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	Phage Hunters II	4
or BIOL 132	Organism Function and Diversity	
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 & BIOL 491	Research Design & Proposal Development in 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 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
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

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