Biology B.S.

Click here to view the Suggested Plan of Study (p. 5)

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. **(**http://registrar.wvu.edu/gef/**)**

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
General Education Foundations		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research	
or ENGL 103	Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Degree Requirements

Students must complete WVU General Education Foundations requirements, College B.S. requirements, STEM Foundations requirements, major requirements, and electives with a minimum of 120 hours. For complete details on these requirements, visit the B.S. Degrees tab on the Eberly College of Arts and Sciences (http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/#bachelorofsciencetext) page.

Departmental Requirements for the B.S. in Biology

Students intending to graduate with a B.S. in Biology must earn a minimum of 53 hours of coursework in biology or approved courses in the biological sciences, with a minimum of 120 hours total required for graduation.

- **Capstone Requirement**: The university requires the successful completion of a Biology capstone course (BIOL 320 or BIOL 321 or the research capstone, BIOL 486).
- **Writing and Communication Skills Requirement**: The B.S. in Biology is a **SpeakWrite Certified Program™**. SpeakWrite Certified programs incorporate and develop students' written, verbal, visual, and mediated communication skills across the curriculum.
- **Calculation of Major GPA:** A minimum GPA of a 2.0 is required in all courses applied to major requirements, with a minimum grade of a C- in BIOL 115, BIOL 115L, BIOL 117, and BIOL 117L. If a course is repeated, all attempts will be included in the calculation of the GPA, unless the course is eligible for a D/F repeat.
- **Areas of Emphasis:** The B.S. in Biology offers 3 areas of emphasis: Cell and Molecular Biology, Ecology, Ecosystems and Global Change, and Integrative Biology. Each student must complete an area of emphasis
- **Upper-division laboratory requirement**: all biology majors just complete a minimum of two upper-division BIOL laboratory courses. Those courses are identified with an "L" listed after the course number.
- **Research Option:** With permission of the department, students may enroll in BIOL 386, BIOL 484, or BIOL 485. These courses can lead to the research capstone, BIOL 486. Up to 6 credits of research can be used towards the biology electives within each track.

Curriculum Requirements

Code	Title	Hours
University Requirements		48
ECAS B.S. Requirements		11
Biology Major Requirements		61
Total Hours		120

University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 4, 5, 6, and 7		18
BIOL 191	First-Year Seminar	1
General Electives		29
Total Hours		48

ECAS Bachelor of Science Requirements

Code	Title	Hours
ECAS B.S. Requirements		
Global Studies and Diversity Requirement		
MATHEMATICS REQUIREMENT:		3
MATH 150	Applied Calculus	
or MATH 155	Calculus 1	
SCIENCE REQUIREMENT (choose from one of the following pairs) *		8
CS 110 & CS 111	Introduction to Computer Science and Introduction to Data Structures	
or SUST 101 & 101L & SUST 207 & SUST 207L	Sustainable Earth and Sustainable Earth Laboratory and Climate System Science and Climate System Science Laboratory	
or STAT 211 & STAT 312	Elementary Statistical Inference and Intermediate Statistical Methods	
or PHYS 101 & PHYS 102	Introductory Physics 1 and Introductory Physics 2	
or PHYS 111 & PHYS 112	General Physics 1 and General Physics 2	
Total Hours		11

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Major Requirements fulfill additional ECAS BS Science requirements.

Biology Major Requirements

Code	Title	Hours
STEM FOUNDATIONS *		**8**
CHEM 115 & 115L & CHEM 116 & CHEM 116L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory and Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
CORE COURSES		**27**
Foundational Core Courses		
BIOL 115 & 115L	Principles of Biology and Principles of Biology Laboratory	
BIOL 117 & 117L	Introductory Physiology and Introductory Physiology Laboratory	

BIOL 219 & 219L	Cellular and Molecular Biology and Cellular & Molecular Biology Laboratory	
BIOL 221	Ecology and Evolution	
BIOL 223	Quantitative Biology	
Advanced Biology Core Courses		
BIOL 302	Biometry	
BIOL 315	Communicating Natural Science	
BIOL 327	Professional Development	
BIOL 387	Experimental Design & Communication 1	
BIOL 487	Experimental Design & Communication 2	
AREA OF EMPHASIS		**12**
Select one of the areas of emphasis below.		
Cell and Molecular Biology		
Ecology, Ecosystems and Global Change		
Integrative Biology		
UPPER-DIVISION BIOLOGY ELECTIVES		**11**
Select one course from each group below outside of the selected AoE. **		
Cell/Molecular Electives		
BIOL 310 & 310L	Advanced Cellular/Molecular Biology and Advanced Cellular/Molecular Biology Laboratory	
BIOL 312	Introduction to Virology	
BIOL 313	Molecular Basis of Cellular Growth	
BIOL 316 & 316L	Developmental Biology and Developmental Biology Laboratory	
BIOL 324 & 324L	Molecular Genetics and Molecular Genetics Laboratory	
BIOL 335	Cell Physiology	
BIOL 348	Neuroscience 1	
BIOL 350 & 350L	Plant Physiology and Plant Physiology Laboratory	
BIOL 410	Cell and Molecular Biology Methods	
BIOL 418	Medical Genetics	
BIOL 420	Genomics	
BIOL 421	Experimental Biochemistry	
BIOL 423 & 423L	Biochemistry of Nucleic Acids and Proteins and Biochemistry of Nucleic Acids and Proteins Laboratory	
BIOL 425	Developmental Genetics	
BIOL 426	Molecular Biology of Cancer	
BIOL 454	Immunology	
BIOL 455	Evolution of Infectious Diseases	
BIOL 474	Neurogenetics and Behavior	
BIOL 475	Neurobiological Diseases	
Organismal Biology Electives		
BIOL 316 & 316L	Developmental Biology and Developmental Biology Laboratory	
BIOL 324 & 324L	Molecular Genetics and Molecular Genetics Laboratory	
BIOL 338	Behavioral Ecology	
BIOL 340	Invertebrate Zoology	
BIOL 341 & 341L	Ichthyology and Ichthyology Laboratory	
BIOL 344 & 344L	Advanced Human Physiology and Advanced Human Physiology Laboratory	

BIOL 345 & 345L	Human Anatomy and Human Anatomy Laboratory	
BIOL 349	Neuroscience 2	
BIOL 350 & 350L	Plant Physiology and Plant Physiology Laboratory	
BIOL 363	Plant Geography	
BIOL 418	Medical Genetics	
BIOL 425	Developmental Genetics	
BIOL 436	General Animal Physiology	
BIOL 438	Animal Behavior	
BIOL 439	Neuroethology	
BIOL 450 & 450L	Plant Systematics and Plant Systematics Laboratory	
BIOL 474	Neurogenetics and Behavior	
BIOL 475	Neurobiological Diseases	
BIOL 478	Sensory Neural Systems and Behavior	
BIOL 479	Principles of Systems Neuroscience	
AEM 341 & 341L	General Microbiology and General Microbiology Laboratory	
PSYC 426	Physiological Psychology	
Ecology / Ecosystem Electives		
BIOL 338	Behavioral Ecology	
BIOL 339	Animal Communication	
BIOL 361 & 361L	Plant Ecology and Plant Ecology Laboratory	
BIOL 363	Plant Geography	
BIOL 365 & 365L	Conservation Biology and Conservation Biology Laboratory	
BIOL 420	Genomics	
BIOL 448	Plant-Microbial Interactions	
BIOL 455	Evolution of Infectious Diseases	
BIOL 456	Microbial Symbiosis	
BIOL 457	Ecology of Parasites	
BIOL 461	Principles of Evolution	
BIOL 462	Ecosystem Models	
BIOL 463	Global Ecology	
BIOL 477	Evolution of the Human Brain	
AEM 401	Environmental Microbiology	
GEOL 331	Paleontology	
WMAN 446 & 446L	Freshwater Ecology and Freshwater Ecology Laboratory	
Integrative Biology Electives		
AGBI 410	Introductory Biochemistry	
BIOL 339	Animal Communication	
BIOL 376L	Research Methods Laboratory	
BIOL 386	Undergraduate Research	
BIOL 430	Bioinformatics	
BIOL 474	Neurogenetics and Behavior	
BIOL 476 & 476L	Computational Neuroscience and Computational Neuroscience Laboratory	
BIOL 484	Undergraduate Research 1	
BIOL 485	Undergraduate Research 2	
CAPSTONE EXPERIENCE		**3**

Select one of the following options:	
BIOL 320	The Total Science Experience: Genomics
BIOL 321	Total Science Experience Lab
BIOL 486	Honors Investigation and Thesis
Total Hours	61

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STEM foundation courses are common to most STEM majors and excluded from the calculation of the percentage of upper-division courses.

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Up to 6 credits of research (BIOL 386, or BIOL 484 and BIOL 485) can be used towards the Upper-Division Biology Electives.

Suggested Plan of Study

First Year

Fall	Hours	Spring	Hours
BIOL 191	1	BIOL 117 & 117L (GEF 8; B.S. First Area 2)	4
BIOL 115 & 115L (GEF 2; B.S. First Area 1)	4	CHEM 116 & 116L (GEF 8; B.S. Second Area 2)	4
CHEM 115 & 115L (GEF 8; B.S. Second Area 1)	4	ENGL 101 (GEF 1)	3
MATH 150 or 155	3	GEF 5	3
GEF 4	3	General Elective	1
	15		15

Second Year

Fall	Hours	Spring	Hours
BIOL 219 & 219L	4	BIOL 221	3
ENGL 102 (GEF 1)	3	BIOL 327	1
ECAS BS Requirement 1	4	BIOL 223	3
General Elective	3	ECAS BS Requirement 2	4
		AoE Cousre 1**	3
		General Elective	2
	14		16

Third Year

Fall	Hours	Spring	Hours
BIOL 387	1	AoE Course 4	4
AoE Course 2	3	BIOL 315	3
AoE Course 3	3	GEF 6	3
BIOL 302	3	General Elective	4
General Elective	3		
General Elective	3		
	16		14

Fourth Year

Fall	Hours	Spring	Hours
BIOL 487	1	Upper-Division Biology Elective	3
Upper-Division Biology Elective	4	Upper-Division Biology Elective	3
GEF 7	3	BIOL Capstone*	3
General Elective	3	General Elective	4
General Elective	3	General Elective	3
	14		16

Total credit hours: 120

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Capstone options include BIOL 320, BIOL 321 or BIOL 486

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At least two upper division lab courses must be taken, one of which can be 386 or 485.

Areas of Emphasis Offered:

- Cellular and Molecular Biology (p. 6)
- Ecology, Ecosystems, and Global Change (p. 6)
- Integrative Biology (p. 7)

Cellular and Molecular Biology Area of Emphasis Requirements:

This Area of Emphasis will prepare students for health professions, pharmacy and pharmacology, and graduate school in cellular or molecular biology, virology, genetics, immunology and a variety of related fields.

Curriculum Requirements

Code	Title	Hours
AGBI 410	Introductory Biochemistry	3
BIOL 310	Advanced Cellular/Molecular Biology	3
or BIOL 335	Cell Physiology	
BIOL 316	Developmental Biology	3
or BIOL 425	Developmental Genetics	
BIOL 324	Molecular Genetics	3
or BIOL 418	Medical Genetics	
Total Hours		12

Ecology, Ecosystems and Global Change Area of Emphasis Requirements:

This Area of Emphasis will prepare students for government and industry careers in natural climate solutions, conservation, and environmental consulting, as well as graduate school in ecology, biogeochemistry, climate change and a variety of related fields.

Curriculum Requirements

Code	Title	Hours
BIOL 338	Behavioral Ecology	3
or BIOL 361 & 361L	Plant Ecology and Plant Ecology Laboratory	
or BIOL 456	Microbial Symbiosis	
or BIOL 457	Ecology of Parasites	
or WMAN 446 & 446L	Freshwater Ecology and Freshwater Ecology Laboratory	
BIOL 365 & 365L	Conservation Biology and Conservation Biology Laboratory	3
or BIOL 448	Plant-Microbial Interactions	
or BIOL 462	Ecosystem Models	
or BIOL 463	Global Ecology	
BIOL 436	General Animal Physiology	3
or BIOL 350 & 350L	Plant Physiology and Plant Physiology Laboratory	
BIOL 461	Principles of Evolution	3
Total Hours		12

Integrative Biology Area of Emphasis Requirements:

This Area of Emphasis provides an overview of the sub-fields available to biologists. This area of emphasis will prepare students for careers in health care, government, consulting and industry. It also provides preparation for Master's Degree programs in biomedical science or ecology and environmental science.

Curriculum Requirements

Course options for each of the groups of biology electives are listed on the B.S. Biology page (http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/biology/biology_bs/), under the section "Upper-Division Biology Electives."

Code	Title	Hours
Select one course from the Cell & Molecular Electives		3
Select one course from the Organismal Electives		3
Select one course from the Ecology and Ecosystems Electives		3
Select one course from the Integrative Biology Electives		3
Total Hours		12

Major Learning Outcomes

BIOLOGY

Upon successful completion of the B.S. degree, **Biology** majors will demonstrate competency in these areas:

1. Biological Foundations: Students will demonstrate competency in the content areas (listed below) at three biological levels - cellular/molecular, organismal/physiological, ecosystem/ populations)

- Information flow
- Transformations of energy and matter
- Structure-function relationships
- Evolution
- Systems and interactions

2. Integrative skills: Students will demonstrate interpersonal skills including: effective communication with both professional and general audiences in written and oral forms, the ability to work in collaborative teams, global perspective, and application of knowledge and skills from across the curriculum to social issues.

3: Scientific Tools: Students will be able to apply science process skills, including: scientific literacy, experimental design, collecting and analyzing data quantitatively and statistically, application of critical and analytical thinking.