Biology - B.S.

The Biology bachelor's degree program provides a strong background of critical thinking skills and knowledge needed for further study in professional and graduate schools and for careers in biological science. The study of biology enables students to gain an understanding of the principles that govern life from the basic biochemistry of living cells to that of complex ecosystems. This understanding helps students identify and address the biological problems associated with human beings and their environments.

Upon completion of the program, graduates are expected to:

- Understand and apply the fundamental biological concepts of evolution, structure and function, information exchange and storage, and transformation of energy and matter to explain biological systems from molecules to communities.
- Communicate scientific information using oral and written arguments and visual presentation.
- Identify, evaluate and analyze scientific information.
- Apply the scientific method and critical thinking skills to address scientific questions.
- Apply mathematical and computational skills and interdisciplinary concepts and knowledge to interpret biological phenomena.
- Recognize ethical concerns pertaining to biological science and apply ethical practice in the scientific process.
- Evaluate the influence that biological science has on society, including the historical context of major findings in modern biology.

Upon completion of the Biomedical Science specialization, graduates are expected to:

- Apply fundamental concepts of microbiology, biochemistry and immunology to explain the cellular and molecular bases of host-microbial interactions.
- Apply fundamental concepts of human anatomy, human physiology, and histology to problem solve clinical situations.

Upon completion of the Environmental Studies specialization, graduates are expected to:

- Apply the core concepts and methods from economics, social, political and biological sciences to identify and address environmental problems.

Upon completion of the Plant Science specialization, graduates are expected to:

- Apply the fundamental concepts of plant anatomy, physiology, and diversity to cultivate, maintain the health of, and produce products from plants.

The courses in this program have been designed to provide students with a strong foundation in the fundamental principles of biology. The biology courses allow students to explore the molecular and cellular basis of life, structure and function of organisms, and ecological interactions of organisms. The physical science courses provide opportunities for students to break the barriers between traditional sciences and integrate their knowledge of biology, chemistry and physics, a practice that is essential to the future of scientific progress.

To support student success in the Biology program, science faculty members are committed to following best practices for science education. This includes using active learning pedagogies in the classroom and guided inquiry learning pedagogies in the laboratories and providing quality internships opportunities. These teaching pedagogies are student-centered, interactive and focused on problem-based learning. They provide students with multiple opportunities to gain experiential training and use critical-thinking skills, both of which are essential for being successful members of the scientific community.

Graduates are prepared for careers that include, but are not limited to, biological technicians, forensic scientists, environmental scientists, microbiologists, medical laboratory scientists, zoologists and wildlife biologists. The Biology degree program also prepares students to pursue careers in healthcare, education and business.

Biology

A four-year program leading to the bachelor of science degree

Major Courses		
BIO1022	General Biology - Organismal	3
BIO1026	General Biology Laboratory - Organismal	1
BIO2001	Genetics	3
BIO3040	Molecular Biology	3
BIO3046	Molecular Biology Laboratory	1
BIO3100	Coastal Ecology	3
BIO3106	Coastal Ecology Laboratory	1
BIO4020	Integrative Biology	3
BIO4026	Integrative Biology Laboratory	1
BIO4100	Senior Seminar in Biology	3
Major Electives or Specialization		
Choose 16-18 credits of the following (at least two courses must be at 3000 level or higher)* or Specialization listed below: †		16-18
BIO2003 & BIO2006	Human Anatomy and Physiology I and Human Anatomy and Physiology I Laboratory	
BIO2013 & BIO2016	Human Anatomy and Physiology II and Human Anatomy and Physiology II Laboratory	
BIO2041 & BIO2046	Human Physiology and Human Physiology Laboratory	
BIO2201 & BIO2206	General Microbiology and General Microbiology Laboratory	
BIO2510 & BIO2516	Plant Cultivation I: Soil, Soil Substitutes, and Disease Management and Plant Cultivation I: Soil, Soil Substitutes, and Disease Management Laboratory	
BIO3070	Evolution	
BIO3400	Fundamentals of Pharmacology	
BIO3510 & BIO3516	Plant Cultivation II: Hydroponics, Aquaponics, Tissue Culture, Genetics and Extraction and Plant Cultivation II: Hydroponics, Aquaponics, Tissue Culture, Genetics and Extraction Laboratory	
BIO4030	Advanced Anatomy	
BIO4040 & BIO4046	Functional Histology and Functional Histology Laboratory	
BIO4070	Fundamentals of Immunology	
BIO4510 & BIO4516	Applications of Plants & Fungi and Applications of Plants & Fungi Laboratory	
CHM3040 & CHM3046	Biochemistry and Biochemistry Laboratory	
CHM3200	Analytical Chemistry	
SCI3020	Sustainability Policy and Planning	
SCI3070	Food Sustainability	
SCI3080	The Business of Sustainability	
SCI4090	Research Seminar in Sustainability	
Applied/Experiential Learning		
Choose 6 credits from the following:		6
ASCI4799	College of Arts & Sciences Internship [Ic]	
DEE3999	Directed Experiential Education [D]	
RSCH3810	Undergraduate Laboratory and Field Research	
RSCH3830	Undergraduate Research Experience	
RSCH4020	Honors Directed Academic Experience	
Study Abroad [Sa]		
Related Professional Studies		
CAR0010	Career Management	1
CHM1011	General Chemistry I	3
CHM1016	General Chemistry I Laboratory	1
CHM1022	General Chemistry II	3
CHM1026	General Chemistry II Laboratory	1
CHM2011	Organic Chemistry I	3
CHM2016	Organic Chemistry I Laboratory	1
CHM2022	Organic Chemistry II	3
CHM2026	Organic Chemistry II Laboratory	1
FYS1020	First-Year Seminar	1
A&S Core Experience		
Communications Foundation Courses		9
ENG1020	Rhetoric & Composition I	
ENG1021	Rhetoric & Composition II	
ENG1030	Communication Skills	
Integrative Learning		6
Two ILS courses, one at the 2000 level, one at the 4000 level		
Arts and Humanities		6
PHIL3240	Ethics: A Global Perspective	

One course from ART, HIST, HUM, LIT or REL		
Mathematics		6
MATH1040	Calculus I (or higher, based on student's placement) **	
MATH2010	Introduction to Biostatistics	
Science		4
BIO1011 & BIO1016	General Biology - Cellular and General Biology Laboratory - Cellular	
Social Sciences		6
PSYC1001	Introductory Psychology	
One course from ANTH, ECON, GEND, LEAD, PSCI, RES or SOC		
A&S Electives		8
PHY1011	General Physics I	
or PHY2011	Physics I	
PHY1016	General Physics I Laboratory	
or PHY2016	Physics I Laboratory	
PHY1022	General Physics II	
or PHY2022	Physics II	
PHY1026	General Physics II Laboratory	
or PHY2026	Physics II Laboratory	
Free Electives #		
15-16 credits selected from 1000-4999 numbered offerings within the university		15-16
Total Credits		**122.0-125.0**

* Students are responsible for meeting prerequisites.

** Students that do not place in MATH1040 Calculus I, will need to take an extra course(s), MATH1020 Fundamentals of Algebra, and/or MATH1030 Precalculus, as prerequisite(s). If needed one, or both, will count as a free elective(s).

†Specialization in Biomedical Science		**22**
Students must use 4 credits of free electives to complete this specialization		
BIO2003 & BIO2006	Human Anatomy and Physiology I and Human Anatomy and Physiology I Laboratory	
BIO2013 & BIO2016	Human Anatomy and Physiology II and Human Anatomy and Physiology II Laboratory	
BIO2201 & BIO2206	General Microbiology and General Microbiology Laboratory	
CHM3040	Biochemistry	
BIO4040 & BIO4046	Functional Histology and Functional Histology Laboratory	
BIO4070	Fundamentals of Immunology	

†Specialization in Environmental Studies		**22**
Students must use 4 credits of free electives to complete this specialization		
BIO2201 & BIO2206	General Microbiology and General Microbiology Laboratory	
BIO3070	Evolution	
SCI3020	Sustainability Policy and Planning	
SCI3070	Food Sustainability	
SCI3080	The Business of Sustainability	
SCI4090	Research Seminar in Sustainability	
SOC3200	Environmental Sociology ‡	
‡Students must use social science elective to take SOC1001 to satisfy SOC3200 prerequisite		

†Specialization in Plant Science		**16**
BIO2201 & BIO2206	General Microbiology and General Microbiology Laboratory	
BIO2510 & BIO2516	Plant Cultivation I: Soil, Soil Substitutes, and Disease Management and Plant Cultivation I: Soil, Soil Substitutes, and Disease Management Laboratory	
BIO3510 & BIO3516	Plant Cultivation II: Hydroponics, Aquaponics, Tissue Culture, Genetics and Extraction and Plant Cultivation II: Hydroponics, Aquaponics, Tissue Culture, Genetics and Extraction Laboratory	
BIO4510 & BIO4516	Applications of Plants & Fungi and Applications of Plants & Fungi Laboratory	

[Ic]Typically, internships require a minimum of six credits. Students interested in a 9 or 12-credit internship can apply additional experiential learning and free elective credits, if available. Students are strongly encouraged to contact a faculty advisor before scheduling internship and free elective credits.

[D] Directed Experiential Education (DEE) opportunities are based on project availability with community partners and student eligibility. For more information, visit Experiential Education & Career Services (EE&CS).

[Sa]To be eligible to count toward Applied/ Experiential Learning, a Study Abroad offering must meet certain requirements. Contact JWU Global to discuss eligible Study Abroad options for this degree program.

In addition to classes, free elective credits may be applied to a number of options such as internship, study abroad, Directed Experiential Education courses and courses in a specialization or minor as relevant. For Accelerated Master's program students, up to three graduate-level courses may apply. Students are strongly encouraged to contact a faculty advisor before scheduling free elective credits.

NOTE: Students must pass MATH0010 Pre-Algebra or have equivalent placement scores to enroll in required math course(s).

Note: Students must pass ENG0001 Writing Workshop or have equivalent placement scores to enroll in ILS 2000-level courses

In collaboration with academic colleges across all JWU campuses, JWU Global Study Abroad programs offer a variety of international options for major, minor, arts and sciences, and elective credit at many affordable price points for students during the academic year, break periods, and summer. Faculty-led, exchange, affiliate, and direct-enroll programs range in duration from one week to a full semester or full year. Financial aid may be applied and scholarships are available. Visit the study abroad website for information, program descriptions and online applications. Where will you go?