

## Bachelor of Science

# Biology with a Major in Biomedical Sciences-Pre Health (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

Mathematics: MATH 205 or MATH 211; C or better required

Information Literacy and Research: CS 121G, CS 126G, or OEAS 130G required

Nature of Science: met in the major by CHEM 121N-CHEM 122N and CHEM 123N-CHEM 124N

### Upper-Division General Education Requirements

The Professional Education core satisfies this requirement for the secondary education concentration.

- 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 (300-level or above) 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.

## Biology Core

### Required Biology Core Courses (C or better required in each course)

BIOL 121N & BIOL 122N	General Biology I and General Biology I Lab	4
BIOL 123N & BIOL 124N	General Biology II and General Biology II Lab	4
BIOL 293	Cell Biology	3
BIOL 294	Genetics	3
Select one of the following:		8
BIOL 240 & BIOL 241	Fundamentals of Anatomy and Physiology I and Fundamentals of Anatomy and Physiology II	
BIOL 250 & BIOL 251	Human Anatomy and Physiology I and Human Anatomy and Physiology II	

**Total Credit Hours** 22

## Biomedical Sciences-Pre Health Major

### General Education

Complete lower-division requirements	33-39
Complete upper-division requirements (minimum of 6 credit hours)	6

### Biology Core

Complete the biology core	22
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### Upper-Division Required Biology Courses (C or better required in each course)

BIOL 302	Introduction to immunology	3
BIOL 316	General Microbiology	3
BIOL 317	General Microbiology Laboratory	2

### Writing Intensive Requirement

Choose a Writing Intensive (W) course from the following Upper-Division Biology Electives or BIOL 405W, which requires the approval of topic/sponsor or a biomedical-specific course section. BIOL 405W will NOT count towards the upper-division Biology electives.

### Upper-Division Biology Elective Courses

Students must choose 16 elective credit hours from the following 16 Biology elective courses. At least one of the courses must be BIOL 416, BIOL 440, or BIOL 476. Two laboratory-based courses (\*\*) are required in the 16 elective credit hours. Students must pass all Biology electives with a C or better (P=Passing for courses graded Pass/Fail).

Select at least one of the following:

BIOL 416	Clinical Immunology
BIOL 440	Methods in Immunological Research **
BIOL 476	Cancer Immunology and Immunotherapy

Select from the following to complete the Upper-Division Biology elective credits:

BIOL 306	Human Genetics
BIOL 309	Foundations of Pathophysiology **
BIOL 313	Introduction to Neuroanatomy **
BIOL 314	Developmental Biology **
BIOL 355	Stem Cell Biology

BIOL 380	Research in Pathogen Biology I: Laboratory Investigation **
BIOL 381	Research in Pathogen Biology II: Analysis **
BIOL 403	Medical Microbiology
BIOL 408	Introduction to Pharmacology
BIOL 423W	Cellular and Molecular Biology
BIOL 425	Cancer Biology
BIOL 426	Histology **
BIOL 430W	Microbial Pathogenesis
BIOL 436W	Infectious Disease Epidemiology
BIOL 437W	One Health: People, Animals and the Environment
BIOL 449	Microbial Impact on Human Health
BIOL 457	General Virology
BIOL 460	Frontiers in Nanoscience and Nanotechnology
BIOL 461	Human Cadaver Dissection **
BIOL 462	Microbial Genetics
BIOL 463	Cell Signaling in Host Pathogen Interactions
BIOL 464	Biomedical Applications of Low Temperature Plasmas
BIOL 465	Biotechnology
BIOL 470T	Diseases that Changed our World
BIOL 475	Neurobiology
BIOL 481W	Forensic and Medical Entomology **
BIOL 482	Human and Veterinary Parasitology
BIOL 490	Advanced Human Physiology

#### Experiential Learning

A maximum of 6 credits can be applied toward Upper-Division Biology credit hours. These courses require documented prior approval.

BIOL 367	Cooperative Education
BIOL 368	Internship
BIOL 369	Practicum
BIOL 487	Honors Research in Biology **
BIOL 488W	Honors Research in Biology **
BIOL 497	Undergraduate Research <small>Counts towards lab credit if 3 credits are earned.</small>
BIOL 498	Independent Study

#### Non-Biology Degree Requirements (C or better required in each course)

CHEM 121N	Foundations of Chemistry I Lecture	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
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
CHEM 441	Biochemistry Lecture	3
PHYS 111N	Introductory General Physics	4
PHYS 112N	Introductory General Physics	4
STAT 130M or STAT 310	Elementary Statistics Introductory Data Analysis	3

**Total Credit Hours** **117-123**

#### Elective Credit

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

## Honors Program in Biology

### A. Honors Research

Undergraduates with junior or senior standing and a GPA of 3.00 or better are eligible to participate in Honors Research. After consultation with the program director (Dr. Deborah A. Waller), students select a professor who agrees to oversee the research project. Students then enroll in two courses, BIOL 487 and BIOL 488W. The courses may be taken in any sequence: fall-spring, spring-summer, summer-summer, summer-fall. Normally both semesters are required but a student may receive credit for only one semester. The research project, time commitment by the student and the basis for the grade are mutually determined by the student and professor. Because first-semester research results are often preliminary, the grade for BIOL 487 is based on a review paper and/or research proposal, which provides the student with an overview of the field. The second semester is graded on the final research paper and a seminar presented to the honors committee and interested faculty. Professors should encourage students to publish results and present papers at scientific meetings when appropriate. Students should also be urged to apply for funds from agencies that provide seed money to undergraduates. The program director can provide information on scientific societies that sponsor meetings and/or offer small grants. Successful completion of both courses with a C (2.0) or better will allow the student to use BIOL 488W as a lab course in meeting his/her requirements.

### B. Bachelor's Degree with Honors in Biological Sciences and Honors Designation for Biology courses

Students maintaining an overall GPA of at least 3.25 and of 3.50 in biology can receive a "Bachelor's Degree with Honors in Biological Sciences" subject to satisfaction of the minimum University standards for the Honors degree and completion of one of the following two options:

**Option 1:** Successful completion of two semesters of biological research taken as BIOL 487 / BIOL 488W (Honors Research).

**Option 2:** Successful completion of three upper-division courses in Biological Sciences and achievement of the "Honors" designation in each.

Students petitioning for designation of an upper-division biology course as "Honors" must have a minimum overall GPA of 3.25 and a GPA of at least 3.50 in biology.

To receive the "Honors" designation for a course, students must achieve a final course score of at least 95% or the equivalent of an "A" on the University grade scale.

Faculty are encouraged to assign and work with students on other activities deemed appropriate for an "Honors" course designation and utilize the results of these activities in the assignment of a course grade.

## 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>First Semester</b>		
ENGL 110C	English Composition (C or better required)	3
MATH 162M	Precalculus I	3
BIOL 121N & BIOL 122N		4
CHEM 121N	Foundations of Chemistry I Lecture	3

CHEM 122N	Foundations of Chemistry I Laboratory	1
<b>Credit Hours</b>		<b>14</b>
<b>Second Semester</b>		
ENGL 211C or ENGL 231C	Writing, Rhetoric, and Research or Writing, Rhetoric, and Research: Special Topics	3
MATH 205	Calculus for Life Sciences	3
BIOL 123N & BIOL 124N		4
CHEM 123N	Foundations of Chemistry II Lecture	3
CHEM 124N	Foundations of Chemistry II Laboratory	1
<b>Credit Hours</b>		<b>14</b>
<b>Sophomore</b>		
<b>First Semester</b>		
BIOL 240 or BIOL 250	Fundamentals of Anatomy and Physiology I or Human Anatomy and Physiology I	4
BIOL 293	Cell Biology	3
CHEM 211	Organic Chemistry I Lecture	3
CHEM 212	Organic Chemistry I Laboratory	2
STAT 130M or STAT 310	Elementary Statistics or Introductory Data Analysis	3
<b>Credit Hours</b>		<b>15</b>
<b>Second Semester</b>		
BIOL 241 or BIOL 251	Fundamentals of Anatomy and Physiology II or Human Anatomy and Physiology II	4
BIOL 294	Genetics	3
CHEM 213	Organic Chemistry II Lecture	3
CHEM 214	Organic Chemistry II Laboratory	2
Human Creativity		3
<b>Credit Hours</b>		<b>15</b>
<b>Junior</b>		
<b>First Semester</b>		
BIOL 302	Introduction to immunology	3
PHYS 111N	Introductory General Physics	4
SOC 201S	Introduction to Sociology (meets Human Behavior)	3
Literature		3
Interpreting the Past		
Language and Culture I (May be waived, see requirement details)		0-3
<b>Credit Hours</b>		<b>13-16</b>
<b>Second Semester</b>		
BIOL 316	General Microbiology	3
BIOL 317	General Microbiology Laboratory	2
PHYS 112N	Introductory General Physics	4
PSYC 201S	Introduction to Psychology	3
Oral Communication		3

Language and Culture II (May be waived, see requirement details)		0-3
<b>Credit Hours</b>		<b>15-18</b>
<b>Senior</b>		
<b>First Semester</b>		
Biology 300/400-level Writing Intensive (W) course (C or better required)		3
BIOL 440 or BIOL 416 or BIOL 476	Methods in Immunological Research or Clinical Immunology or Cancer Immunology and Immunotherapy	4
300/400-level Biology elective		4-5
Philosophy & Ethics		3
Upper-Division General Education course		3
<b>Credit Hours</b>		<b>17-18</b>
<b>Second Semester</b>		
300/400-level Biology elective		5
CHEM 441	Biochemistry Lecture	3
Impact of Technology		3
CS 121G or CS 126G or OEAS 130G	Introduction to Information Literacy and Research for Scientists or Honors: Introduction to Information Literacy and Research or Research Skills and Information Literacy for the Natural Sciences	3
Upper-Division General Education course		3
<b>Credit Hours</b>		<b>17</b>
<b>Total Credit Hours</b>		<b>120-127</b>

## 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.