### Bachelor of Science

**Biochemistry with a Major in Biochemistry-Research (BS)**

#### Requirements

##### Lower-Division General Education

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

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

**Oral Communication:** COMM 101R

Mathematics: MATH 163

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

The Nature of Science: BIOL 121N, BIOL 122N, BIOL 123N, BIOL 124N

##### 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, 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.

#### Biochemistry Core

In addition to completing the University's lower-division general education requirements and upper-division general education requirements, a biochemistry major must complete the following courses.

##### Required Chemistry Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 121N</td>
<td>Foundations of Chemistry I Lecture</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 122N</td>
<td>Foundations of Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 123N</td>
<td>Foundations of Chemistry II Lecture</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 124N</td>
<td>Foundations of Chemistry II Laboratory</td>
<td>1-2</td>
</tr>
<tr>
<td>or CHEM 125</td>
<td>Foundations of Chemistry II Lab with Introduction to Chemical Research</td>
<td></td>
</tr>
<tr>
<td>CHEM 160G</td>
<td>Introduction to Chemistry and Biochemistry Research and Careers</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 211</td>
<td>Organic Chemistry I Lecture</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 212</td>
<td>Organic Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 213</td>
<td>Organic Chemistry II Lecture</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 214</td>
<td>Organic Chemistry II Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>or CHEM 216</td>
<td>Advanced Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 321</td>
<td>Analytical Chemistry Lecture</td>
<td>5</td>
</tr>
<tr>
<td>&amp; CHEM 322</td>
<td>Analytical Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Physical Chemistry Lecture</td>
<td>6</td>
</tr>
<tr>
<td>&amp; CHEM 333</td>
<td>Physical Chemistry Lecture</td>
<td></td>
</tr>
<tr>
<td>CHEM 441</td>
<td>Biochemistry Lecture</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 442W</td>
<td>Biochemistry Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 443</td>
<td>Intermediate Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 485</td>
<td>Chemistry and Biochemistry Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

##### Other Required courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 211</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 212</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 231N</td>
<td>University Physics I</td>
<td>8</td>
</tr>
<tr>
<td>&amp; PHYS 232N</td>
<td>and University Physics II</td>
<td></td>
</tr>
<tr>
<td>BIOL 293</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 294</td>
<td>Genetics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Hours**: 65-66

Biochemistry 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.

#### Research Major

Students with an interest in pursuing biochemical research after graduation or in graduate school or those seeking a deeper understanding of biochemical research and applications may pursue a Biochemistry-Research major. Courses taken for the research concentration will substitute for courses in the regular curriculum; please consult the Chief Departmental Advisor for specific information on substitutions. Additionally, all regular BS-Biochemistry 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

##### Biochemistry Core

Complete the biochemistry core 65-66
Chemistry-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  115-124

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

Additional Requirements and Information

ACS-Certified Degree
Biochemistry majors can attain an ACS-certified degree for chemistry content if they also complete the following.
CHEM 332W  Experimental Physical Chemistry I  2
CHEM 351  Inorganic Chemistry  3
Select two of the following lecture electives:  6
CHEM 411  Natural Products Chemistry in the Caribbean
CHEM 415  Intermediate Organic Chemistry
CHEM 421  Instrumental Analysis Lecture
CHEM 449  Environmental Chemistry
CHEM 451  Advanced Inorganic Chemistry
Select two of the following laboratory electives:  4
CHEM 334W  Experimental Physical Chemistry II
CHEM 352  Inorganic Chemistry Laboratory
CHEM 422  Instrumental Analysis Laboratory

Total Credit Hours  15

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
Freshman
Fall
ENGL 110C  English Composition (Grade of C or better required)  3
MATH 163  Precalculus II  3
CHEM 121N and CHEM 122N  4
BIOL 293 and BIOL 122N  4
CHEM 160G  Introduction to Chemistry and Biochemistry Research and Careers  3

Credit Hours  17

Spring
Select one of the following:  3
ENGL 211C  Writing, Rhetoric, and Research
ENGL 231C  Writing, Rhetoric, and Research: Special Topics
MATH 211  Calculus I  4

Total Credit Hours  120-121

Sophomore

Fall
CHEM 211 and CHEM 212  5
MATH 212  Calculus II  4
COMM 101R  Public Speaking  3
Elective or Language and Culture I (May be waived; See requirement details)  3

Credit Hours  15

Spring
CHEM 213 AND CHEM 214 or CHEM 216  5
Elective or Language and Culture II (May be waived; See requirement details)  3
Human Behavior  3
Elective  3

Credit Hours  14

Junior

Fall
CHEM 321 and CHEM 322  5
PHYS 231R  University Physics I  4
CHEM 441  Biochemistry Lecture  3
BIOL 293  Cell Biology  3

Credit Hours  15

Spring
CHEM 443  Intermediate Biochemistry  3
PHYS 232R  University Physics II  4
CHEM 442W  Biochemistry Laboratory (C or better required)  4
Elective  2

Credit Hours  13

Senior

Fall
CHEM 331  Physical Chemistry Lecture I  3
BIOL 294  Genetics  3
Interpreting the Past  3
Philosophy and Ethics  3
Upper-Division General Education Course (Option D)  3

Credit Hours  15

Spring
CHEM 485  Chemistry and Biochemistry Seminar  1
CHEM 333  Physical Chemistry Lecture II  3
Impact of Technology  3
Literature  3
Upper-Division General Education Course (Option D)  3
Human Creativity  3

Credit Hours  16

Biotechnology with a Major in Biochemistry-Research (BS)  2
Linked Bachelor's/Master's Degree Programs

The linked BS in biochemistry and the MS in chemistry allows exceptional students to count up to 12 hours of graduate courses toward both a BS degree in biochemistry 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.