

BIOLOGY, BA

Banner Code: SC-BA-BIOL

Academic Advising

1200 Exploratory Hall
Fairfax Campus

Website: <https://science.gmu.edu/academics/departments-units/biology/biology-ba>

The Bachelor of Arts in Biology provides a sound liberal arts education with substantial experience in quantitative and analytical thought, along with preparation for related professions. The program provides the strong background necessary for not only graduate study in the life sciences, but also enables students to develop careers in a wide variety of disciplines, including teaching, environmental management, microbiology, molecular biology, biotechnology, genetics, wildlife management, fisheries biology, and marine science. Furthermore, our curriculum prepares students for careers in the health sciences including medicine, dentistry, veterinary science, and related allied health disciplines.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Undergraduate Admissions Policies (<https://catalog.gmu.edu/admissions/undergraduate-policies/>) section of this catalog.

To apply for this program, please complete the George Mason University Admissions Application (<https://www2.gmu.edu/admissions-aid/apply-now>).

For students interested in taking the Biological Health concentration, it is advised that they have already obtained a bachelor's degree; this concentration is primarily intended for students who are interested in changing their careers to one with a biology foundation. The BA's other concentration, or the Biology, BS (<https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/>) are great options for students early in their undergraduate studies.

Policies

Students must fulfill all Requirements for Bachelor's Degrees (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), including the Mason Core (<https://catalog.gmu.edu/mason-core/>). Students in this bachelor's program must also complete the additional College Requirements for the BA Degree (see Requirements).

The writing intensive requirement is fulfilled by BIOL 400 News Views: Selected Topics (Mason Core) (<https://catalog.gmu.edu/>

[mason-core/](https://catalog.gmu.edu/mason-core/)) or MLAB 300 Science Writing (Mason Core) (<https://catalog.gmu.edu/mason-core/>).

- For post-baccalaureate students enrolled in the Biological Health concentration, BIOL 400 News Views: Selected Topics (Mason Core) (<https://catalog.gmu.edu/mason-core/>) or MLAB 300 Science Writing (Mason Core) (<https://catalog.gmu.edu/mason-core/>) are not required.

Post-baccalaureate students entering this program are advised to explore the Application for a Second Bachelor's Degree (<https://catalog.gmu.edu/admissions/undergraduate-policies/#text>) and the AP. 5.3.3 (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-3>) sections of this catalog.

Important information and departmental policies are listed with the Department of Biology (<https://catalog.gmu.edu/colleges-schools/science/biology/>).

For policies governing all undergraduate programs, see AP.5 Undergraduate Policies (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/>).

Important Program Requirements

- Biology majors must earn a minimum grade of 'C' in all courses under the "Biology Core Courses" header.
- **Upper-level Courses:** At least 45 credits counted toward the degree must be from 300-400 level courses.
 - At least one of which must be an approved upper-level laboratory.
 - BIOL 495 Directed Studies in Biology, and BIOL 497 Special Problems in Biology do not count toward the upper-level laboratory course requirement. The courses do, however, count as non-laboratory electives.
 - The total limit for BIOL 493 Honors Research in Biology, BIOL 495 Directed Studies in Biology and BIOL 497 Special Problems in Biology combined is 3 credits toward the BA.
- Students may **not** count BIOL 124 Human Anatomy and Physiology I and/or BIOL 125 Human Anatomy and Physiology II as a biology elective, but may be taken as a general elective.
- Students who transfer in both BIOL 303 Animal Biology and BIOL 304 Plant Biology will satisfy BIOL 300 BioDiversity plus four credits of biology elective coursework.

Teacher Licensure

Students who wish to become teachers can pursue either the Biology, BA or the Biology, BS (<https://catalog.gmu.edu/colleges-schools/science/biology/biology-bs/>) in addition to obtaining teaching credentials. For more information, visit the Secondary Education program's webpage (<https://education.gmu.edu/secondary-education/>).

Requirements

Degree Requirements

Total credits: minimum 120

Students should refer to the Admissions & Policies tab for specific policies related to this program.

All students must complete the *Biology Core Courses* and the *Supporting Core Courses* listed below. Students then elect to complete the BA degree either with or without a concentration.

Biology Core Courses

Code	Title	Credits
BIOL 102	Introductory Biology I-Survey of Biodiversity and Ecology (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
BIOL 103 & BIOL 105	Introductory Biology II-Survey of Cell and Molecular Biology (Mason Core) (https://catalog.gmu.edu/mason-core/) and Introductory Biology II Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/) ¹	4
BIOL 213 & BIOL 215	Cell Structure and Function and Cell Structure and Function Laboratory	4
BIOL 214	Biostatistics for Biology Majors	4
BIOL 308 & BIOL 338	Foundations of Ecology and Evolution and Foundations of Ecology and Evolution Laboratory (Mason Core) (https://catalog.gmu.edu/mason-core/) ¹	4
or BIOL 300	BioDiversity	
BIOL 311 & BIOL 313	General Genetics and General Genetics Laboratory	4
BIOL 400	News Views: Selected Topics (Mason Core) (https://catalog.gmu.edu/mason-core/) ²	3
Total Credits		27

¹ For post-baccalaureate students enrolled in the Biological Health concentration, BIOL 103 Introductory Biology II-Survey of Cell and Molecular Biology (Mason Core) (<https://catalog.gmu.edu/mason-core/>), BIOL 105 Introductory Biology II Laboratory (Mason Core) (<https://catalog.gmu.edu/mason-core/>), BIOL 300 BioDiversity, BIOL 308 Foundations of Ecology and Evolution, BIOL 338 Foundations of Ecology and Evolution Laboratory (Mason Core) (<https://catalog.gmu.edu/mason-core/>) are not required.

² Fulfills the writing intensive requirement.

Supporting Core Courses

Code	Title	Credits
Chemistry		
CHEM 211 & CHEM 213	General Chemistry I (Mason Core) (https://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory I (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
CHEM 212 & CHEM 214	General Chemistry II (Mason Core) (https://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory II (Mason Core) (https://catalog.gmu.edu/mason-core/)	4
Mathematics		
Select one option from the following:		4-6
MATH 111	Linear Mathematical Modeling (Mason Core) (https://catalog.gmu.edu/mason-core/)	
MATH 113	Analytic Geometry and Calculus I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
MATH 123 & MATH 124	Calculus with Algebra/Trigonometry, Part A and Calculus with Algebra/Trigonometry, Part B (Mason Core) (https://catalog.gmu.edu/mason-core/)	
Computer Science		3
Select one from the following: ¹		
CDS 130	Computing for Scientists (Mason Core) (https://catalog.gmu.edu/mason-core/) ²	
Any course(s) that fulfill the Mason Core: Information Technology and Computing requirement (https://catalog.gmu.edu/mason-core/#information-technology)		
Additional Science		6
Select 6 credits from the following:		
ASTR 103	Astronomy (Mason Core) (https://catalog.gmu.edu/mason-core/)	
ASTR 111	The Solar System (Mason Core) (https://catalog.gmu.edu/mason-core/)	
ASTR 113	Stars, Galaxies, and the Universe (Mason Core) (https://catalog.gmu.edu/mason-core/)	
GEOL 101	Physical Geology (Mason Core) (https://catalog.gmu.edu/mason-core/)	
GEOL 102	Historical Geology (Mason Core) (https://catalog.gmu.edu/mason-core/)	
PHYS 160	University Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/)	

PHYS 243	College Physics I (Mason Core) (https://catalog.gmu.edu/mason-core/) ³
PHYS 244	College Physics I Lab (Mason Core) (https://catalog.gmu.edu/mason-core/) ³
PHYS 245	College Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/) ³
PHYS 246	College Physics II Lab (Mason Core) (https://catalog.gmu.edu/mason-core/) ³
PHYS 260	University Physics II (Mason Core) (https://catalog.gmu.edu/mason-core/)
Total Credits	21-23

¹ For post-baccalaureate students enrolled in the Biological Health concentration, the Computer Science requirement is not required.

² Recommended by the Department of Biology.

³ Required for students enrolled in the Biological Health Concentration.

Biology Elective Options

Code	Title	Credits
Students must complete 8-12 credits of additional biology courses, at least 1 credit of which must be in an upper-level laboratory, and no more than 4 credits can be in lower-level courses:		8-12

Non-lab Courses ¹

BIOL 101	Biology Freshman Seminar
BIOL 177	Introductory Ecology for Environmental Engineers
BIOL 302	Alternative Careers in Biology
BIOL 305	Biology of Microorganisms
BIOL 309	Oceanography or EVPP 309 Oceanography or GEOL 309 Oceanography
BIOL 312	Biostatistics for Bioinformatics
BIOL 318	Conservation Biology
BIOL 322	Developmental Biology
BIOL 326	Animal Physiology
BIOL 331	Invertebrate Zoology
BIOL 334	Vertebrate Paleontology or GEOL 334 Vertebrate Paleontology (Mason Core) (https://catalog.gmu.edu/mason-core/)
BIOL 336	Invertebrate Paleontology
BIOL 345	Plant Ecology
BIOL 350	Freshwater Ecosystems or EVPP 350 Freshwater Ecosystems
BIOL 377	Applied Ecology or EVPP 377 Applied Ecology
BIOL 382	Introduction to Virology

BIOL 385	Biotechnology and Genetic Engineering
BIOL 404	Medical Microbiology
BIOL 408	Mushrooms, Molds and Society or EVPP 408 Mushrooms, Molds and Society
BIOL 412	Phage Genomics
BIOL 413	Histotechniques
BIOL 417	Selected Topics in Molecular and Cellular Biology
BIOL 420	Vaccines
BIOL 421	Genetics of Human Diseases
BIOL 423	Biology of Obesity and Weight Loss
BIOL 425	Human Physiology
BIOL 426	Mechanisms of Aging
BIOL 427	Disease Ecology and Conservation or EVPP 427 Conservation Medicine
BIOL 429	Biological Foundations of Pharmacology
BIOL 432	Clinical Applications in Human Physiology
BIOL 435	Selected Topics in Biology
BIOL 443	Tropical Ecology
BIOL 449	Marine Ecology
BIOL 450	Marine Conservation
BIOL 452	Immunology
BIOL 454	Marine Mammal Biology and Conservation
BIOL 457	Reproductive Strategies
BIOL 460	Infectious Diseases Wildlife or EVPP 460 Infectious Diseases of Wildlife
BIOL 472	Introductory Animal Behavior
BIOL 482	Introduction to Molecular Genetics
BIOL 483	General Biochemistry
EVPP 419	Marine Mammal Biology and Conservation
EVPP 421	Marine Conservation
EVPP 449	Marine Ecology
EVPP 451	Fungi and Ecosystems
CONS 472	Introduction to Animal Behavior
CONS 480	Primate Behavior, Ecology and Conservation

Upper-level Laboratory Courses ^{1,2}

BIOL 303 & BIOL 306	Animal Biology and Biology of Microorganisms Laboratory
BIOL 304	Plant Biology
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory
BIOL 322 & BIOL 323	Developmental Biology and Environmental Effects on Embryonic Development
BIOL 377 & BIOL 378	Applied Ecology and Applied Ecology Laboratory

BIOL 385 & BIOL 486	Biotechnology and Genetic Engineering and Molecular Biology and Biotechnology Laboratory
BIOL 401	Phage Discovery
BIOL 405	Microbial Genetics
BIOL 407	Microbial Diversity
BIOL 430	Advanced Human Anatomy and Physiology I ²
BIOL 431	Advanced Human Anatomy and Physiology II ²
BIOL 437 or EVPP 437	Ornithology
BIOL 438 or EVPP 438	Mammalogy
BIOL 439 or EVPP 439	Herpetology
BIOL 440 or CONS 440	Field Biology Ecology Field Skills
BIOL 443 & BIOL 444	Tropical Ecology and Tropical Ecology Laboratory
BIOL 452 & BIOL 453	Immunology and Immunology Laboratory
BIOL 465	Histology
BIOL 472 & BIOL 473	Introductory Animal Behavior and Introductory Laboratory in Animal Behavior
BIOL 485	Cell Signaling Laboratory
EVPP 441	Protist Diversity and Ecology
CONS 332	Insect Biology
CONS 402	Applied Conservation
CONS 404	Biodiversity Monitoring
CONS 405	Landscape and Macrosystems Ecology
CONS 406	Small Population Management

¹ For the Biological Health concentration, the full 12 credits must be chosen in upper-level courses, and at least one course must include a laboratory.

² Students completing the Biological Illustration Concentration should select BIOL 430 Advanced Human Anatomy and Physiology I and BIOL 431 Advanced Human Anatomy and Physiology II to fulfill the biology elective requirements for the major.

Concentration in Biological Illustration (BIOI)

This optional concentration consists of a selection of courses designed to address the needs and interests of students who wish to study biology and simultaneously have the aptitude to draw, animate, or design art for textbooks, videos, papers, etc. This concentration has significant biology, chemistry, and physics components like all biology majors, and includes art classes that will prepare students for the opportunity to use their love of biology and art in one degree.

Code	Title	Credits
Select 15 credits from the following:		15
AVT 222	Drawing I (Mason Core) (https://catalog.gmu.edu/mason-core/)	
AVT 323	Drawing II	
AVT 324	Figure Drawing	
AVT 327	Illustration	
AVT 328	Mixed Media	
AVT 382	2D Experimental Animation	
AVT 383	3D Experimental Animation	
Total Credits		15

Concentration in Biological Health (BIOH)

This concentration is specially designed for students who have a previous four-year degree and wish to change careers to pursue a profession in the health sciences. Students are encouraged to work closely with an advisor on their program of study as it relates to their transfer coursework.

Code	Title	Credits
Additional Chemistry		
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	5
CHEM 314 & CHEM 318 or BIOL 483	Organic Chemistry II and Organic Chemistry Lab II General Biochemistry	4-5
Total Credits		9-10

Mason Core and Elective Requirements

In order to meet a minimum of 120 credits, this degree requires additional credits (specific credit counts by concentration are shown below), which may be applied toward any remaining Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements (outlined below), Requirements for Bachelor's Degrees (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-3-2>), College Requirements for the BA Degree (outlined below), and elective courses. Students are strongly encouraged to consult with their advisors to ensure that they fulfill all requirements.

- Without concentration: 58-64 credits
- BIOI concentration: 43-49 credits
- BIOH concentration: 48-55 credits

Mason Core

Some Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements may already be fulfilled by the major requirements listed above. Students are strongly encouraged to consult their advisors to ensure they fulfill all remaining Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements.

All Integration-level requirements must be completed at George Mason and cannot be satisfied through transfer credit. These courses are integral to the university's educational philosophy and ensure that all graduates demonstrate proficiency in writing, critical thinking, and integrative learning consistent with the university's standards. Rare exceptions to this policy may only be granted by the Provost's Office.

Students who have completed the following credentials are eligible for a waiver of the Foundation and Exploration (lower level) requirement categories with the exception of Written Communication, which must be met by transferring in or taking an approved course at George Mason University. The Integration category (upper level) is not waived under this policy. See Admissions (<https://catalog.gmu.edu/admissions/undergraduate-policies/#transfertext>) for more information.

- VCCS Uniform Certificate of General Studies
- VCCS or Richard Bland Associate of Science (A.S.), Associate of Arts (A.A.), Associate of Arts and Sciences (A.A.&S.), or Associate of Fine Arts (A.F.A.)

Code	Title	Credits
Foundation Requirements		
	Written Communication (lower-level) (https://catalog.gmu.edu/mason-core/#written)	3
	Oral Communication (https://catalog.gmu.edu/mason-core/#oral)	3
	Quantitative Reasoning (https://catalog.gmu.edu/mason-core/#quantitative)	3
	Information Technology and Computing (https://catalog.gmu.edu/mason-core/#information-technology)	3
Exploration Requirements		
	Arts (https://catalog.gmu.edu/mason-core/#arts)	3
	Global Contexts (https://catalog.gmu.edu/mason-core/#global-contexts)	3
	Global History (https://catalog.gmu.edu/mason-core/#global-history)	3
	Literature (https://catalog.gmu.edu/mason-core/#literature)	3
	Natural Science (https://catalog.gmu.edu/mason-core/#natural-science)	7
	Social and Behavioral Sciences (https://catalog.gmu.edu/mason-core/#social-behavioral-science)	3
	Just Societies (optional) (https://catalog.gmu.edu/mason-core/#justsocieties) ¹	
Integration Requirements		
	Written Communication (upper-level) (https://catalog.gmu.edu/mason-core/#written-upper)	3
	Writing Intensive (https://catalog.gmu.edu/mason-core/#wi) ²	3
	Mason Apex (https://catalog.gmu.edu/mason-core/#apex) ³	3
Total Credits		40

¹ In addition to covering content related to the designated category, Exploration level courses marked with a Just Societies "flag" are specifically designed to help students learn how to interact effectively with others from all walks of life, including those with backgrounds and beliefs that differ from their own. Students who wish to increase their knowledge and skills in this area may choose to enroll in a Just Societies-flagged course. Students interested in this approach to completing their Mason Core Exploration Requirements should

work closely with their advisor to identify the appropriate Just Societies-flagged courses.

² Most programs include the writing-intensive course designated for the major as part of the major requirements; this course is therefore not counted towards the total required for Mason Core.

³ Minimum 3 credits required.

College Requirements for the BA Degree

In addition to the program requirements and the Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements, students pursuing a BA degree must complete the coursework below. Except where expressly prohibited, a course used to fulfill this college-level requirement may also be used simultaneously to satisfy other requirements such as Mason Core (<https://catalog.gmu.edu/mason-core/>) requirements, other college-level requirements, or requirements for the major. In some cases, the requirements listed below may be superseded by requirements of the degree program and the Mason Core (<https://catalog.gmu.edu/mason-core/>).

Foundational Breadth

Choose two courses from approved Mason Core: Arts (<https://catalog.gmu.edu/mason-core/#arts>), Mason Core: Literature (<https://catalog.gmu.edu/mason-core/#literature>), Mason Core: Global Contexts (<https://catalog.gmu.edu/mason-core/#global-contexts>), and Mason Core: Social and Behavioral Sciences (<https://catalog.gmu.edu/mason-core/#social-behavioral-science>) courses in addition to those required by the Mason Core (<https://catalog.gmu.edu/mason-core/>). The two courses used to fulfill the college-level requirements must each be from different Mason Core categories. Additionally, they must be from different disciplines than the courses used to fulfill the University Mason Core requirements.

Natural Science

Choose one credit in addition to the Mason Core: Natural Science (<https://catalog.gmu.edu/mason-core/#natural-science>) requirement for a total of 8 credits¹. This combined college-level and university requirement must be fulfilled by completing two of any approved Mason Core: Natural Science (<https://catalog.gmu.edu/mason-core/#natural-science>) courses that include a laboratory experience².

Code	Title	Credits
	Select an additional Mason Core Natural Science course	1

¹ For Geography, BA majors, this extra credit is not required.

² BIOL 124 Human Anatomy and Physiology I and BIOL 125 Human Anatomy and Physiology II may not be used to fulfill this requirement.

Foreign Language

Code	Title	Credits
	Intermediate-level proficiency in one foreign language is required and may be fulfilled via one of the options below: ¹	

1. Completing a course in a foreign language numbered 202 (or its equivalent), or higher level courses taught in the language.

2. Achieving a satisfactory score on an approved proficiency test.

3. Completing an American Sign Language course meeting intermediate-level proficiency:

EDSE 218 Intermediate American Sign Language (ASL) I

EDSE 219 American Sign Language (ASL) III

EDSE 314 Intermediate American Sign Language (ASL) II

EDSE 315 American Sign Language (ASL) IV

EDSE 316 American Sign Language (ASL) V

EDSE 420 Deaf History and Culture

4. Conferral of a baccalaureate degree.²

- Minimum 3.33 GPA in honors biology courses
- Minimum 3.33 GPA in biology requirements
- Minimum 3.00 GPA in supporting requirements
- Minimum 3.00 GPA overall

¹ Students who are already proficient in a second language may be eligible for a waiver of this requirement. Additional information on waivers can be found with the college's Office of Academic and Student Affairs (<http://cosundergrad.gmu.edu/>).

² This option is only available to students in the Biology, BA with a concentration in Biological Health who have already conferred a baccalaureate degree.

Honors

Honors in the Major

Admissions

Minimum requirements for invitation:

- GPA in biology courses must be 3.33 or better
- GPA in supporting requirements (math and other science) must be 3.00 or better
- Grade of 'B' or better in BIOL 213 Cell Structure and Function and BIOL 215 Cell Structure and Function Laboratory.

Students should apply for admission to the Honors Program during their first or second year at the university. Contact the Department of Biology (<https://catalog.gmu.edu/colleges-schools/science/biology/>) for information on applying.

Retention Requirements

Students in honors biology must maintain a biology GPA of 3.33 or better and a supporting GPA of 3.00 or better from the time they have accumulated 30 hours and thereafter. Students who fall below this standard will be given a one semester probationary period in which to bring their GPA back up to the minimum standard.

Requirements to Graduate with Biology Honors

Students are required to take 6 to 8 credits in honors courses in BIOL including three semesters of BIOL 494 Honors Seminar in Biology or two semesters of BIOL 494 Honors Seminar in Biology and one semester of BIOL 493 Honors Research in Biology. BIOL 498 Research Seminar may count toward one of the semester requirements of BIOL 494 Honors Seminar in Biology. The GPA requirements are as follows: