

# Biological Sciences

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369A Shelby Center

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The Biological Sciences department offers the following undergraduate degrees:

- Biological Sciences, BS (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba>)
- Biological Sciences, BS - Biochemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-biochemistry-concentration>)
- Biological Sciences, BS - Pre-Professional Health Careers Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-preprofessional-health-careers-concentration>)
- Biological Sciences, BS - Ecology and Evolution Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-ecology-evolution-concentration>)
- Biological Sciences, BS - Microbiology Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-microbiology-concentration>)
- Biological Sciences, BS - Secondary Education Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-secondary-education-concentration>)
- Biological Sciences, BS - Exercise Physiology Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-exercise-physiology-concentration>)

## Program Objectives

The UAH Department of Biological Sciences aspires to provide one of the best programs in the southeastern U.S. for both undergraduate and graduate students in terms of both quality and efficacy. Our goal is to provide forward-looking, comprehensive curricula that includes both instruction and laboratory experience for our undergraduates and meets the highest national standards.

## Learning Outcomes

Biological Sciences graduates will demonstrate the ability to

- Correctly use and apply key words, concepts, and theories from the biological sciences
- Write in a scholarly manner
- Engage in effective oral presentation of scientific topics or research results

Majors in Biological Sciences

- Biological Sciences, BS (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba>)
- Biological Sciences, BS - Biochemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-biochemistry-concentration>)
- Biological Sciences, BS - Pre-Professional Health Careers Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-preprofessional-health-careers-concentration>)
- Biological Sciences, BS - Ecology and Evolution Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-ecology-evolution-concentration>)
- Biological Sciences, BS - Microbiology Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-microbiology-concentration>)
- Biological Sciences, BS - Secondary Education Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-secondary-education-concentration>)
- Biological Sciences, BS - Exercise Physiology Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-bs-ba-exercise-physiology-concentration>)

For more information about the department of biology, visit [uah.edu/biology](http://uah.edu/biology).

## Minor in Biological Sciences

- Biological Sciences (<http://catalog.uah.edu/undergrad/colleges-departments/science/biological-sciences/biological-sciences-minor>)

UAH's Joint Undergraduate Master's Program (JUMP) allows undergraduate students to study at the graduate level. By taking graduate courses in your senior year you could reduce the time taken to get a graduate (MS) degree. Please visit JUMP (<http://catalog.uah.edu/undergrad/academic-information/jump>) page for general information.

## Requirements For Admissions

1. Cumulative Overall 3.3 GPA
2. Major GPA of 3.5
3. Student shall complete BYS 120, BYS 219, BYS 300, BYS 361 + BYS 362, CH 121 + CH 125, CH 123 + CH 126, CH 331 + CH 335, CH 332 + CH 336 by Junior year

## Additional Information

- Maximum of 12 credit hours count toward both degrees

### Designated Faculty Contact/Advisor

Dr. Debra Moriarity [debra.moriarity@uah.edu](mailto:debra.moriarity@uah.edu) 256.824.6045  
BYS 100 - INTRO HEALTH PROFESSIONS  
Semester Hour: 1

Career options for undergraduate students interested in health professions. Basics of health-care delivery systems and terminology of health care. No BYS major or minor credit. Primarily for freshman and sophomores.

BYS 109 - FUNDAMENTALS OF BIOLOGY  
Semester Hours: 4

Introduction to biological principles of cell structure, function, metabolism, and reproduction. Discussion of biological function with emphasis on strategies employed by organisms in meeting similar biological needs. Principles of ecology and evolution. Not intended for biology majors. Co-requisite: BYS 109L.

BYS 109L - LABORATORY  
Semester Hours: 0

Students will get hands-on experience with topics covered in the lecture, including light microscopy, properties of macromolecules, properties of plants and animals, and introduction to genetics. Every other week will be a recitation and online lab assignment. Co-requisite: BYS 109.

BYS 119 - PRINCIPLES OF BIOLOGY  
Semester Hours: 4

Lecture/Lab/Recitation. Introduction to biological principles of cell structure, function, metabolism and reproduction. One two hour lab and a one hour recitation per week.

BYS 119L - LABORATORY  
Semester Hours: 0

Laboratory exercised to introduce students to accurate measurement techniques, observation, and the development of relevant hypotheses. Several formal lab reports are required as an introduction to scientific writing.

BYS 119R - RECITATION  
Semester Hours: 0

Homework turned in and discussed; exams discussed and further assistance with course material available.

BYS 120 - ORGANISMAL BIOLOGY  
Semester Hours: 4

Lecture/Lab/Recitation. Discussion of biological function with special emphasis on contrasting strategies employed by organisms in meeting similar biological needs. One two-hour lab and a one hour recitation per week. Prerequisite: BYS 119.

BYS 120L - ORGANISMAL BIOLOGY LAB  
Semester Hours: 0

Introduction to the basic concepts of natural selection, population biology, and the biodiversity of animals and plants. Several formal lab reports are required as a further introduction to scientific writing, along with a lab practical on the biodiversity of animals and plants.

BYS 120R - RECITATION  
Semester Hours: 0

Homework turned in and discussed; exams discussed and further assistance with course material available.

BYS 205 - CODING ALGORITHMS FOR BIOLOGY  
Semester Hours: 3

Prerequisites: BYS 119, BYS 120, MA 112.

**BYS 214 - INFECTION & IMMUNITY**

Semester Hours: 4

Lecture/Lab. Two 2-hour labs a week. Principles of microbiology with emphasis on infectious disease of humans; epidemiological and immunological aspects. No credit for students who have credit for BYS 321 or advanced microbiology courses. Recommended for students in the College of Nursing.

Prerequisites: BYS 119 and either CH 101 or 121.

**BYS 214L - LABORATORY**

Semester Hours: 0

**BYS 215 - HUMAN ANATOMY & PHYSIOLOGY I**

Semester Hours: 4

Structure and function of the human body with emphasis on their relationship to disease. Part 1 of a two course sequence. Anatomy and physiology of major organs and organ systems and their relationship to each other. Emphasizes relationships of human systems to applications and simulations.

Prerequisites: BYS 119, CH 101 and CH 105.

**BYS 215L - HA&P I LABORATORY**

Semester Hours: 0

An introduction to anatomical terminology; basic histology of normal tissues versus common pathologies. Focus on the human skeletal and muscular systems. Students are engaged in recognition of individual bones, surface markings and major muscles through dissection and use of muscular models.

**BYS 216 - HUMAN ANATOMY & PHYSIOLOGY II**

Semester Hours: 4

Structure and function of the human body with emphasis on their relationship to disease. Part II of a two course sequence. Anatomy and Physiology of major organs and organ systems and their relationship to each other. Emphasizes relationships of human systems to applications and simulations.

Prerequisite: BYS 215.

**BYS 216L - HA&P II LABORATORY**

Semester Hours: 0

Study of the anatomy of the nervous, cardiovascular, respiratory, renal and digestive systems. Dissections of eye, brain, heart, lung and kidney. Basic EKG/ECG reading and a study of factors affecting blood pressure. Enzymatic action of the digestive system; basic urinalysis determinations.

**BYS 219 - GENETICS AND EVOLUTION**

Semester Hours: 4

Lecture/Lab/Recitation. Two labs and one recitation per week. Hereditary basis of organisms; genes as the discrete units of inheritance and genes in organisms and populations. Medelian principles and evolutionary processes. Replication, transcription and translation of DNA, RNA, and proteins.

Prerequisites: BYS 120 and (CH 101 or CH 121) and (MA 107 or 112).

**BYS 219L - LABORATORY**

Semester Hours: 0

Laboratory activities include experiments to further students understanding in Mendelian genetics, molecular biology and Human genetic diseases.

Counted as part of the overall grade fro BYS 219.

**BYS 219R - RECITATION**

Semester Hours: 0

Homework turned in and discussed; exams discussed and further assistance with course material available.

**BYS 292 - INTRO TO BIOLOGICAL RESEARCH**

Semester Hours: 3

Introduction to the principles and practices of biological research. Covers experimental design, statistical analysis, critical review of journal articles, responsible conduct of research, and writing for the biological sciences. Recommended for students planning to do undergraduate research.

Prerequisites: BYS 119, MA 112, EH 101.

**BYS 300 - CELL & DEVELOPMENTAL BIOLOGY**

Semester Hours: 4

Lecture/Lab. One lab per week. Introduces the student to topics in cell and developmental biology. Subjects include cell structure, organelles, cytoskeleton, secretory pathway, cell division, cell cycle, cell interaction and control of differentiation. Prerequisites: BYS 219 and either CH 123 or 201.

**BYS 300L - CELL & DEVELOPMENT BIO LAB**

Semester Hours: 0

**BYS 301 - ELEMENTARY BIOCHEMISTRY**

Semester Hours: 3

Biochemistry and energetics of living cells, metabolism, structure and function of carbohydrates, lipids, proteins and nucleic acid. Enzymes, coenzymes, vitamins, blood, endocrine glands, DNA synthesis and gene expression. Same as CH 301. Prerequisites: BYS 120 and either CH 201 or 331.

**BYS 302 - PEOPLE, PLANTS & ENVIRONMENT**

Semester Hours: 3

This course is designed to introduce students from multiple departments to the vital roles that plants have in our ecosystems through the study of basic plant and soil science. Special attention is placed on the impact that plants have on our technology-based society.

**BYS 311 - INTRO MOLECULAR UNDSST BIO SYST**

Semester Hours: 3

Introduction to a molecular understanding of genes, gene expression and genetic engineering in selected prokaryotic and eucaryotic systems. Includes examples of biotechnology applications. Prerequisite: CH 331.

**BYS 312 - PRINCIPLES OF ECOLOGY**

Semester Hours: 4

Lecture/Lab. One lab a week. Population structure and growth, competition, predation, symbiosis, biogeochemical cycling and energy flow, disturbance and community dynamics, biodiversity and conservation. Field trips required. Prerequisites: BYS 120, and BYS 219.

**BYS 313 - ANATOMY & PHYSIOLOGY I**

Semester Hours: 4

Lecture/Lab. One lab a week. Structure and function of the human body. Anatomy of the skeletal and muscular systems, physiology of membranes, cellular and epithelial transport and nervous system function. Appropriate preparation for professional schools/graduate study in biological sciences. Prerequisite: BYS 119. Prerequisites with concurrency: BYS 300, and either CH 201 or 331.

**BYS 313L - LABORATORY**

Semester Hours: 0

Laboratory activities on the basic concept of system physiology including a rat dissection. Focuses on membrane transport and histology, and include gross anatomy and a study of the muscles and bones of the human body. Capstone student research project on electromyography of muscles.

**BYS 314 - ANATOMY & PHYSIOLOGY II**

Semester Hours: 4

Lecture and one lab a week. Continuation of BYS 313 stressing structural and functional relationships of major organ systems, focusing on heart, brain, lungs, kidney and the gastrointestinal tract. Appropriate for students preparing for professional schools or graduate study in biological sciences. Prerequisite: BYS 313.

**BYS 314L - ANATOMY/PHYSIOLOGY II LAB**

Semester Hours: 0

Research-intensive system based laboratory course. Includes brain dissection and student EEG project and a heart dissection and a cardiovascular physiology project. This is followed by a pulmonary function lab and a renal function lab where students calculate their own glomerular filtration rate.

**BYS 315 - ICHTHYOLOGY**

Semester Hours: 4

Classification, anatomy, physiology, and ecology of freshwater and marine fishes. Emphasis fishes of north Alabama. Laboratory and field trips required. Prerequisites: BYS 120 and BYS 219. Prerequisite with concurrency: BYS 300.

**BYS 317 - VERTEBRATE ZOOLOGY**

Semester Hours: 5

Lecture/Lab. Two three-hour labs a week. Morphology of vertebrate animals. Relationship of organs and systems and their phylogenetic significance. Prerequisites: BYS 120 and BYS 219. Prerequisite with concurrency: BYS 300.

**BYS 318 - VERTEBRATE REPRODUCTION**

Semester Hours: 3

General treatment of the major concepts and controversial areas of comparative vertebrate reproduction: ecological and evolutionary aspects, development of reproductive functions and sexual behavior, seasonal breeding and other topics of current interest. Prerequisites: BYS 120 and BYS 219. Prerequisite with concurrency: BYS 300.

**BYS 320 - MEDICAL TERMINOLOGY**

Semester Hours: 3

The meaning, spelling, etymology and pronunciation of major medical terms related to anatomy, pathology, medical professions, procedures and pharmaceuticals; body systems, their associated diseases and disorders. Correct usage of terms and interpretation of documents containing these terms. Hybrid course with online and in-class portions. Prerequisites: BYS 300 or BYS 215 and BYS 216.

**BYS 321 - GENERAL MICROBIOLOGY I**

Semester Hours: 4

Structure, biochemistry, and genetics of microorganisms, control of microbial growth, and microorganisms as pathogens. Lab covers basic and diagnostic methods in microbiology, environmental factors controlling microbial growth and survival, and characteristics of medically important microorganisms. Prerequisites: BYS 120, BYS 219. Prerequisite with concurrency: BYS 300.

**BYS 321L - LABORATORY**

Semester Hours: 0

**BYS 322 - GENERAL MICROBIOLOGY II**

Semester Hours: 4

Emphasizes diversity of microorganisms with respect to ecology, physiology, and phylogeny. Prerequisite: BYS 321.

**BYS 322L - GENERAL MICROBIOLOGY II LAB**

Semester Hours: 0

**BYS 347 - BIOPHYSICAL CHEMISTRY I**

Semester Hours: 3

First and second laws of thermodynamics. Free energy and equilibrium. Colligative properties of solutions. Ionic equilibria. Electrochemistry. Reaction kinetics. Enzyme catalysis. Adsorption and surface tension. Same as CH 347. Prerequisites: CH 332, PH 112, PH 115 and MA 172.

**BYS 348 - BIOPHYSICAL CHEMISTRY II**

Semester Hours: 3

Viscosity, diffusion, sedimentation, electrophoresis, determination of molecular weight by osmotic pressure. Light scattering and photochemistry. Elementary IR, UV-VIS, ESR, NMR spectroscopy. Fluorescence. Optical rotation. Same as CH 348. Prerequisites: BYS 347 or CH 347.

**BYS 361 - GENERAL BIOCHEMISTRY**

Semester Hours: 3

Biochemical structure and function of amino acids, proteins, carbohydrates, lipids, and nucleic acids; Enzyme catalysis and kinetics; major catabolic pathways, their integration and control mechanisms: Glycolysis, Citric Acid Cycle, Fatty Acid Oxidation and Oxidative Phosphorylation. Same as CH 361. Prerequisites: BYS 120, CH 332 and CH 335 or BYS 311, CH 332 and CH 335.

**BYS 362 - GENERAL BIOCHEMISTRY LAB**

Semester Hour: 1

One 3-hour lab a week. Practical experience in isolation, qualitative identification, and quantitative estimation of biomolecules. Same as CH 362. Prerequisites: CH 335 and CH 336. Prerequisite with concurrency: CH 361.

**BYS 363 - GEN BIOCHEMISTRY II**

Semester Hours: 3

A continuation of BYS 361 to include amino acid oxidation, biosynthesis of biomolecules, integration of metabolism, DNA and RNA metabolism, protein biosynthesis, and gene structure. Same as CH 363. Prerequisites: BYS 361.

**BYS 364 - BIOGEOGRAPHY**

Semester Hours: 3

Why plants and animals live where they do. Principles governing plant and animal distribution and dispersal, using the communities of North America as prime examples. Strongly recommended: BYS 312. Prerequisites: BYS 120, BYS 219. Prerequisite with concurrency: BYS 300.

**BYS 365 - GEN BIOCHEMISTRY LAB II**

Semester Hour: 1

Experimental course illustrating the topics in BYS 363. Prerequisites: BYS 361 and BYS 362. Prerequisite with concurrency: BYS 363.

**BYS 401 - EXERCISE PHYSIOLOGY**

Semester Hours: 4

Lecture/Lab. One lab per week. Basic human physiology as differentiated by the effects of exercise. Physiology of major systems of the body that may act as a limiting factor or enhance the performance, of human movement. Strongly recommended: BYS 301 or CH 301. Prerequisites: BYS 215 & BYS 216 OR BYS 313 & BYS 314.

**BYS 401L - LABORATORY**

Semester Hours: 0

**BYS 402 - KINESIOLOGY & BIOMECHANICS**

Semester Hours: 4

Lecture/Lab. One lab per week. A study of the structural and functional relationships of the human skeletal, muscular and neural systems as they relate to movement of the human body. Prerequisites: BYS 215 & BYS 216 OR BYS 313 & BYS 314.

**BYS 402L - LABORATORY**

Semester Hours: 0

**BYS 403 - ADV EXERCISE PHYSIOLOGY**

Semester Hours: 4

Lecture/Lab. One lab per week. Human physiology, addressing the effects of environmental variables such as altitude, thermal stress and terrain on the major physiological systems of the body; in-depth analysis of resistance training, aerobic and anaerobic training; integration of multiple systems. Prerequisites: BYS 401, and (BYS 301 or CH 301) or (BYS 361 or CH 361).

**BYS 405 - PSYCHOPHARMACOLOGY**

Semester Hours: 3

Introduction to drug classification and action with emphasis on physiological and psychological interactions.

**BYS 419 - MICROBIAL GENETICS**

Semester Hours: 3

Transmission, expression, and evolution of genes in microorganisms. Studies of chromosomes, plasmids, transposons, bacteriophages, and other genetic elements. Prerequisites: BYS 219, BYS 300 and BYS 321.

**BYS 430 - IMMUNOLOGY**

Semester Hours: 4

Lecture/Lab. One 3-hour lab per week. Innate, humoral and cell-mediated immunity. Immune deficiencies and hypersensitivities. Autoimmunity, transplantation, and tumor immunology. Prerequisites: BYS 219, BYS 300 and BYS 321. Prerequisite with concurrency: CH 361.

**BYS 436 - BIOLOGICAL PSYCHOLOGY**

Semester Hours: 3

Functional analysis of neural and endocrine systems underlying behavior. Same as PY 436. Prerequisites: (either a or b): (a) 15 hours of PY or approval of instructor; (b) BYS 120 or BYS 313, and 6 hours of PY.

**BYS 437 - PSYCHOBIOLOGY STRESS & ILLNESS**

Semester Hours: 3

Overview of psychological stress responses and their influence on health, behavior and illness. Same as PY 437. Prerequisites: approval of instructor.

**BYS 464 - EVOLUTION**

Semester Hours: 3

Principles of evolution and speciation. Nature of species, selection and adaptation, divergence and cladogenesis, isolation, hybridization, and phylogeny. Prerequisites: BYS 120, 219. Prerequisites with concurrency: BYS 300.

**BYS 465 - MOLECULAR METHODS & EVOLUTION**

Semester Hours: 4

This lecture and laboratory course is intended as an intense introduction to modern molecular methods in biological research. Topics include: genetic variation, evolutionary genetics, ecological genetics, genomics, gene expression, phylogenetics, and bioinformatics. Prerequisites: BYS 464.

**BYS 490 - SENIOR CAPSTONE**

Semester Hours: 2

Discussions, readings, and presentations of topical biological subjects using scientific literature. Capstone course emphasizing refinement of oral and written communication skills and critical thinking. All students will take ETS Major Field Test in Biology as part of the course grade. Prerequisites: BYB 119, 120, 219, and 300. Senior standing.

**BYS 491 - SP TOPICS BIOLOGICAL SCI**

Semester Hours: 1-4

Directed readings and/or written reports on topics of interest to individual students carried out under supervision of an instructor. Prerequisites: Permission of instructor required before registration.

**BYS 492 - UNDERGRADUATE RESEARCH**

Semester Hours: 2-4

For advanced-level biological sciences students with biological sciences GPA of 3.5 or above. Individual investigations into biological problems under direct supervision of instructor. May also be taken at the Marine Environmental Sciences Consortium, Dauphin Island, Alabama. Prerequisites: Permission of instructor required before registration.

**BYS 499 - UNGRAD HONORS RES & THESIS**

Semester Hours: 2-4

Individual investigations into biological problems under direct supervision of instructor. For honors students majoring in the biological sciences. Prerequisites: Approval of instructor, chair, and director of honors program; Senior Standing.

## Marine Sciences

Select courses in marine sciences, available through the Marine Sciences Consortium at The Dauphin Island Sea Lab (<http://www.disl.org>), may be taken for credit at UAH toward a biological sciences major or minor, a minor in marine sciences, or a Master of Science degree in biological sciences. Marine sciences coursework must be approved by the Marine Sciences Consortium UAH liaison officer in the Biological Sciences Department prior to enrollment in the courses.

**MS 202 - MARINE BIOLOGY**

Semester Hours: 4

Survey of invertebrates, vertebrates, and marine plants as communities with local examples. Examination of marshland, estuarine, beach, dune, inlet and neritic habitats, and niches. Lecture/Lab/field work. Offered only at the Marine Environmental Sciences Consortium Sea Lab at Dauphin Island, AL. Prerequisites: BYB 119 and BYB 120.

**MS 204 - COM MARINE FISHERIES/ALA**

Semester Hours: 2

Biology, harvesting technology, and processing of commercially valuable fish and shellfish species of Alabama. Offered only at the Marine Environmental Sciences Consortium Sea Lab at Dauphin Island, Alabama. No credit for biological sciences major or minor; can be used for marine science minor.

**MS 301 - MARINE TECH METHODS I**

Semester Hours: 2

Marine science research equipment, methods, and techniques. Operation and field maintenance of major sampling gear. Only at the Marine Environmental Sciences Consortium Sea Lab at Dauphin Island, Alabama. No credit for biological sciences major or minor; can be used for a marine science minor. Prerequisites: BYB 119 and BYB 120.

**MS 303 - COASTAL CLIMATOLOGY**

Semester Hours: 2

Physical factors resulting in climactic conditions in and near coastal region. Emphasis on northern Gulf of Mexico. Only at the Marine Environmental Sciences Consortium Sea Lab at Dauphin Island, Alabama. No credit toward a biological sciences major or minor; can be used for a marine science minor.

**MS 304 - COASTAL ZONE MANAGEMENT**

Semester Hours: 2

Examination of ecological features and physical management policies design for coastal communities and a review of the federal and state programs that impinge upon coastal ecological communities. Only at the Marine Environmental Sciences Consortium Sea Lab at Dauphin Island, Alabama.

**MS 491 - SPECIAL TOPICS IN MARINE SCIEN**

Semester Hours: 1-4