

BIOLOGY

Degree: B.S., Biology

Department of Biological Sciences (<https://cas.umw.edu/biology/>)

Biology encompasses the study of all living things and their interaction with the environment. The Department faculty is dedicated to providing students with a strong undergraduate education in the fundamental principles of biology, while offering opportunities and encouraging students to pursue specialized areas of interest.

The Bachelor of Science in Biology degree prepares students for future careers in life sciences research, teaching, and biotechnology. Many graduates pursue advanced degrees in specialized areas such as cellular and molecular biology, bioinformatics, physiology, immunology, entomology, microbiology, ecology, and environmental engineering.

The biology core curriculum is designed to ensure thorough command of the scientific method and access to inquiry-based learning experiences, while providing a balanced background in cell and molecular biology, organismal biology, and ecology. Elective courses cover a wide variety of specialized topics to meet students' particular interests in biology. An array of laboratory and field experiences further develop working knowledge of the scientific method, teach specific experimental techniques, and promote ongoing development of quantitative and analytical skills.

All of the equipment and facilities in the department are available for undergraduate student use. Collections of microscope slides, vertebrate and invertebrate specimens and a herbarium are available to enhance learning. Advanced laboratory instrumentation such as spectrophotometers, thermal cyclers, ultracentrifuges, and two electron microscopes allow students to engage in sophisticated research. The department also has appropriate field equipment for collecting biological data from the terrestrial, aquatic, and estuarine habitats surrounding campus.

Every student is expected to engage in undergraduate research through either research-intensive laboratory courses or undergraduate research with a UMW faculty member. Research intensive (RI) classes allow students to work in teams to design research plans, collect and analyze data and present their findings at a University symposium, while undergraduate research may be a more independent project, mentored by a faculty member. On many occasions this independent work results in presentations at state, regional, and national scientific meetings. Research students who meet minimum requirements (3.0 overall GPA and a 3.25 average in biology) may pursue Honors in Biology by writing and defending a thesis on their research project. Students can also gain focused research experience via participation in the UMW Summer Science Institute. Financial support for student research is available. Additionally, biology faculty offer research opportunities through the university's undergraduate research (URES 197) program.

Students may also take advantage of Biology service learning opportunities (BIOL 000 Community Service Learning), or internship opportunities (BIOL 499) to gain valuable career related experience which can count for the University's Beyond the Classroom OR After Mary Washington general education requirement. A maximum of 2 elective credits of BIOL 499 may be counted towards the Biology major.

Student Learning Outcomes

Students will demonstrate knowledge of Core Concepts for Biological Literacy. Students will demonstrate knowledge of:

1. Core Concept of the concepts and processes of evolution.
2. Core Concept of the nature of structure and function.
3. Core Concept of information flow, exchange, and storage.
4. Core Concept of the pathways and transformations of energy and matter.
5. Core Concept of the nature of biological entities as systems.

Students will demonstrate abilities of Core Competencies for the Practice of Biology. Students will be able to:

6. Core Competency for the practice of Biology of how to apply the processes of science.
7. Core Competency for the practice of Biology of how to use quantitative reasoning.
8. Core Competency of the practice of Biology of how to use modeling and simulation.

Students will demonstrate abilities of Core Competencies for Societal Issues in Biology. Students will be able to:

9. Core Competency for societal issues in Biology of the ability to tap into the interdisciplinary nature of science.
10. Core Competency for societal issues in Biology of the ability to communicate and collaborate with other disciplines.
11. Core Competency for societal issues in Biology of the ability to understand the relationship between science and society.

Major Requirements

Students must earn a C- or better in most BIOL required courses that serve as prerequisites for other BIOL courses. Students must also earn a C- or better in the core courses (BIOL 210 Introduction to Ecology and Evolution, BIOL 260 Biostatistics and Research Design, BIOL 340 Cellular Biology, BIOL 341 General Genetics) to graduate with a degree in Biology. See also the Chemistry Program's minimum grade requirements for CHEM 111 General Chemistry I, CHEM 112 General Chemistry II.

Code	Title	Credits
BIOL 132	Organism Function and Diversity	4
or BIOL 126	Phage Hunters II	
BIOL 210	Introduction to Ecology and Evolution ¹	3
BIOL 260	Biostatistics and Research Design ¹	4
BIOL 340	Cellular Biology ¹	4
BIOL 341	General Genetics ¹	4
BIOL 451	Seminar	2
Select one Research Intensive class from the classes listed below:		4
BIOL 419	Neuroethology	
BIOL 427	Ornithology	
BIOL 430	Molecular Biology of the Gene	
BIOL 432	Virology	
BIOL 439	Developmental Biology	
BIOL 462	Research Practices in Plant Ecology	
BIOL 466	Research in Endocrinology	
BIOL 467	Research in Molecular Parasitology	
BIOL 472	Research-Intensive Topics in Biology	

BIOL 481 & BIOL 491	Research Design & Proposal Development in Biology and Special Problems in Biology
Select 16 additional hours of BIOL electives, including 1 lab class ^{2,3}	
16	
Total Credits	
41	

- ¹ These are prerequisites for various upper-level courses. and should be completed during the second year.
- ² CHEM 317 Biochemistry I and EESC 418 Applied Ecotoxicology count as electives in the BIOL major.
- ³ A maximum of 2 credit hours of BIOL 499 Internship counts as an elective in the BIOL major

Note: BIOL 132 Organism Function and Diversity, or BIOL 126 Phage Hunters II, and CHEM 111 General Chemistry I, CHEM 112 General Chemistry II are prerequisites for the biology major's core curriculum and should be taken in the student's first year.

All graduating students must participate in the assessment of the major.

General Education Requirements

The general education requirements for Bachelor of Arts/Bachelor of Science degrees (<https://catalog.umw.edu/undergraduate/general-education/requirements-bachelor-arts-bachelor-science-degrees/>) apply to all students who are seeking to earn an undergraduate B.A., B.S. or B.S.Ed. degree.

Students seeking a Bachelor of Liberal Studies degree have a separate set of BLS general education requirements (<https://catalog.umw.edu/undergraduate/general-education/requirements-bachelor-liberal-studies-degrees/>).

Electives

Elective courses are those that are not needed to fulfill a general education requirement or major program requirement but are chosen by the student to complete the 120 credits required for graduation with a B.A./B.S./B.S.Ed. degree or the BLS degree. These courses may be taken graded or pass/fail (or S/U in the case of physical education and 100-level dance). No student in a regular B.A./B.S./B.S.Ed. program may count more than 60 credits in a single discipline toward the 120 credits required for graduation.

Total Credits Required for the Degree: 120 credits

Plan of Study

This suggested plan of study should serve as a guide to assist students when planning their course selections. It is not a substitute for a student's Degree Evaluation or the Program Requirements listed for this major in the catalog. Academic planning is the student's responsibility, and course selections should be finalized only after speaking with an advisor. Students should familiarize themselves with the catalog in effect at the time they matriculated at the University of Mary Washington. Students should also familiarize themselves with general education requirements (<https://catalog.umw.edu/undergraduate/general-education/>) which can be fulfilled through general electives as well as major/minor course requirements. Course requirements and sequencing may vary with AP, IB, CLEP, Cambridge or previous coursework, transfer courses, or other conditions. To be considered full-time, an undergraduate student must be enrolled in 12 or more credits for the semester.

Course	Title	Credits
Freshman		
Fall		
BIOL 121 or BIOL 125	Biological Concepts or Phage Hunters I	4
CHEM 111	General Chemistry I	4
FSEM 100	First-Year Seminar	3
General Education Courses		6
Credits		17
Spring		
BIOL 132 or BIOL 126	Organism Function and Diversity or Phage Hunters II	4
CHEM 112	General Chemistry II	4
General Education Courses		6
Credits		14
Sophomore		
Fall		
BIOL 260 or BIOL 210	Biostatistics and Research Design ¹ or Introduction to Ecology and Evolution	4
BIOL 340	Cellular Biology	4
General Education Courses		9
Credits		17
Spring		
BIOL 260 or BIOL 210	Biostatistics and Research Design ¹ or Introduction to Ecology and Evolution	4
BIOL 341	General Genetics	4
General Education Courses		8
Credits		16
Junior		
Fall		
Laboratory Elective		4
General Education Courses or Electives		9
Credits		13
Spring		
Biology Elective ²		4
General Electives		12
Credits		16
Senior		
Fall		
BIOL 451	Seminar (or Research Intensive Course) ^{3, 4}	2
Biology Elective		4
General Electives		9
Credits		15
Spring		
Biology Elective		4
Research Intensive Course (or BIOL 451) ^{3, 4}		4
General Electives		5
Credits		13
Total Credits		121

- ¹ BIOL 260 is a Digital Intensive course and counts as Writing Intensive in the major.
- ² Total of 12 credits of electives are required, of which at least 8 credits must be laboratory courses.
- ³ A research intensive course will count as Writing Intensive in the major.
- ⁴ BIOL 451 counts as Speaking Intensive in the major.

Biological Sciences Faculty

Dianne M. Baker, Chair

Professors

Dianne M. Baker
Andrew S. Dolby
Alan B. Griffith
Lynn O. Lewis
Deborah A. O'Dell

Associate Professors

Swati Agrawal
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Ginny R. Morriss
Abbie M. Tomba
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Assistant Professors

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Laura M. Sipe

Senior Lecturer

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