

BIOMEDICAL SCIENCES

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 interests in health-related professions.

The Biomedical Sciences major is designed for students interested in pursuing careers in the health sciences. The track provides students with the knowledge and the skills to be successful candidates for graduate study in a broad range of health-related fields including medical, dental, physician's assistant, nursing, physical therapy, and more. Students who complete all requirements earn the degree of Bachelor of Science (B.S.) in Biology with a major in Biomedical Sciences.

This program provides discipline-specific knowledge required for students to pursue graduate programs in the health sciences. It provides a thorough foundation in biology's fundamental principles including organism function, cell biology, genetics, physiology and the research process. Command of these core concepts is necessary for students to understand complex biological problems and to apply their knowledge to health-related problems. Four health related natural science electives are required so that students can develop a strong understanding of the basis of human health. Additionally, students must choose one course on societal perspectives on health which will expose students to a variety of health care concerns and provide a framework for the students to understand and have empathy for their patients.

The Biomedical Sciences major also emphasizes skills that students need to be effective health care providers. Students can gain perspective on the true nature of their chosen profession by utilizing their health-related internships, study abroad, or research experience to apply what they have learned and satisfy the beyond the classroom learning requirement.

All of the equipment and facilities in the department are available for undergraduate student use. Collections of microscope slides and anatomical specimens are available to enhance learning. Advanced laboratory instrumentation such as spectrophotometers, thermal cyclers, ultracentrifuges, tissue culture facilities and two electron microscopes allow students to engage in sophisticated research.

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 (<https://umw-preview.courseleaf.com/search/?P=URES%20197>)) program.

Students may also take advantage of Biology service learning opportunities (BIOL 000 (<https://umw-preview.courseleaf.com/search/?P=BIOL%20000>) Community Service Learning), or internship opportunities (BIOL 499 (<https://umw-preview.courseleaf.com/search/?P=BIOL%20499>)) 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.

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 260 (<https://catalog.umw.edu/search/?P=BIOL%20260>) Biostatistics and Research Design, BIOL 340 (<https://catalog.umw.edu/search/?P=BIOL%20340>) Cellular Biology, BIOL 341 (<https://catalog.umw.edu/search/?P=BIOL%20341>) General Genetics, and BIOL 413 Human Physiology) to graduate with a major in Biomedical Sciences. See also the Department of Chemistry's minimum grade requirements for CHEM 111 (<https://catalog.umw.edu/search/?P=CHEM%20111>) General Chemistry I, CHEM 112 (<https://catalog.umw.edu/search/?P=CHEM%20112>) General Chemistry II.

Major Requirements

Code	Title	Credits
BIOL 126 or BIOL 132	Phage Hunters II Organism Function and Diversity	4
BIOL 260	Biostatistics and Research Design	4
BIOL 340	Cellular Biology	4
BIOL 341	General Genetics	4
BIOL 413	Human Physiology	4

Four health related natural science electives (at least two courses must have labs) from: 15

BIOL 210	Introduction to Ecology and Evolution
BIOL 301	Anatomy Chordates, w/lab
or BIOL 384	Human Anatomy
BIOL 371	Microbiology
BIOL 372	Parasitology
BIOL 406	Histology
BIOL 410	Neurobiology
BIOL 414	Exercise Physiology
BIOL 415	Nutrition and Metabolism
BIOL 416	Vertebrate Endocrinology
BIOL 419	Neuroethology
BIOL 430	Molecular Biology of the Gene
BIOL 431	Research in RNA Technology
BIOL 432	Virology
BIOL 439	Developmental Biology
BIOL 440	Biology of Cancer
BIOL 441	Immunology
BIOL 442	Evolution
BIOL 443	The Biology and Biochemistry of Proteins
BIOL 444	Bioinformatics
BIOL 451	Seminar ¹
BIOL 466	Research in Endocrinology
BIOL 467	Research in Molecular Parasitology
BIOL 471	Topics in Biology ¹
BIOL 472	Research-Intensive Topics in Biology ¹
BIOL 482	Literature Research in Biology ¹
BIOL 481	Research Design & Proposal Development in Biology
BIOL 491	Special Problems in Biology
BIOL 499	Internship ²
CHEM 211	Organic Chemistry I
CHEM 317	Biochemistry I

One course on the societal perspective on health from: 3

COMM 378	Health Communication
PHIL 226	Medical Ethics
PSYC 211	Psychopathology
PSYC 231	Infant and Child Development
PSYC 232	Adolescent and Emerging Adult Development
PSYC 233	Adult Development
PSYC 242	Psychology of Personality
PSYC 253	Fundamentals of Learning and Motivation
PSYC 273	Cognitive Psychology
PSYC 274	Biological Psychology
PSYC 301	Social Psychology
PSYC 305	Cognitive Neuroscience
PSYC 315	Foundations of Clinical Psychology
PSYC 320	Psychology of Exceptional Children and Youth
PSYC 339	Health Psychology
PSYC 346	Forensic Psychology
PSYC 348	Anthropology and Psychology

PSYC 349	Psychology of Human Sexuality
PSYC 350	Psychology of Women and Gender
PSYC 351	Positive Psychology
PSYC 352	Cultural Psychology
PSYC 354	Sport Psychology
PSYC 372	Sensation and Perception
PSYC 394	Psychopharmacology
SOCG 334	Medical Sociology
SOCG 335	Global Perspectives on Health and Illness
One Research Intensive Course or Course Sequence from:	4
BIOL 419	Neuroethology
BIOL 430	Molecular Biology of the Gene
BIOL 431	Research in RNA Technology
BIOL 432	Virology
BIOL 439	Developmental Biology
BIOL 466	Research in Endocrinology
BIOL 467	Research in Molecular Parasitology
BIOL 472	Research-Intensive Topics in Biology ¹
BIOL 481	Research Design & Proposal Development in
& BIOL 491	Biology
	and Special Problems in Biology

Total Credits 42

¹ Approved sections only.

² A maximum of 2 credit hours of BIOL 499 Internship may count towards the Biomedical Sciences major

Plans 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.

Biomedical Sciences

Course	Title	Credits
Freshman		
Fall		
BIOL 121	Biological Concepts	4
or BIOL 125	or Phage Hunters I	
CHEM 111	General Chemistry I	4
FSEM 100	First-Year Seminar	3
General Education Courses		6
Credits		17
Spring		
BIOL 132	Organism Function and Diversity	4
or BIOL 126	or Phage Hunters II	
CHEM 112	General Chemistry II	4

General Education Courses		6
Credits		14
Sophomore		
Fall		
BIOL 260	Biostatistics and Research Design ¹	4
BIOL 340	Cellular Biology	4
General Education Courses		6
Credits		14
Spring		
BIOL 341	General Genetics	4
Societal Perspective Elective		3
General Education Courses		9
Credits		16
Junior		
Fall		
Health-related Electives ²		8
General Education Courses or Electives		6
Credits		14
Spring		
BIOL 413	Human Physiology	4
Health-related Elective		3-4
General Electives		9
Credits		16-17
Senior		
Fall		
Research Intensive Course or Elective ³		4
General Electives		12
Credits		16
Spring		
Research Intensive Course or Elective ³		4
General Electives		9
Credits		13
Total Credits		120-121

¹ BIOL 260 is a Digital Intensive course and counts as Writing Intensive in the major.

² Four health-related natural science electives (at least two courses must have labs).

³ A research intensive course will count as Writing Intensive in the major.

Note: There is no specific class for Speaking Intensive in the major, however many Research Intensive courses are designated as Speaking Intensive, and BMED-designated sections of BIOL 451 fulfill the Speaking Intensive requirement and count as two (2) Health-related elective credits.

Biomedical Sciences: Pre-medicine/Pre-dentistry/Pre-veterinary Tracks

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	Biostatistics and Research Design ¹	4
BIOL 340	Cellular Biology	4
CHEM 211	Organic Chemistry I ²	4
General Education Courses		3
Credits		15
Spring		
BIOL 341	General Genetics	4
CHEM 212	Organic Chemistry II ²	4
Societal Perspective Elective		3
General Education Courses		6
Credits		17
Junior		
Fall		
CHEM 317	Biochemistry I ²	3
PHYS 101 or PHYS 105	General Physics w/Lab ² or University Physics, w/Lab	4
Health-related Electives ³		8
Credits		15
Spring		
BIOL 413	Human Physiology	4
PHYS 102 or PHYS 106	General Physics w/Lab ² or University Physics w/Lab	4
Health-related Elective		3-4
General Electives		3
Credits		14-15
Senior		
Fall		
Research Intensive Course or Elective ⁴		4
General Electives		12
Credits		16
Spring		
Research Intensive Course or Elective ⁴		4
General Electives		8
Credits		12
Total Credits		120-121

¹ BIOL 260 is a Digital Intensive course and counts as Writing Intensive in the major.

² CHEM 211 and CHEM 317 count as health-related electives in the major, but CHEM 212 and Physics do not.

³ Four health related natural science electives (at least two courses must have labs).

⁴ A research intensive course will count as Writing Intensive in the major.

Note: There is no specific class for Speaking Intensive in the major, however many Research Intensive courses are designated as Speaking Intensive, and BMED-designated sections of BIOL 451 fulfill the Speaking Intensive requirement and count as two (2) Health-related elective credits.

Biological Sciences Faculty

Dianne M. Baker, Chair

Faculty

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