Biological Sciences Program

Faculty/Staff
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Aims of the Department
The mission of the Department of Biological Sciences is to encourage thoughtful investigation of living systems.

Student Learning Outcomes
Biological Sciences graduates will be able to:

- Use scientific processes (observe nature, pose problems, generate and test hypotheses, design experiments, interpret and evaluate data, and determine how to follow up on findings), especially involving quantitative reasoning and analysis.
- Communicate effectively with people both in biology as well as in other disciplines through written, visual, and oral methods.
- Evaluate the social, ethical, and moral implications of biological research and how science impacts their faith.

Programs
The department offers a Bachelor of Arts and a Bachelor of Science degree in biology. The B.A. degree requires 30 semester hours in biology, 18 hours in a minor area and includes a foreign language component. The B.S. degree allows a choice between three areas of emphasis: Biomedical emphasis, Ecology and Conservation Biology emphasis, or Integrative Biology emphasis. Students may also choose to pursue a B.S. or minor in Life Science towards Secondary Certification in coordination with the Education Department.

Biological Sciences Degrees and Certificates

B.A. Biology

Program:
Biological Sciences
Type:
B.A.

Required Courses
*Include one botany elective.

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4
BIOL 180	Biology Research Seminar	1
BIOL 230	Ecology	4
BIOL 320	Genetics	4
BIOL 340	Cell and Molecular Biology I	4
BIOL 419	Philosophy of Science	3
	BIOL BA Elective (x2)	6 - 8

	Sub-Total Credits	**30-32**

Required Cognates

Item #	Title	Credits
CHEM 111	General Chemistry I	4
CHEM 112	General Chemistry II	4
	MATH 121 or 141	3
	Sub-Total Credits	**11**
	Total credits for degree:	41-43

B.S. Biology, Biomedical Emphasis

Program:
Biological Sciences
Type:
B.S.

Biology, B.S. Core Curriculum
Required of all B.S. students.

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4
BIOL 180	Biology Research Seminar	1
BIOL 230	Ecology	4
BIOL 320	Genetics	4
BIOL 419	Philosophy of Science	3
	Sub-Total Credits	**20**

Required Courses

Item #	Title	Credits
BIOL 340	Cell and Molecular Biology I	4
	BIOL Electives (x3)	9 - 12
	Sub-Total Credits	**13-16**

Electives to be selected from the following courses:
In order for BIOL 480 to count as an elective, at least three credit hours of BIOL 480 must be completed and a final presentation must be given.

Item #	Title	Credits
BIOL 318	Microbiology & Immunology	4
BIOL 333	Parasitology	3
BIOL 341	Cell and Molecular Biology II	4
BIOL 410	Human Physiology	4
BIOL 443	Comparative Vertebrate Anatomy	4
BIOL 450	Histology	4
BIOL 455	Immunology	3
BIOL 480	Research in Biology	3

Required Cognates

Item #	Title	Credits
CHEM 111	General Chemistry I	4
CHEM 112	General Chemistry II	4
CHEM 231	Organic Chemistry I	4
CHEM 232	Organic Chemistry II	4
PHYS 121	General Physics I	4
PHYS 122	General Physics II	4
	MATH 121 or 141	3
	Sub-Total Credits	**27**
	Total credits for degree:	60-63

B.S. Biology, Ecology and Conservation Biology Emphasis

Program:
Biological Sciences
Type:
B.S.

Biology B.S. Core Curriculum
Required of all B.S. students.

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4
BIOL 180	Biology Research Seminar	1

BIOL 230	Ecology	4
BIOL 320	Genetics	4
BIOL 419	Philosophy of Science	3
	Sub-Total Credits	**20**

Required Courses

In consultation with the advisor, BIOL 480 Research in Biology, may replace one of the electives. In order for BIOL 480 to count as an elective, at least three credit hours of BIOL 480 must be completed and a final presentation must be given.

Item #	Title	Credits
BIOL 328	Biostatistics	3
BIOL 345	Environment and Mankind	4
BIOL 360	Plant Biology	4
BIOL 443	Comparative Vertebrate Anatomy	4
BIOL 475	Management of Fish & Wildlife Resources	4
	BIOL - Botany Elective	4
	BIOL - Ecology Elective	4
	BIOL - Zoology Elective (x2)	7 - 8
	Sub-Total Credits	**34-35**

Botany electives:

Item #	Title	Credits
BIOL 314	Systematic Botany	4
BIOL 465	Plant Physiology	4
	Sub-Total Credits	**4**

Ecology electives:

Item #	Title	Credits
BIOL 325	Field Ecology	4
BIOL 335	Limnology	4
	Sub-Total Credits	**4**

Zoology electives:

Item #	Title	Credits
BIOL 312	Ornithology	3
BIOL 435	Herpetology	4

BIOL 440	Mammalogy	4
BIOL 462	Ichthyology	4
	Sub-Total Credits	**7-8**

Required Cognates

Item #	Title	Credits
CHEM 111	General Chemistry I	4
CHEM 112	General Chemistry II	4
	MATH 121 or 141	3
	Sub-Total Credits	**11**
	Total credits for degree:	80-82

B.S. Integrative Biology

Program:
Biological Sciences
Type:
B.S.

Biology B.S. Core Curriculum
Required of all B.S. students

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4
BIOL 180	Biology Research Seminar	1
BIOL 230	Ecology	4
BIOL 320	Genetics	4
BIOL 419	Philosophy of Science	3
	Sub-Total Credits	**20**

Choose one course from each of the following groups:
Choose three additional electives from any group: 9-12

Item #	Title	Credits
	Biomedical Electives	3 - 4
	Botany electives:	4

	Ecology electives:	4
	Research Techniques Electives:	3 - 4
	Zoology Electives:	3 - 4
	Sub-Total Credits	**26-32**

Required Cognates:

Item #	Title	Credits
CHEM 111	General Chemistry I	4
CHEM 112	General Chemistry II	4
	MATH 121 or 141	3
	Sub-Total Credits	**11**
	Total credits for degree:	57-63

B.S. Life Science Secondary Certification

You must make formal application for admittance to the Teacher Education Program. Applications are available at the Education Department Office.

Program:
Biological Sciences
Type:
B.S.

Life Science B.S. - Secondary Certification
Must include one botany elective and one zoology elective.

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4
BIOL 180	Biology Research Seminar	1
BIOL 230	Ecology	4
BIOL 320	Genetics	4
BIOL 419	Philosophy of Science	3
	BIOL - Electives (x3-4)	12
	Sub-Total Credits	**32**

Required Cognates

Item #	Title	Credits
CHEM 111	General Chemistry I	4
CHEM 112	General Chemistry II	4
	MATH 121 or 141	3
	Sub-Total Credits	**11**
	Total credits for degree:	43

Minor in Biology

Program:
Biological Sciences
Type:
Minor

Required Courses

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4
	BIOL Minor - Electives (6 hours must be upper division)	10
	Sub-Total Credits	**18**
	Total credits for degree:	18

Minor in Life Science - Secondary Certification

You must make formal application for admittance to the Teacher Education Program. Applications are available at the Education Department Office.

Program:
Biological Sciences
Type:
Minor

Minor in Life Science - Secondary Certification

Item #	Title	Credits
BIOL 111	General Biology I	4
BIOL 112	General Biology II	4

BIOL 230	Ecology	4
BIOL 320	Genetics	4
BIOL 419	Philosophy of Science	3
	LIfe Science Minor Electives - upper division (x2)	8
	Sub-Total Credits	**27**
	Total credits for degree:	27

Biological Sciences Classes

BIOL 101: Anatomy & Physiology I
An integrated study of the anatomy and physiology of human organ systems with a focus on homeostasis and the role of cellular processes involved with maintaining that homeostasis. Topics include basic cell biology and histology, skin, bones, muscles, and the nervous system. Does not apply toward a biology major or minor.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Fall

BIOL 102: Anatomy & Physiology II
An integrated study of the anatomy and physiology of human organ systems with a focus on homeostasis and the role of cellular processes involved with maintaining that homeostasis. Topics include the cardiovascular, immune, respiratory, digestive, urinary, endocrine, and reproductive systems, as well as an introduction to metabolism, nutrition, chemical balance, pregnancy, development, and heredity. Does not apply toward a biology major or minor.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Spring

BIOL 103: Human Biology
This is a survey course, concerning the structure and function of the human body. Important themes in this course include understanding our bodies' systems, the impact of disease and injury, as well as disease prevention and the principles of healthful living. This course fulfills the Life Science Competency requirement as specified in the Core Curriculum. Does not apply toward a biology major or minor.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Fall

BIOL 111: General Biology I
A survey course covering the basic disciplines of life science. Topics include cell biology, metabolism, genetics, molecular biology, natural history, and microorganisms. A full sequence of high school biology and chemistry is highly recommended.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Fall

BIOL 112: General Biology II
A survey course covering the basic disciplines of life science. Topics include protists, fungi, plants, animals, and ecology. Animal physiology and behavior is emphasized. A full sequence of high school biology and chemistry is highly recommended.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Spring

BIOL 180: Biology Research Seminar
A freshman level seminar course designed to initiate students early in their careers to the concepts, principles and conduct of biological research by exposing them to active researchers in various disciplines of biology. Class activities include attendance at research presentations by staff and outside researchers, participation with questions and preparation of two page summary of each presentation. Required for all freshmen. All other biology majors will be expected to attend. Presentations by special guests.

Credits: 1
Program: Biological Sciences
Semester Offered: Fall

BIOL 220: Microbiology and Immunology
Introduction to the structure, function and control of microorganisms in the environment with special emphasis on those organisms of medical importance. Introduction to immune responses and mechanisms including antibody and host-antigen interactions, and humoral and cellular immunological response mechanisms. Lab fee. (Biology or MLS majors should take BIOL 318.)

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Fall

BIOL 225: Field Biology
This course is a field study of the plants, animals, natural features, and climate of a particular region of North America or perhaps another continent. it includes the study of ecological relationships in the selected study area. Students will be assessed by periodic quizzes in the field. This three week intensive field course will involve camping and extensive travel to National Parks, game reserves, and natural areas. A field trip fee will be charged commensurate with the distance traveled. (Offered periodically as an intensive course spanning 3 weeks before fall term, during Christmas holiday, or 3 weeks after spring term. Offered concurrently with BIOL 325. Non-Biology majors should register for BIOL 225.)

Credits: 4
Program: Biological Sciences

BIOL 230: Ecology
This course will examine the principles governing relationships between organisms and the physical and chemical environment and among organisms. Important topics will include population dynamics, ecosystem processes and the distribution of the earth's biomes. The principles of ecology will be brought to bear on issues such as conservation of biodiversity and wise use of natural resources. The laboratory includes a four-day field trip. Field trip fee.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Fall

BIOL 298: Individual Study Topics
A study in an area of student interest under the direction of a staff member. This study may involve data collection, or library

work and will involve a written report. Content and method of study must be arranged prior to registration. May be repeated for a total of 3 credits.

Credits: 1 - 3
Prerequisites: BIOL 111 BIOL 112 and approval of instructor
Program: Biological Sciences

BIOL 299: Directed Group Study Topics
Provides academic departments an opportunity to offer courses in specialized or experimental areas, either lower or upper division, not listed in the undergraduate *Bulletin*. May be repeated for a total of 3 credits.

Credits: 1 - 3
Prerequisites: Approval by department chair
Program: Biological Sciences

BIOL 312: Ornithology
A study of birds, with emphasis on avian identification, geographic distribution, migration, habits and conservation. Attention is given to anatomical and physiological features that contribute to their unique lifestyles. Laboratory sessions are largely in the field and include a five-day field trip. Field trip fee.

Credits: 3
Lab Hours: 3
Lecture Hours: 2
Prerequisites: BIOL 111
Program: Biological Sciences
Semester Offered: Spring even years

BIOL 314: Systematic Botany
This is a taxonomic study of the flowering plants of Texas. It includes methods for identification and preservation of plant specimens. Laboratory includes a four-day field trip. Field trip fee.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Spring odd years

BIOL 315: Field Invertebrate Zoology
A taxonomic and ecological study of invertebrates from marine, freshwater, and terrestrial environments. Some attention is focused on the direct role of invertebrates on human life. Laboratory studies include field work locally and at the Texas Gulf Coast. Field trip fee covering cost of transportation, room and board, and use of a research vessel. (Offered periodically)

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences

BIOL 318: Microbiology & Immunology
This course is an introduction to the structure, function and control of microorganisms in the environment with special emphasis on those organisms of medical importance. Included is an introduction to immune responses and mechanisms, antibody and host-antigen interactions, bursal and thymic influences on the lymphoid system, and humoral and cellular immunological response mechanisms. Offered concurrently with BIOL 220, so students of this course cannot appropriate for upper division level work. Students cannot take both courses for credit. (Class counts toward a Biology or MLS major.)

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences

Semester Offered: Fall

BIOL 320: Genetics
The study of inheritance and the molecular mechanisms which impact it with an emphasis on problem-solving and independent laboratory work. Course requires a comprehensive written report of results from a semester-long laboratory project.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Spring

BIOL 325: Field Ecology
This course is a field study of the plants, animals, natural features, and climate of a particular region of North America or perhaps another continent. It includes the study of ecological relationships in the selected study area. Students will be assessed by periodic quizzes in the field and a field presentation or a summative paper after returning to campus. This three week intensive field course will involve camping and extensive travel to National Parks, game reserves, and natural areas. A field trip fee will be charged commensurate with the distance traveled. (Offered periodically as an intensive course spanning 3 weeks before fall term, Christmas holiday, or 3 weeks after spring term. Offered concurrently with BIOL 225. Biology majors or minors should register for BIOL 325.)

Credits: 4
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences

BIOL 328: Biostatistics
The student will learn basic statistical skills, such as hypothesis testing, probability, statistical inference, correlation, regression, curve fitting, and population and sample comparison techniques. The student will also learn to analyze data and generate appropriate graphs using R, SPSS, and Excel.

Credits: 3
Prerequisites: BIOL 230 MATH 141
Program: Biological Sciences
Semester Offered: Spring

BIOL 330: Bacteriology and Virology
Biology of bacteria, viruses, fungi and other microorganisms, and their interactions with their environment. Includes surveys of microbial diversity and taxonomy, human-microbe relationships, environmental and industrial microbiology. Bacteria and viruses will be used in the laboratory to provide training and experimental methodology.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112 BIOL 320
Program: Biological Sciences
Semester Offered: Periodically

BIOL 333: Parasitology
This course is a comparative survey of the primary parasites of human and veterinary importance with an emphasis on morphology, life cycles, epidemiology, pathogenesis and the interface between the parasite and the host immune system. Students will develop a global perspective of the burden of parasitic diseases and will analyze current literature in molecular parasitology topics.

Credits: 3
Prerequisites: BIOL 111 BIOL 112 or permission of instructor
Program: Biological Sciences
Semester Offered: Spring odd years

BIOL 335: Limnology
In this course we will examine topics dealing with the biological and ecological characteristics and economic importance of surface waters, including lakes, streams and wetlands. Specific topics will include light and heat in aquatic environments, dissolved gasses, nutrients, dynamics of phytoplankton, periphyton, and consumers and the impact of human society on natural surface waters. Laboratory includes a four-day field trip. Field trip fee.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 230
Program: Biological Sciences
Semester Offered: Spring even years

BIOL 340: Cell and Molecular Biology I
A study of the internal workings of the cell. The molecular basis of various cell activities is emphasized. Particular attention is paid to molecular genetics, DNA replication, protein synthesis, regulation of gene expression, and methods in molecular biology.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 320
Program: Biological Sciences
Semester Offered: Fall

BIOL 341: Cell and Molecular Biology II
A study of the internal workings of the cell. The molecular basis of various cell activities is emphasized. Particular attention is paid to mammalian cell culture techniques, molecular transport, cell signaling, the cytoskeleton, the cell cycle, and the extracellular matrix.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 340
Program: Biological Sciences
Semester Offered: Spring

BIOL 345: Environment and Mankind
Environmental science is a discipline that encompasses learning in the sciences, and touches on human development, governance and policy, and ethics. This course will provide the student with the tools to think critically about the environment and how human decisions and activities influence the quality of our lives and the other creatures we share the earth with. We will engage in lecture, discussion, debate and group projects concerning the impact of environmental problems, such as waste management, climate change, water issues, biodiversity, air pollution, human population, and resource use by society. We will also focus on local problems concerning our environment (Also taught as HNRS 345).

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Program: Biological Sciences
Semester Offered: Spring

BIOL 360: Plant Biology
This is a broad course emphasizing importance of plants and their role in human life. This is an applied botany course in which physiology, structure, development and economic botany are studied. The systematic survey section will include algae, mosses, non-seed plants, and seed plants.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112 or permission of instructor

Program: Biological Sciences
Semester Offered: Spring even years

BIOL 410: Human Physiology
This course explores the inner workings of the human body and how it maintains homeostasis. Emphasis is placed on understanding structure-function relationships and the interconnectedness of organ systems. Students learn diagnostic problem-solving skills, quantitative laboratory techniques used by physiologists, and methods to evaluate health information using peer-reviewed sources.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111, 112 or BIOL 101, 102
Program: Biological Sciences
Semester Offered: Fall, even years

BIOL 419: Philosophy of Science
A study of the philosophies and methodologies of science. Includes a review of the history of scientific and religious thought and the role each has played in the development of modern theories of origin (Also taught as RELT or GEOL 419 or HNRS 404).

Credits: 3
Program: Biological Sciences
Semester Offered: Spring

BIOL 435: Herpetology
Lectures will introduce students to topics of importance to the study of reptiles and amphibians. In lecture, we will focus on anatomy, physiology, taxonomy, ecology, behavior and conservation of this fauna. In laboratories, we will focus on external anatomy, identification skills, habitat preferences, distribution, and collection techniques. We will place emphasis on the fauna in our immediate area, but we will discuss reptiles and amphibians from other areas of Texas in our laboratories.

Credits: 4
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Spring odd years

BIOL 440: Mammalogy
A systematic study of mammals with emphasis on natural history and ecology.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Fall, odd years

BIOL 443: Comparative Vertebrate Anatomy
An introduction to the classification and diversity of chordates and a comparison of the different vertebrate organ systems. Special consideration will be given to taxonomic comparisons of the skeletal and muscular systems.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Fall, even years

BIOL 450: Histology
An investigation of the structure and function of the tissues of the human body. The course is lab intensive and is intended to acquaint the student with the microscopic characteristics of tissues.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Fall, odd years

BIOL 455: Immunology
This course presents the basic concepts of the innate and adaptive immune systems including details about the molecules, cells and organs involved. Emphasis will be placed on mechanisms of immune system development and response to pathogens, as well as on the classic experiments performed to make key discoveries in immunology.

Credits: 3
Prerequisites: BIOL 320
Program: Biological Sciences
Semester Offered: Spring even years

BIOL 462: Ichthyology
A systematic study of fishes with emphasis on anatomy, physiology, taxonomy, behavior, ecology, and conservation of this fauna. In laboratories, we will focus on external anatomy, identification skills, habitat preferences, distribution, and collection techniques. We will place emphasis on the fauna in our immediate area. Lecture and laboratories will discuss fishes from other areas of Texas and the world.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Fall, even years

BIOL 465: Plant Physiology
This is a study of primary plant metabolic processes, including the movement of materials in and out of plant cells and within plants, photosynthesis, respiration, mineral nutrition, nitrogen metabolism and growth analysis. Other topics include environmental physiology such as the effects of temperature, salt, and water stress and the implications of globally rising carbon dioxide.

Credits: 4
Lab Hours: 3
Lecture Hours: 3
Prerequisites: BIOL 111 BIOL 112
Program: Biological Sciences
Semester Offered: Periodically

BIOL 475: Management of Fish & Wildlife Resources
This integrative course focuses on ecological principles as they are applied to the conservation and management of fisheries and wildlife resources. We will also discuss how conservation practices are influenced by politics and law, culture, social acceptability and economic feasibility. In lab, you will be introduced to the techniques and equipment used to survey fisheries and wildlife populations. Lec. 3 Lab 3.

Credits: 4
Prerequisites: BIOL 230
Program: Biological Sciences
Semester Offered: Fall, odd years

BIOL 480: Research in Biology
A supervised research experience involving the development of a research question, data collection, and data analysis. May be repeated for a total of 6 credits. May count as one Biology Elective with approval of the Department if research results are formally presented. Eligible for IP grading.

Credits: 3
Prerequisites: Approval of research advisor

Program: Biological Sciences
Semester Offered: Fall, Spring

BIOL 498: Individual Study Topics
Special study may be pursued beyond completed course work under the direction of a staff member. This study may involve data collection or library work and will involve a written report. Content and method of study must be arranged prior to registration. May be repeated for a total of 3 credits. (Offered periodically)

Credits: 1 - 3
Prerequisites: BIOL 111 BIOL 112 Two upper division courses; and permission of the instructor
Program: Biological Sciences

BIOL 499: Directed Group Study Topics
Provides academic departments an opportunity to offer courses in specialized or experimental areas, either lower or upper division, not listed in the undergraduate *Bulletin*. Student may be allowed to repeat the course for credit.

Credits: 1 - 3
Prerequisites: Approval by department chair
Program: Biological Sciences