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, Eberly Edge requirements, major requirements, and electives with a minimum of 120 hours.

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.

- **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 119L, BIOL 117, and BIOL 120L. 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. Students who transfer into the Biology major may use BIOL 115L in place of BIOL 119L and BIOL 117L in place of BIOL 120L.
- **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.
- **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.
- **Capstone Requirement:** The university requires the successful completion of a Biology capstone course (BIOL 320 or BIOL 321 or the research capstone, BIOL 486).
- **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		36
Eberly Edge Requirements		12

Biology Major Requirements	72
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		17
Total Hours		36

Eberly Edge Program Requirements

Code	Title	Hours
EDG 1: Data and Society (BIOL 387 and either BIOL 323L or BIOL 485)		
EDG 2: Effective and Civil Communication		3
EDG 3: Ethics and Civil Responsibility		3
EDG 4: Global and Regional Perspectives		3
EDG 5: Practicing Arts & Sciences (ARSC 380)		3
EDG 6: High Impact Experience ((BIOL 320 or BIOL 321; or (BIOL 386 or BIOL 484) and BIOL 486))		
Total Hours		12

Biology Major Requirements

Code	Title	Hours
STEM FOUNDATIONS *		**19**
MATH 150	Applied Calculus	
or MATH 155	Calculus 1	
CHEM 115	Fundamentals of Chemistry 1	
& 115L	and Fundamentals of Chemistry 1 Laboratory	
& CHEM 116	and Fundamentals of Chemistry 2	
& CHEM 116L	and Fundamentals of Chemistry 2 Laboratory	
or CHEM 111	Survey of General, Organic, and Biological Chemistry 1	
& 111L	and Survey of Chemistry 1 Laboratory	
& CHEM 112	and Survey of General Organic Biological Chemistry 2	
& CHEM 112L	and Survey of Chemistry 2 Laboratory	
Select one pair of courses:		
PHYS 101	Introductory Physics 1	
& 101L	and Introductory Physics 1 Laboratory	
& PHYS 102	and Introductory Physics 2	
& PHYS 102L	and Introductory Physics 2 Laboratory	
PHYS 111	General Physics 1	
& 111L	and General Physics 1 Laboratory	
& PHYS 112	and General Physics 2	
& PHYS 112L	and General Physics 2 Laboratory	
SUST 101	Sustainable Earth	
& 101L	and Sustainable Earth Laboratory	
& SUST 201	and Earth System Science	
& SUST 201L	and Earth System Science Laboratory	
SUST 101	Sustainable Earth	
& 101L	and Sustainable Earth Laboratory	
& SUST 207	and Climate System Science	
& SUST 207L	and Climate System Science Laboratory	
CORE COURSES		
Foundational Core Courses		**18**

BIOL 115 & BIOL 119L	Principles of Biology and Foundations Inquiry Lab 1	
BIOL 117 & BIOL 120L	Introductory Physiology and Foundations Inquiry Lab 2	
BIOL 219 & BIOL 222L	Cellular and Molecular Biology and Intermediate Inquiry Lab	
BIOL 221	Ecology and Evolution	
BIOL 223	Quantitative Biology	
Advanced Biology Core Courses		**11**
BIOL 302	Biometry	
BIOL 315	Communicating Natural Science	
BIOL 323L	Advanced Inquiry Lab	
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		**9**
Select at least 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 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	Comparative 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 & Behavior
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 & Behavior
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		72

*

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 & BIOL 120L (GEF 8)	4
BIOL 115 & BIOL 119L (GEF 2)	4	CHEM 116 & 116L (GEF 8)	4
CHEM 115 & 115L (GEF 8)	4	ENGL 101 (GEF 1)	3
MATH 150 or 155	3	EDG 2: Effective and Civil Communication	3
GEF 4	3	General Elective	1
	15		15

Second Year

Fall	Hours	Spring	Hours
BIOL 219 & BIOL 222L	5	BIOL 221	3
ENGL 102 (GEF 1)	3	BIOL 327	1
STEM Foundation Science 1	4	BIOL 223	3
EDG 3: Ethics and Civil Responsibility	3	STEM Foundation Science 2	4
		EDG 4: Global and Regional Perspectives	3
		General Elective	1
	15		15

Third Year

Fall	Hours	Spring	Hours
ARSC 380	3	BIOL 315	3
BIOL 387	1	BIOL 323L (EDG 1)	2
AoE Course 1	3	AoE Course 4	3
AoE Course 2	3	GEF 5	3
AoE Course 3	3	GEF 6	3
BIOL 302	3		
	16		14

Fourth Year

Fall	Hours	Spring	Hours
BIOL 487	1	Upper-Division Biology Elective	3
Upper-Division Biology Elective	3	BIOL Capstone (EDG 6)*	3
Upper-Division Biology Course	3	General Elective	3
GEF 7	3	General Elective	3
General Elective	3	General Elective	2

General Elective	3	
	16	14

Total credit hours: 120

*

Capstone options include BIOL 320, BIOL 321 or BIOL 486

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	Comparative 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.