		
<b>Fall</b>		
CHEM 121N and CHEM 122N		4
MATH 163	Precalculus II	3
ENGL 110C	English Composition (Grade of C or better required)	3
CHEM 160G	Introduction to Chemistry and Biochemistry Research and Careers	3
<b>Credit Hours</b>		<b>13</b>
<b>Spring</b>		
CHEM 123N AND CHEM 124N or CHEM 125		4-5
MATH 211	Calculus I	4
ENGL 211C or ENGL 231C (Grade of C or better required)		3
Philosophy and Ethics		3
<b>Credit Hours</b>		<b>14-15</b>
<b>Sophomore</b>		
<b>Fall</b>		
CHEM 211 and CHEM 212		5
MATH 212	Calculus II	4

PHYS 231N	University Physics I	4
Human Creativity		3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
CHEM 213 AND CHEM 214 or CHEM 216		5
CHEM 321 and CHEM 322		5
PHYS 232N	University Physics II	4
Elective		2
<b>Credit Hours</b>		<b>16</b>
<b>Junior</b>		
<b>Fall</b>		
CHEM 331	Physical Chemistry Lecture I	3
CHEM 332W	Experimental Physical Chemistry I (C or better required)	2
CHEM 351	Inorganic Chemistry	3
CHEM 441	Biochemistry Lecture	3
CHEM 352 or CHEM 442W		2-4
Impact of Technology		3
<b>Credit Hours</b>		<b>16-18</b>
<b>Spring</b>		
CHEM 333	Physical Chemistry Lecture II	3
CHEM 334W	Experimental Physical Chemistry II	2
CHEM 415 or CHEM 439 or CHEM 443 or CHEM 451		3
COMM 101R	Public Speaking	3
Literature		3
<b>Credit Hours</b>		<b>14</b>
<b>Senior</b>		
<b>Fall</b>		
CHEM 415 or CHEM 439 or CHEM 443 or CHEM 451		3
Interpreting the Past		3
Human Behavior		3
Elective or Language & Culture I (May be waived; See requirement details)		3
Upper-Division General Education Course (Option D)		3
<b>Credit Hours</b>		<b>15</b>
<b>Spring</b>		
CHEM 421 and CHEM 422		6
CHEM 485	Chemistry and Biochemistry Seminar	1
Upper-Division General Education Course (Option D)		3
Elective or Language and Culture II (May be waived; See requirement details)		3
Elective		3
<b>Credit Hours</b>		<b>16</b>
<b>Total Credit Hours</b>		<b>120-123</b>

## Linked Bachelor's/Master's Degree Programs

The linked BS in chemistry and the MS in chemistry allows exceptional students to count up to 12 hours of graduate courses toward both a BS degree in chemistry and an MS degree in chemistry. Students in the combined program must complete Senior Thesis I and II (CHEM 490

and CHEM 499), be accepted into the chemistry master's program, and earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree). Additional requirements apply; please contact the Chief Departmental Advisor.

## **BA or BS to MBA (Master of Business Administration) Linked Program**

The linked BA/MBA or BS/MBA program is an early entry to the MBA program of study. The early-entry program is designed for well qualified non-business undergraduate ODU students to start their MBA program prior to completing their undergraduate degree. Well qualified non-business undergraduate students may take MBA-level courses as early as three semesters prior to graduation and count up to 12 graduate credits toward their undergraduate degree. Students participating in the early-entry program must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree). Early-entry program students should carefully consider their undergraduate degree program requirements when planning their course of study. Students in the early-entry program work in close consultation with the MBA Program Office and should refer to information in the Strome College of Business section in the graduate catalog (<http://catalog.odu.edu/graduate/stromecollegeofbusiness/>) to develop an individualized plan of study based on the required coursework.

## **BA or BS to MPA (Master of Public Administration) Linked Program**

The linked BA/MPA or BS/MPA program provides qualified Old Dominion University undergraduate students with the opportunity to earn a master's degree in public administration while taking credits in the MPA program as an undergraduate student. The program is designed for highly motivated students with the desire to immediately continue their education after the bachelor's degree. The program is especially relevant to individuals seeking to work (or currently working) in the public or non-profit sectors, but is suitable for students from any undergraduate major. Graduate courses may be taken during the fall and spring semester of the student's senior undergraduate year. Up to 12 graduate credits can count toward both the undergraduate and graduate degree and can meet upper-level General Education requirements. After receiving the undergraduate degree, a student will continue with the MPA program, taking MPA courses until completing the required 39 credit hours. Students in the linked program must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

Requirements for admission to the graduate program can be found in the School of Public Service section of the Graduate Catalog (<http://catalog.odu.edu/graduate/business/public-service/>). For additional information, please contact the School of Public Service in the Strome College of Business.