

Department of Biology

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BS in Biology

Mission Statement

The BS program in Biology prepares students for advanced study and careers in research, education, and service in Biology-related disciplines. Students will acquire descriptive, experimental, quantitative, and conceptual abilities spanning molecular, cellular, organismal, and ecological levels. Lecture and laboratory courses will emphasize model systems, the role of evolution, diversity of living systems, hypothesis-based reasoning, and communication skills. Science, social science, and humanities coursework will foster creativity, free thought, interdisciplinary skills, and commitment to ethical scholarship.

Degree Requirements

All students admitted as sophomores are eligible to continue in the program provided they obtain, by the end of their third regular term at AUB, a minimum average of 2.2 (or 70) in their biology courses. Students seeking to be readmitted to the program after being dropped must meet transfer requirements. Students will be considered for transfer to Biology provided they obtain a minimum grade of B (or 75) in BIOL 201 and B (or 75) in BIOL 202 and a C+ (or 70) or above in CHEM 201 and a 2.7 (or 75) or above overall average. Meeting the minimum requirements for joining the biology department does not guarantee acceptance. Transfer to Biology from other departments within the university is competitive and requires departmental approval.

The requirements for a BS degree in Biology are 90 credits for students entering the department at the sophomore level. The distribution of these courses is as follows:

University General Education Requirements

The General Education requirements are 6 credits in English Communication Skills and 3 credits in Arabic Communication Skills, 12 credits in the humanities including 6 credits of CVSP, 6 credits in the Social Sciences, (37+15) credits in the Natural Sciences, 3 credits in Quantitative Thought, and STAT 210.

Major Requirements

Students majoring in biology are required to complete 37 credits of Biology: BIOL 201, 202, 220, 223, two of the following four courses: BIOL 224, 252, 260, 270 (students are not allowed to register for two of those four courses during the same term unless they have an F or a W on their transcript for one of these courses from a previous term and students cannot register for two semi-required courses during the same semester; however, justified exceptions need chair's approval), BIOL 293, and a minimum of 13 credits in biology elective courses, including at least one lab course. Additionally, BIOL 296 (a 0-credit exit survey) must be taken in the last term of study.

Students are also required to complete 15 credits of Natural Sciences, CHEM 201, 210, 211, 212 and PHYS 204 with PHYS 204L, or PHYS 205 with PHYS 205L.

To earn a minor in Biology, students must pass 15 credits of biology. The courses are BIOL 201 (4 credits), BIOL 202 (4 credits), plus at least two courses (provided the prerequisites of these courses are satisfied) to complete the 15 credits required for the minor.

Unless otherwise stated, only senior undergraduate biology majors with an average of 3.2 (or 80) or above can register in biology graduate courses with consent of the instructor.

Students from any field can minor in aquatic and environmental sciences by completing, in addition to BIOL 202 or BIOL 200, a total of 15 credits chosen from the following three lists:

- List 1: BIOL 252, BIOL 250, BIOL 256
- List 2: BIOL 266, BIOL 246, BIOL 267, BIOL 255
- List 3: CHEM 202, PHIL 209, PSPA 288F, BIOL 240, BIOL 241, BIOL 245, BIOL 246, BIOL 250, BIOL 252, BIOL 254, BIOL 255, BIOL 256, BIOL 258, BIOL 259, BIOL 266, BIOL 267, BIOL 281

Land and Water Resources: AGSC 215, LDEM 230

Plant Sciences: AGSC 284, AGSC 295

Landscape: LDEM 211, LDEM 215

Ecosystem Management: LDEM 203

Environmental Health: ENHL 220

Civil Engineering: CIVE 350, CIVE 450

One course from each of lists 1 and 2 is required. All students should take at least three of the total required courses in a field outside their major field of study, and these courses should be from at least two different disciplines. Only one of the courses taken from lists 1 and 2 by biology majors minoring in environmental and aquatic studies is counted toward the major.

Course Descriptions

BIOL 101 Basic Concepts in Biology 3.0; 3 cr.
 A course that deals with the basic concepts in biology, and prepares students for BIOL 201 and BIOL 202. This course introduces the student to the forms and functions of plants and animals, and to the principles of genetics, evolution, and ecology. *Every term.*

BIOL 102 Basic Concepts in Biology II 3.0; 3 cr.
 This course is only intended for freshman students who have taken BIOL 101 and plan to continue their education in the field of biological sciences as it prepares students for BIOL 201 and 202. The course introduces students to the forms and functions of animals. It covers basic anatomy and physiology of animal systems, and emphasizes the evolutionary relationships between the different groups of animals. It also introduces students to basic concepts in ecology. *Prerequisite: BIOL 101.*

BIOL 104 Introduction to Organismal Biology 3.0; 3 cr.
 The course introduces basic principles of organismal biology through study of representative groups of unicellular organisms, plants and animals. Topics include the origins of life, major events in the history of life, adaptations of organisms to particular environments, patterns of reproduction in plants and animals, form and function, physiology, and locomotion in animals and ecology. The course is for students who will not continue their education in the sciences. *Every term.*

BIOL 105 Introductory Biology 3.3; 4 cr.
 An introduction to the fundamental principles of biology. This course covers the basis of life, the structure and function of cells and systems, the general classification and diversity of plants and animals, as well as genetics and ecology. *Occasionally.*

BIOL 106 Contemporary Issues in Biology 3.0; 3 cr.
 course designed to provide freshman students with the scientific background to some of the current topics in biology today. The course introduces students to the general concepts of biology, including origins of life, evolution and organic building blocks. Moreover, the course will cover socially important contemporary topics such as human evolution, fresh water issues, ecology, environmental conservation, cloning, stem cell research, GMOs, diseases and nutrition. Topics will be added and removed as new discoveries are made and news changes. *Every term.*

BIOL 200 Diversity of Life 3.3; 4 cr.
 A course that deals with the basic aspects of cell structure and function, heredity, diversity, classification, evolution and interrelationships of living things, and briefly covers organs and systems in animals and plants. Laboratory activity reflects the contents of the course. Not open to biology majors and minors. Sophomore standing is required. *Every term.*

BIOL 201 General Biology I 3.3; 4 cr.
 An integrated approach to the biology of organisms covering the organization of life, energy transfer through living systems, perpetuation of life, and diversity of life. *Every term.*

BIOL 202 **General Biology II** **3.3; 4 cr.**
A study of the anatomy and physiology of plants and animals covering their structure, growth, nutrition, transport, reproduction, development, and control systems. This course focuses also on the relationships between structure and function, and stresses the evolutionary adaptation and changes in the different systems of the major plant and animal groups. *Prerequisite: BIOL 201. Every term.*

BIOL 209 **Concepts and Connections** **3.0; 3 cr.**
A course that covers the basic aspects of cell structure and function. An overview of heredity, diversity and evolution. Interrelationships of living things and a brief coverage of organs and systems in animals. *Not open to biology majors and minors. Sophomore standing is required. Every term.*

BIOL 210 **Human Biology** **3.0; 3 cr.**
A course that covers the fundamental principles of cell biology, genetics, and human biology, with emphasis on the morphology, physiology, and disorder of body systems. *Not open to biology majors and minors. Students cannot receive credit for all three of the following: BIOL 201, BIOL 202, BIOL 210. Every term.*

BIOL 220 **Introductory Biochemistry** **3.0; 3 cr.**
An introduction to the structure-function relationships of biomolecules, cells, enzymes, and the metabolic reactions of living cells. *Prerequisites: BIOL 202 and CHEM 211. Every term.*

BIOL 223 **Genetics** **3.3; 4 cr.**
A course that deals with the basic principles of classical and modern genetics with emphasis on the analysis of genetic material and genetic processes at the molecular level. *Prerequisite: BIOL 202. Every term.*

BIOL 224 **Microbiology** **3.3; 4 cr.**
A course that deals with micro-organisms, especially bacteria, and in particular those of pathogenic and industrial importance. This course includes basic knowledge on isolation, classification, and the various metabolic processes. *Prerequisite: BIOL 223. Every term.*

BIOL 225 **Molecular Biology** **3.0; 3 cr.**
A course that introduces the different techniques of molecular biology and recombinant DNA technology, and discusses the most recent advances in the field. *Prerequisite: BIOL 223. Occasionally.*

BIOL 234 **Vascular Plants** **2.3; 3 cr.**
A course that deals with the structure, life history, and classification of vascular plants, including psilophytes, club mosses, horsetails, ferns, conifers, and flowering plants, emphasizing their evolutionary relationships. *Prerequisite: BIOL 202. Occasionally.*

BIOL 236 **Plant Systematics** **2.3; 3 cr.**
A course that deals with the relationships between and among vascular plants based on evolutionary principles as expressed by systematics. The course provides underlying principles of systematics, including modern molecular technological approaches. Students deal with plant identification, and classification of the major families of local vascular plants. *Prerequisite: BIOL 202. Occasionally.*

- BIOL 240** **Animal Behavior** **3.0; 3 cr.**
A course that covers the basic concepts of animal behavior including physiological, genetic, ecological, and evolutionary aspects, as well as exploration of the controversial ideas of sociobiology. *Prerequisite: BIOL 202. Occasionally.*
- BIOL 241** **Biology of Invertebrates** **3.3; 4 cr.**
A study of invertebrates, excluding insects, emphasizing their morphological and functional diversity, phylogenetic relationships, classification, development, and adaptation. *Prerequisite: BIOL 202. Annually.*
- BIOL 243** **Behavioral Neuroscience** **3.0; 3 cr.**
An introduction to the neural basis of behavior. The course surveys the structure and organization of the human brain and how complex behavior arises from it. *Prerequisite: PSYC 101 or PSYC 201. Annually.*
- BIOL 244** **Introduction to Neurobiology** **3.0; 3 cr.**
A comprehensive introduction to neural signaling, brain development and adult brain regeneration. The course covers molecular to higher organizational level of neural functions. It emphasizes the fundamental principles and mechanisms associated with brain development and physiology including nerve communication, neurogenesis, patterning and regionalization as well as neural stem cells function. *Prerequisite: BIOL 202. Annually.*
- BIOL 244L** **Neurobiology Lab** **0.3; 1 cr.**
The course will introduce the students to basic concepts of neurobiology including brain and cranial nerve anatomy, brain development, adult brain derivatives, spinal cord reflex, receptor and action potentials, nerve degeneration and special senses. The students will learn to perform a combination of manipulations ranging from live brain dissections to histological staining and analyses and will use plastic models and computer simulation. Animal models studied include sheep, chicken, frog and mouse. *Pre- or corequisite: BIOL 244. Annually.*
- BIOL 245** **Environmental Physiology of Aquatic Organisms** **3.0; 3 cr.**
A course that describes the strategies used by aquatic animals to deal with environmental variations. The course covers various animal physiological systems with an emphasis on aquatic adaptations. Some topics such as air bladder control, electrical generation and reception, and gill excretion which are specific to aquatic organisms are introduced herein. *Prerequisite: BIOL 200 or BIOL 202. Annually.*
- BIOL 246** **Marine Biology** **3.3; 4 cr.**
A course that introduces the biology of life in the marine environment (microbial world, seaweeds and plants, marine animals) as well as the structure and function of the marine ecosystem (e.g., coral reefs, ocean depths, estuaries). The course also covers the impact of humans on the marine environment. *Prerequisite: BIOL 202. Every term.*
- BIOL 247** **Animal Physiology** **3.0; 3 cr.**
A study of the fundamental principles and mechanisms that govern body functions in animals, with an emphasis on the molecular aspects. *Prerequisite: BIOL 202. Annually.*

BIOL 249 Parasitology 3.3; 4 cr.
 A general overview of the classification, morphology, development, and physiology of human and animal parasites. *Prerequisite: BIOL 202. Annually.*

BIOL 250 Biosphere 3.0; 3 cr.
 A course that focuses on defining global environmental problems such as global warming, acid rain, deforestation, and loss of biodiversity, and introduces methods that can help eliminate or reduce these problems. *Annually.*

BIOL 251 Introduction to Bioinformatics 3.0; 3cr.
 An introduction to the foundations of modern bioinformatics. The course covers databases, data formats, algorithms, and statistical concepts for analyzing biological data with special emphasis on sequence and gene expression data. *Annually.*

BIOL 251L Bioinformatics Lab 0.3; 1 cr.
 A bioinformatics computer lab. The lab section introduces the programming language R, the de-facto standard in biological data analysis. Students learn how to use R packages, write scripts, and write functions to analyze sequence, genomics, and gene expression data. No prior programming experience is required. *Annually*

BIOL 252 Ecology 3.3; 4 cr.
 A study of organisms in relation to their biotic and abiotic environment. This course deals with population growth and regulation, species diversity, age structure, succession, food chains, energy flow, and recycling of nutrients. *Prerequisite: BIOL 202 or LDEM 209. Every term.*

BIOL 253 Phylogenetics 3.0; 3 cr.
 A course that introduces the concept of phylogenetic trees, presents different techniques to estimate them, and shows how phylogenetic trees form the basis for understanding a wide range of phenomena in Biology, such as ecological adaptation, disease spread or tumor evolution. *Prerequisite: BIOL 202. Annually.*

BIOL 254 Evolution 3.0; 3 cr.
 A study of the processes that bring about evolutionary changes in organisms, evolutionary trends, patterns of adaptations, and principal factors that influence the patterns of speciation. *Prerequisite: BIOL 201. Annually.*

BIOL 255 Marine Ecology 3.0; 3 cr.
 An introduction to the ecology of marine and brackish water ecosystems, structures and processes, with special attention to the eastern Mediterranean Sea. Interrelationships among animals, plants, and chemical and physical aspects of the environment are studied, as well as the unique adaptations for survival in these habitats. *Prerequisite: BIOL 200 or BIOL 202. Occasionally.*

BIOL 256 Conservation Biology 3.0; 3 cr.
 A course that deals with various environmental issues in the world today; introduces the science of conservation; and describes typical methods of conservation. Students are trained in reading scientific literature and scientific writing, and are required to research a conservation topic. *Prerequisite: BIOL 200 or BIOL 202. Annually.*

- BIOL 257 Ecology and Evolution 3.0; 3 cr.**
 An introduction to the basic principles, concepts and processes in ecology and evolution with a brief history of life on Earth and the relationships of these principles and concepts to current environmental issues such as pollution, climate change and biodiversity and its conservation. Animal behavior will be approached from the ecological and evolutionary perspectives. *Students who have taken BIOL 252 or BIOL 254 cannot get credit for BIOL 257. Occasionally.*
- BIOL 258 Introduction to Aquaculture 3.0; 3 cr.**
 An introduction to the general concepts of aquaculture. The course discusses topics such as culture species, culture methods, water quality, filtration, feeding, and harvesting. It also introduces uses of aquaculture for food production, biomedical research, ornamentals, or restocking programs. *Pre- or corequisite: BIOL 200 or BIOL 202. Occasionally.*
- BIOL 258L Aquaculture Laboratory 0.3; 1 cr.**
 This is an intensive writing course that introduces students to the practical side of aquaculture. Students will get their hands wet. They will set up fish maintenance systems, evaluate progressive changes in water chemistry, evaluate effects of water chemistry on fish health, and most importantly learn techniques used to maintain fish in healthy and sustainable environments. Students will be expected to keep a detailed log of their activities and perform a fullfledged research project that is expected to be written as a scientific publication. *Pre- or corequisite: BIOL 258. Annually.*
- BIOL 259 Microbes and the Environment 3.0; 3 cr.**
 A course that explores the various habitats of micro-organisms in nature and the interactions within. The course discusses microbial metabolic activities and their impact on the environment. It explores the role of microbes as pathogens, particularly environmentally transmitted ones. The course also discusses the beneficial role of microbes in the biodegradation of pollutants is, in addition to public health topics in microbiology. The course includes a substantial component of reading and analysis of primary research papers in environmental microbiology, in addition to presenting a poster session. *Prerequisite: BIOL 202. Occasionally.*
- BIOL 260 Cell Biology 3.3; 4 cr.**
 A course that provides an understanding of the structure and function of cellular organelles and components, and the functional interaction of the cell with its microenvironment. *Prerequisite: BIOL 223. Every term.*
- BIOL 261 Biology of Cancer 3.0; 3 cr.**
 This course compares the basic biology of normal versus the malignant neoplastic state and provides a comprehensive overview of the basic biology of cancer. *Prerequisite: BIOL 223. Annually.*
- BIOL 262 Virology 3.0; 3 cr.**
 A general overview on the classification, biophysical, and biochemical characteristics of DNA- and RNA- containing bacterial, plant, and animal viruses. *Prerequisite: BIOL 202. Occasionally.*

BIOL 263 Immunology 3.0; 3 cr.
An introduction to basic immunology, types of immune responses, and basic aspects of the specific and non-specific body defense mechanisms, as well as primary immunological diseases and disorders. *Prerequisite: BIOL 202. Annually.*

BIOL 266 Oceanography 3.0; 3 cr.
An introduction to the basic concepts of oceanography and marine science. The course focuses on the chemical, physical, and geological processes that affect life in the oceans and on planet earth in general. The course discusses additional topics such as environmental science, conservation, world fisheries, marine resources, and effects of coastal development on life in the oceans. *Annually.*

BIOL 266L Oceanography Lab 0.3; 1 cr.
This is an intensive writing course that introduces students to the basic concepts of marine science applications. It introduces methods to study chemical, physical, biological and geological processes that affect life in the oceans and on planet earth in general. Methods of research used by oceanographers past and present are introduced and demonstrated. Students will be expected to keep a detailed log of their activities and perform a full-fledged research project that is expected to be written as a scientific publication. *Annually.*

BIOL 268 Introduction to Biotechnology 3.0; 3 cr.
An introduction of both the principles and the applications of molecular biology methods with an emphasis on the application of recombinant DNA technology to animals, plants, and microbial organisms. This course describes the use of genetically engineered products to solve environmental problems and cure human diseases. *Annually.*

BIOL 270 Plant Physiology 3.3; 4 cr.
A study of the vital processes that occur in flowering plants, including biophysical and metabolic processes, with emphasis on photosynthesis, growth, and development. This course also deals with plant responses to the physical environment. *Prerequisite: BIOL 220. Every term.*

BIOL 273 Economic Plants 3.0; 3 cr.
The course consists of the study of the relationship between people and plants. It encompasses the fields of botany, systematic, evolution, anatomy and anthropology. It explores the countless ways humans employ plants for food, medicine, textiles, shelter and more. *Prerequisite: BIOL 202. Every term.*

BIOL 280 Endocrinology 3.0; 3 cr.
A study of the role of chemical messengers in the control of physiological and metabolic processes. This course deals with the biosynthesis, chemistry, and secretion of hormones, as well as their mechanism of action. *Prerequisite: BIOL 202. Occasionally.*

BIOL 281 Ichthyology 3.0; 3 cr.
A study of the different types of fish, their natural history, and environmental and ecological adaptations. It also deals with methods of conserving and culturing fish of economic value, as well as the effect of pollution on fish fauna. *Prerequisite: BIOL 202. Annually.*

- BIOL 283 Reproductive Physiology 3.0; 3 cr.**
An examination of the mechanisms of all major aspects of male and female mammalian reproductive physiology. Emphasis is also given to species variation with regard to reproductive function and to a detailed examination of key reproductive events in both sexes. *Prerequisite: BIOL 202. Occasionally.*
- BIOL 284 Developmental Biology 3.3; 4 cr.**
A study of basic mechanisms and molecular basis that controls embryonic development in both vertebrates and invertebrates with special emphasis on early development and axis formation. Animal models covered include chicken, frog, mouse, drosophila, sea urchin, *C. elegans* and zebrafish. *Prerequisite: BIOL 202. Annually.*
- BIOL 286 Entomology 3.3; 4 cr.**
An introduction to the study of insects, their diversity, classification, morphology, biology, and behavior as well as their medical, ecological, and agricultural importance. *Prerequisite: BIOL 202. Annually.*
- BIOL 290 Special Topics in Biology 1.0-4.0; 1-4 cr.**
The course covers topics in biology that warrant an extensive coverage in a separate course not typically offered by the department. *May be repeated for credit. Every term.*
- BIOL 291 Undergraduate Tutorial 2 or 3 cr.**
Prerequisites: Senior standing, a minimum average of 3.2 (or 80) in the major, and consent of instructor. Graded Pass/ No Pass (or Fail). Every term.
- BIOL 293 Undergraduate Seminar 1.0; 1 cr.**
Prerequisite: Senior standing. Every term.
- BIOL 295 Summer Undergraduate Research 3.3; 4 cr.**
A course intended to train and recruit well-prepared students for graduate work in biology at AUB. Students will conduct a research project during the summer term, and then present and defend their findings. *Prerequisites: Completion of 80/120 credits, a minimum average of 2.7 (or 75) in the major, consent of instructor and approval of the department. Every summer.*
- BIOL 296 Exit Survey 0 cr.**
A computer-based exit exam taken in the last term in the BS in Biology program. *Prerequisite: Completion of graduation requirements for BS in Biology by the end of term. Graded Pass/No Pass (or Fail). Every term.*

37 Credits in Biology¹

Modes Of Analysis	English and Arabic (9)	Humanities (12)	Social Sciences (6)	Natural Sciences (37+15) ¹	Quantitative Thought (3)
Lecture courses (9+12+6+30+12+3)	<ul style="list-style-type: none"> Required Arabic course (3) Required English courses: 203(3), 204(3) 	<ul style="list-style-type: none"> Required credits in the humanities: 12 credits including 6 credits from CVSP 	<ul style="list-style-type: none"> Required (6) 	<ul style="list-style-type: none"> Required biology (23): BIOL 201(4), 202(4), 223(4), 220(3), and two from the following four courses: 224(4), 260(4), 270(4), 252(4) Elective biology (12+1 lab): a total of 13 credits, including a minimum of one 4-credit course Required chemistry (9): CHEM 201(3), 211(3), 212(3) Required physics (3): PHYS 204(3) or 205(3) 	<ul style="list-style-type: none"> Required mathematics (3): STAT 210 (3)
Seminar (1)				Required: BIOL 293(1)	
Laboratory (5+1+2+1)				<ul style="list-style-type: none"> Required biology² (5): BIOL 201(4), 202(4), 223(4), and two from the following four courses: BIOL 224(4), 252(4), 260(4), 270(4) Elective biology³(1): minimum of one 4-credit course Required chemistry (2): CHEM 210(2) Required physics (1): PHYS 204L(1) or 205(1) 	
Research Project (0, 2, or 3)				<ul style="list-style-type: none"> Elective biology courses (2–3): BIOL 291(2 or 3) 	
Exit Survey (0)				<ul style="list-style-type: none"> Required: BIOL 296 (0) 	

1) Plus 8 free elective credits

2) At least 37 credits in Biology and 15 credits in the sciences

3) These courses include a 1-credit laboratory component and have been listed under both lecture and laboratory courses.