MASTER OF SCIENCE (M.S.), MAJOR IN BIOLOGY

Admission Policy
For information regarding admission application requirements and deadlines, please visit The Graduate College website at http://www.gradcollege.txstate.edu/bio.html.

Degree Requirements
The thesis-based master of science (M.S.) degree with a major in biology requires a minimum of 30 semester hours of course work. A supporting minor may be selected with the approval of the appropriate graduate advisor. For the thesis-based degree, the minor must be in the College of Science and Engineering or Department of Geography.

The non-thesis master of science degree with a major in biology requires a minimum of 45 semester hours. A supporting minor may be selected with the approval of the appropriate graduate advisor. For the non-thesis degree, any graduate minor may be chosen.

Course Work Requirements

Thesis Option

Select one of the following seminar options: 3-4

Option A - Take 3 hours from the following:
BIO 5110 Seminar in Biology
BIO 7102 Seminar in Aquatic Resources
BIO 7120 Population Biology Seminar

Option B - Take 2 seminar courses from Option A and:
BIO 5295 Fundamentals of Research

Select a minimum of 21 additional hours of 5000- or 7000-level course work. 1

Thesis Courses (Choose a minimum 6 hours) 6
BIO 5199B Thesis
BIO 5299B Thesis
BIO 5399A Thesis
BIO 5399B Thesis
BIO 5599B Thesis
BIO 5999B Thesis

Total Hours 30-31

1 A maximum of two courses offered in other departments may be substituted for elective course work towards the M.S. in biology with prior approval of the graduate advisor and dean of The Graduate College. Courses taught outside the department that do not require prior approval are: CHEM 5385; HR 5330, HR 5331, HR 5339, HR 5351; and GEO 5415, GEO 5418, GEO 5419, GEO 7417.

Non-thesis Option

BIO 5390 Problems in the Biological Sciences (at least one term of an independent study project) 3

Select one of the following seminar options: 3-4

Option A - Take 3 hours from the following:
BIO 5110 Seminar in Biology
BIO 7102 Seminar in Aquatic Resources
BIO 7120 Population Biology Seminar

Option B - Take two seminars from Option A and:
BIO 5295 Fundamentals of Research

Choose 39 additional hours of elective course work 1 39

Total Hours 45-46

1 A maximum of two courses offered in other departments may be substituted for elective course work towards the M.S. in biology with prior approval of the graduate advisor and dean of The Graduate College. Courses taught outside the department that do not require prior approval are: CHEM 5385; HR 5330, HR 5331, HR 5339, HR 5351; and GEO 5415, GEO 5418, GEO 5419, GEO 7417.

Non-thesis Option with Minor

BIO 5390 Problems in the Biological Sciences (at least one term of an independent study project) 3

Select one of the following seminar options: 3-4

Option A - Take 3 hours from the following:
BIO 5110 Seminar in Biology
BIO 7102 Seminar in Aquatic Resources
BIO 7120 Population Biology Seminar

Option B - Take two seminars from Option A and:
BIO 5295 Fundamentals of Research

Choose 27 additional hours of elective course work 1 27

Minor Course Work 12

Total Hours 45-46
A maximum of two courses offered in other departments may be substituted for elective course work towards the M.S. in biology with prior approval of the graduate advisor and dean of The Graduate College. Courses taught outside the department that do not require prior approval are: CHEM 5385; HR 5330, HR 5331, HR 5339, HR 5351; and GEO 5415, GEO 5418, GEO 5419, GEO 7417.

**Thesis Students**

Students pursuing a master’s degree with thesis should have a thesis committee approved by the end of their first long term of enrollment in the graduate program. The thesis committee comprises three or more individuals and is chaired by the thesis advisor. Committee members should be selected by the student in consultation with the thesis advisor and should be chosen on the basis of what they can contribute to the student’s research and/or graduate studies. Committee members expect to be consulted.

**Non-thesis Students**

Students pursuing a non-thesis degree are required to have a major professor by the end of their first long term of enrollment in the graduate program. The major professor will normally be a faculty member specializing in an area of particular interest to the student and is often the individual who supervises the required independent study project. Prior to the final term of enrollment the non-thesis student must, in consultation with the major professor, select a committee that will administer the final comprehensive examination. A “Master’s Non-Thesis Committee form” can be downloaded from the Department of Biology’s website and must be approved by the chair of the department’s graduate committee and the department chair.

**Comprehensive Examination**

All candidates for master’s degrees in the Department of Biology must pass a comprehensive final examination administered by the student’s committee. The examination may be oral or written and must cover, at a minimum, the student’s field of concentration and the thesis, if one was written. The results of this exam should be reported on the “Master’s Comprehensive Examination Report” form, which can be downloaded from The Graduate College website and which must be filed in the office of The Graduate College at least 10 days prior to the date of expected graduation.

If a student elects to follow the thesis option for the degree, a committee to direct the written thesis will be established. The thesis must demonstrate the student’s capability for research and independent thought. Preparation of the thesis must be in conformity with the Graduate College Guide to Preparing and Submitting a Thesis or Dissertation. The thesis handbook may be accessed at http://www.gradcollege.txstate.edu/docs/Thesis_Diss_Guide.pdf.

**Thesis Proposal**

The student must submit an official Master’s Thesis Proposal form to their thesis committee. The required thesis proposal form may be obtained from The Graduate College at http://www.gradcollege.txstate.edu/gcforms.html. After signing the form and obtaining committee members’ signatures, graduate advisor’s signature (if required by the program), and the department chair’s signature, the student must submit the thesis proposal form with one copy of the proposal attached to the dean of The Graduate College for approval before proceeding with research on the thesis. If the thesis research involves human subjects, the student must obtain exemption or approval from the Texas State Institutional Review Board prior to submitting the proposal form to The Graduate College. If the thesis research involves vertebrate animals, the proposal form must include the Texas State IACUC approval code. It is recommended the thesis proposal form be submitted to the dean of The Graduate College by the end of the student’s enrollment in 5399A.

**Thesis Committee**

The thesis committee must be composed of a minimum of three approved graduate faculty members.

**Thesis Enrollment and Credit**

The completion of a minimum of six hours of thesis enrollment is required. Enrollment for the thesis will be in course number 5399A for a student’s initial thesis enrollment and a thesis B course for each subsequent thesis enrollment in the field in which the subject matter of the thesis falls, e.g., ENG 5399A, ENG 5199B, ENG 5299B, ENG 5399B, ENG 5599B, and ENG 5999B. Preliminary discussions regarding the selection of a topic and assignment to a research supervisor will not require enrollment for the thesis course.

A student will be required to enroll in and pay the fee for at least one hour of the thesis course during any term in which the student will receive thesis supervision or guidance and/or in which the student is using university resources. Failure to register for the thesis course during a term in which supervision is received may result in postponement of graduation. After initial enrollment in 5399A, the student will continue to enroll in a thesis B course as long as it takes to complete the thesis. In the rare case when a student has not previously enrolled in thesis and plans to work on and complete the thesis in one term, the student will enroll in both 5399A and 5399B. The only grades assigned for thesis courses are PR (progress), CR (credit), W (withdrawn), and F (failing). If acceptable progress is not being made in a thesis course, the instructor may issue a grade of F. If the student is making acceptable progress, a grade of PR is assigned until the thesis is completed. The minimum number of hours of thesis credit (“CR”) will be awarded only after the thesis is filed in the Alkek Library and the librarian has electronically returned the thesis card to the office of The Graduate College.

A student who has selected the thesis option must be registered for the thesis course during the term or Summer I (during summer the thesis course runs ten weeks for both sessions) in which the degree will be conferred.

**Fee Reduction**

A master’s degree candidate for graduation may be eligible for a one-time fee reduction under V.T.C.A. Education Code, Section 54.054. Please refer to the section titled Fee Reduction in the Additional Fees and Expenses chapter of this catalog for more information.

**Thesis Deadlines and Approval Process**

Thesis deadlines are posted at the following web page: http://www.gradcollege.txstate.edu/Thes-Diss_Info/T-D_Deadlines.html. The completed thesis must be submitted to the chair of the thesis committee no later than 41 days before the date of the commencement at which the degree is to be conferred.

The following must be submitted to the office of The Graduate College no later than 24 days, not counting weekends or holidays, before the date of commencement at which the degree is to be conferred (see The Graduate College webpage for specific deadlines):
Courses Offered

Biology (BIO)

BIO 5100. Professional Development.
This course is seminar-based and covers topics related to teaching, research, and employment responsibilities. Completion of the course is required as a condition of employment for graduate assistants. This course does not earn graduate degree credit. Repeatable with different emphasis. Graded on a credit (CR), no-credit (F) basis. 

About Professional Development
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships

BIO 5110. Seminar in Biology.
Interactive discussion of timely issues and problems, designed to expose students to the current literature in their fields of interest and its critical analysis. This course is repeatable for credit.

About Seminar in Biology
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

BIO 5114. Collaborative Research.
This course allows master's level graduate students to initiate, conduct, and participate in research in collaboration with graduate faculty of the Department of Biology that is in addition to thesis research conducted under BIO 5399A or BIO 5399B. This course recognizes the collaborative nature of scientific investigation. See also BIO 5214 and BIO 5314.

About Collaborative Research
1 Credit Hour. 1 Lecture Contact Hour. 1 Lab Contact Hour.
Grade Mode: Standard Letter

BIO 5166. Medical Microbiology Laboratory.
This graduate laboratory-based course will cover pathogenic bacteria emphasizing identification of selected groups of pathogens and the biological basis for virulence. Prerequisites: BIO 2400 and BIO 2450 with minimum grades of C.

About Medical Microbiology Laboratory
1 Credit Hour. 0 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter

BIO 5199B. Thesis.
This course represents a student's continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Cannot be taken unless a Thesis Proposal has been submitted. Students working toward the M.A. or M.S. with a thesis are expected to enroll in thesis each semester in which faculty supervision is received or laboratory facilities are utilized. Graded on a credit (CR), progress (PR), no-credit (F) basis.

About Thesis
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 5214. Collaborative Research.
This course allows master's level graduate students to initiate, conduct, and participate in research in collaboration with graduate faculty of the Department of Biology that is in addition to thesis research conducted under BIO 5399A or BIO 5399B. This course recognizes the collaborative nature of scientific investigation. See also BIO 5314.

About Collaborative Research
2 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 5295. Fundamentals of Research.
Designed to acquaint the beginning graduate student with materials and methods of research in the biological sciences. It is recommended that a graduate student take this course the first semester in residence.

About Fundamentals of Research
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 5299B. Thesis.
This course represents a student's continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Cannot be taken unless a Thesis Proposal has been submitted. Students working toward the M.A. or M.S. with a thesis are expected to enroll in thesis each semester in which faculty supervision is received or laboratory facilities are utilized. Graded on a credit (CR), progress (PR), no-credit (F) basis.

About Thesis
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
BIO 5300. Neurobiology.
This course presents the biology of the nervous system with emphasis on the human nervous system. Topics presented in lecture include neuroanatomy, cellular neurobiology, neurophysiology, developmental neurobiology, and neuronal plasticity. Prerequisites: PHYS 1420 and PHYS 1430 or consent of instructor.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Neurobiology

BIO 5301. Evolution.
Basic genetic principles applied to natural selection, adaptation, populations, and speciation. Consideration is given to the origin of life, nature of chromosomal variation, evolution of genetic systems, and certain other selected topics. Prerequisite: Undergraduate genetics course or its equivalent.

3 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Evolution

Students will be introduced to the impact human recreational activities have on wildlife habitats and populations. Management practices to enhance human-wildlife encounters or to minimize detrimental effects on wildlife populations will be presented. Prerequisites: BIO 1330/BIO 1130 and BIO 1331/BIO 1131 or BIO 1320 and BIO 1421.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Wildlife and Recreation: Impact and Management

BIO 5305. Methods of Nature Study for Teachers.
This course provides a comprehensive survey of natural events. It includes laboratory and field work emphasizing observation, collection and discovery of relationships. It is creditable only for those seeking elementary or middle school certification and is required for those seeking grade 4-8 Science or Science/Mathematics teaching certification. This course must be taken the semester immediately prior to student teaching.

3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Methods of Nature Study for Teachers

BIO 5311. Cancer Biology.
Cancer Biology provides a foundation for understanding the complex molecular, biochemical, and cellular processes associated with cancer development. Topics include the role of tumor suppressor genes, oncogenes, DNA repair, apoptosis, ECM, cell-cycle control, cell signaling pathways, immune function and cancer-causing viruses. Emerging diagnostics and/or therapeutics will also be discussed.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Cancer Biology

BIO 5314. Collaborative Research.
This course allows master's level graduate students to initiate, conduct, and participate in research in collaboration with graduate faculty of the Department of Biology that is in addition to thesis research conducted under BIO 5399A or BIO 5399B. This course recognizes the collaborative nature of scientific investigation.

3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
about Collaborative Research

BIO 5319A. Statistical Methods in Biology.
Selected topics in Biology.

3 Credit Hours. 2.5 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Statistical Methods in Biology

BIO 5319C. Ecotoxicology.
Topics to be covered include sources, types, and fates of toxicants, organism response to toxicants, toxicant effects at the population, community, and ecosystem levels, and monitoring and risk assessment. Examination of current literature will form the core of the course.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Ecotoxicology

BIO 5319F. Watershed Management Frameworks and Applications.
Introduction to integrated watershed assessment and management tools for identifying programmatic water quality and quantity issues and their root causes and solutions, and their practical application. The scientific and socio-economic elements are considered within the context of planning and developing watershed protection plans and programs.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Watershed Management Frameworks and Applications

BIO 5324. Natural History and Conservation of Large Mammals.
This course will introduce students to advanced details of natural history, research, and conservation of large mammals. Topics considered will include natural history, range and population status (historic and current), importance to and interaction with humans, research design and analysis, and the development of conservation and management plans.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Natural History and Conservation of Large Mammals
BIO 5335. Fisheries Management.
An introduction to principles and techniques in fisheries management. Includes the study of artificial reproduction, carrying capacity, productivity, sampling procedures, population estimates, mortality, survival growth rates, and commercial and sport fisheries. (Spring, even years). Prerequisite: Ichthyology course or consent of instructor. 3 Credit Hours. 2 Lecture Contact Hours. 4 Lab Contact Hours.
Grade Mode: Standard Letter
Course Attribute(s): Lab Required
about Fisheries Management

BIO 5350G. Medical Microbiology.
This lecture-based course will cover pathogenic bacteria and their ability to cause disease, emphasizing the biological basis for virulence, and research strategies for investigating infectious diseases. Prerequisite: BIO 2400 or equivalent. Students may take only one of BIO 5350G or BIO 5445 for credit. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Medical Microbiology

BIO 5350H. Immunobiology.
This lecture-based course will cover both classic and recent advances in immunobiology. Emphasis on immune cell-cell interaction and its relationship to the immune response. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Immunobiology

BIO 5350I. Emerging Infectious Diseases.
Current topics in the emergence of viral and bacterial diseases in humans. This course will include new diseases, diseases previously seen and increasing in incidence, and diseases not previously seen in this country. This course will be of interest to students who are pursuing advanced degrees and courses in microbiology, biochemistry, and cell and molecular biology. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Emerging Infectious Diseases

BIO 5350J. Environmental Physiology of Animals.
This course is a study of how animals respond physiologically to changes in environmental temperature, moisture, salinity, partial pressure of gases, and toxins. Permission of instructor is required. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Environmental Physiology of Animals

BIO 5350K. Genomics.
The course is a lecture course in modern genomics, including principles of genome function, the human genome, comparative genomics, genome sequencing, evolution and genomic change, databases and medicine, ethical, legal and social issues. The course also includes discussion of transcriptomics, proteomics, metabolomics, directed evolution, protein design, and systems biology. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Genomics

BIO 5350L. Graduate Bacterial Genetics.
This course will cover concepts and mechanisms involved in the genetics of Archaea and Bacteria. Graduate students will learn current strategies dealing with traditional molecular genetics including epigenetics and post-transcriptional regulation involving small non-coding RNA. 3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Graduate Bacterial Genetics

BIO 5350M. Wildlife Policy and Law in North America.
This course provides the student with a historical and cultural context within which wildlife policy and law (federal treaties, statutes, case law, and regulations) have developed in North America, particularly in the United States. Graduate students will research the development of Wildlife law in representative states as well. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Wildlife Policy and Law in North America

BIO 5350N. Virology.
This course examines the structure, multiplication and genetics of bacterial, plant, and animal viruses as well as the role of viruses in human and plant disease. Students are expected to become familiar with the research literature in virology. 3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Virology

Students will obtain a first-hand knowledge of the ecology, biodiversity, conservation, and culture of tropical ecosystems. It is an immersive and intensive study abroad course combining traditional lecture and field-based laboratory instruction. All course work will be conducted during a 1- month stay in the South American country of Ecuador. Co-requisite: BIO 5350P. 3 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.
Co-requisite(s): BIO 5350P
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Tropical Ecology and Conservation

Students will obtain a first-hand knowledge of the ecology, biodiversity, conservation, and culture of tropical ecosystems. It is an immersive and intensive study abroad course combining traditional lecture and field-based laboratory instruction. All course work will be conducted during a 1-month stay in the South American country of Ecuador. Co-requisite: BIO 5350P. 3 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.
Co-requisite(s): BIO 5350P
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Tropical Ecology and Conservation
BIO 5350P. Tropical Ecology and Conservation Lab.
This laboratory course complements the lecture course BIO 5350O, in which students will obtain a first-hand knowledge of the ecology, biodiversity, conservation, and culture of tropical ecosystems. It is an immersive and intensive study abroad course combining traditional lecture and field-based laboratory instruction. All course work will be conducted during a ~1 month stay in the South American country of Ecuador. Co-requisite: BIO 5350O.

3 Credit Hours. 0 Lecture Contact Hours. 9 Lab Contact Hours.
Co-requisite(s): BIO 5350O
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter
about Tropical Ecology and Conservation Lab

BIO 5350Q. Biological Oceanography.
Students will be introduced to the principles of oceanography and will understand anthropogenic impacts on the oceans. Topics to be investigated will include: ocean formation and destruction, sediments, ocean circulation, waves, tides, estuaries, life in the oceans, hydrothermal vents, coral reefs, fisheries, marine pollution, and climate change. 

about Biological Oceanography

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter
about Biological Oceanography

Current government regulations regarding environmental impact, content of environmental impact statements, how to proceed with an impact study, application of ecological principles to impact studies, and steps in the review process for environmental impact statements are considered. (Spring, odd years). Prerequisite: Consent of instructor.

about Environmental Impact Analysis

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Environmental Impact Analysis

BIO 5366. Medical Microbiology.
This lecture-based course will cover pathogenic bacteria and their relationship to disease, emphasizing critical evaluation of research literature, disease transmission and the biological basis for virulence. Prerequisites: BIO 2400 and BIO 2450 with minimum grades of C.

about Medical Microbiology

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Medical Microbiology

BIO 5390. Problems in the Biological Sciences.
Open to graduate students on an individual basis by arrangement with the faculty member concerned.

3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Problems in the Biological Sciences

BIO 5399A. Thesis.
This course represents a student’s initial thesis enrollment. No thesis credit is awarded until student has completed the thesis in BIO 5399B. Students working toward the M.A. or M.S. with a thesis are expected to enroll in thesis each semester in which faculty supervision is received or laboratory facilities are utilized. Graded on a credit (CR), progress (PR), no-credit (F) basis.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis

BIO 5399B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Cannot be taken unless a Thesis Proposal has been submitted. Students working toward the M.A. or M.S. with a thesis are expected to enroll in thesis each semester in which faculty supervision is received or laboratory facilities are utilized. Graded on a credit (CR), progress (PR), no-credit (F) basis.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis

BIO 5402. Earth Science I.
A study of astronomy and meteorology through observation, description, and interpretation of earth phenomena. Includes field observations, methods of measurement and interpretation of data related to the physical environment and space technology. Requires independent scientific and science education research and presentation of findings in a professional context.

about Earth Science I

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Earth Science I

BIO 5403. Earth Science II.
The description and interpretation of earth phenomena considered from the standpoint of geology and oceanography. Includes field observations, methods of sampling and interpretation of data related to the physical environment. Requires independent scientific and science education research and presentation of findings in a professional context.

about Earth Science II

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Earth Science II
BIO 5408. Science Processes and Research.
Students will analyze scientific research design, design research, interpret data, and communicate results. Stress will be placed on broadfield structure and integration of major science concepts and research-based science pedagogy. This course may be taken the semester prior to student teaching and is required for those seeking 7-12 Life Science or Science teacher certification. This course may not count as one of the four upper-level Biology courses required of general Biology majors, or one of the three upper-level Biology courses required of Biology minors.
Grade Mode: Standard Letter
about Science Processes and Research
4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Science Processes and Research

BIO 5410. Field Biology of Plants.
Ecological relationships and natural history of plants, including historical geography, soils, and vegetational regions of Central Texas. Prerequisite: Biology undergraduate botany course or consent of instructor.
Grade Mode: Standard Letter
about Field Biology of Plants
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Field Biology of Plants

A phylogenetic survey of living and fossil vascular plants that focuses on external morphology and reproductive biology. Topics include phylogenetic reconstruction, the origin of vascular plants, seed reproduction, and the origin of angiosperms. Emphasis is on broad-scale evolutionary patterns and origin of major taxonomic groups. Prerequisites: Biology undergraduate botany course and General Chemistry I and II, or consent of instructor.
Grade Mode: Standard Letter
about Morphology of the Vascular Plants
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Morphology of the Vascular Plants

BIO 5412. Plant Anatomy.
A descriptive and functional analysis of seed plants that focuses on internal structure. Topics include recognition and characterization of plant tissues, the structure of plant organs, and organ development. Emphasis is on pattern of tissue organization common to all seed plants and the functional basis for anatomical structure. Prerequisites: Biology undergraduate botany course, and General Chemistry I and II, or consent of instructor.
Grade Mode: Standard Letter
about Plant Anatomy
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Plant Anatomy

BIO 5413. Parasitology.
The biology and biological significance of the common parasites of man and animals. Prerequisite: Biology undergraduate zoology course or consent of instructor.
Grade Mode: Standard Letter
about Parasitology
4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Parasitology

BIO 5415. Ichthyology.
An introduction to the morphology, taxonomy, natural history, and evolution of fishes. Field trips will be made to collect specimens, and laboratory periods will be devoted to morphological and systematic analyses. Prerequisite: Biology undergraduate zoology course or consent of instructor.
Grade Mode: Standard Letter
about Ichthyology
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Ichthyology

BIO 5418. Field Ornithology.
This course is designed to introduce and provide an advanced knowledge of the application of various field, laboratory, and statistical methods and techniques in the study of avian species. The course will include topics related to survey methodology, sampling design, marking/banding, measurement/sample extraction, and aging/sexing of avian species.
Grade Mode: Standard Letter
about Field Ornithology
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Field Ornithology

Class covers ecological theories, concepts, and processes occurring at the population, community, and ecosystem levels of organization in running water. Lab includes sampling methods, description and comparative studies, experiments, critical discussion of literature and experience in writing manuscripts. Prerequisite: Consent of instructor.
Grade Mode: Standard Letter
about Stream Ecology
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Stream Ecology

BIO 5420. Natural History of the Vertebrates.
Environmental relationships and natural history of vertebrates. Emphasis is on evolution taxonomy, speciation, behavior, and morphology. Laboratory will include field trips for the study and collection of vertebrates in their natural habitats. Students will assemble a representative collection of vertebrates.
Grade Mode: Standard Letter
about Natural History of the Vertebrates
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Natural History of the Vertebrates

BIO 5421. Ornithology.
Introduction to anatomy, behavior, ecology, and identification of the birds of Texas. Laboratory will emphasize field studies of birds and their habitat requirements.
Grade Mode: Standard Letter
about Ornithology
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Ornithology
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Grade Mode</th>
<th>Course Attribute(s)</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>BIO 5422</td>
<td>Mammalogy</td>
<td>The taxonomy, distribution, ecology, behavior, and evolution of mammals with particular emphasis on wild mammals of the Southwest. Laboratory will emphasize anatomy, identification, preparation of specimens, and field exercises in methods of population analysis. Students may assemble representative mammal collection.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td>BIO 5423</td>
<td>Wildlife Management</td>
<td>Application of ecological principles and natural history concepts to the management of wildlife habitats and populations. Laboratory will involve demonstrations and practice exercises with wildlife management techniques and instrumentation, and field trips to observe wildlife management projects.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td>BIO 5424B</td>
<td>Ecology of Infectious Diseases of Wildlife</td>
<td>Concepts of the ecology of infectious diseases in wildlife are studied in depth with emphasis on their application to the management and conservation of wildlife species.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
<td>4</td>
<td>3</td>
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<td>BIO 5426</td>
<td>Immunology</td>
<td>A study of the immune response, antigen/antibody reactions, major histocompatibility complex, and immunopathology. Prerequisite: Biology undergraduate cellular biology course or BIO 3442 and organic chemistry, or consent of instructor.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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<td>BIO 5434</td>
<td>Herpetology</td>
<td>A course treating the origin and evolution of amphibians and reptiles; their reproductive and physiological tactics; taxonomy/systematics; and population biology. Emphasis will be placed on North American species and those groups inhabiting Texas.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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<td>BIO 5435</td>
<td>Techniques in Wildlife Management</td>
<td>The basic methodology of practical wildlife management. This involves techniques in monitoring and data collection related to population dynamics and habitat parameters of wildlife species as well as field research.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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<td>BIO 5441</td>
<td>Cellular Physiology</td>
<td>Advanced cellular biology, including membrane physiology, thermodynamics, energy transduction and distribution, and cellular movement in non-muscle and muscle cells. Laboratory includes discussion of current research and exercises in cellular physiology.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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<td>BIO 5442</td>
<td>Experimental Techniques</td>
<td>Use of methods and instruments applicable to biological investigations, including colorimetry, UV-spectrophotometry, fluorescence, flame and atomic absorption spectrophotometry, paper, gas, gel filtration and ion exchange chromatography, radioactive counting, and electrophoresis.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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<td>BIO 5450</td>
<td>Physiological Ecology of Animals</td>
<td>Course brings together the principle concepts of environmental physiology of animals. The biological problems associated with living in various ecological realms will be discussed, and the biochemical and physiological adaptations of animals to their diverse habitats will be studied.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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<td>BIO 5454</td>
<td>Plant Ecology</td>
<td>Functional ecology of terrestrial plants, plant populations, and communities. Laboratory emphasizes quantitative and experimental approaches to plant ecology and the use of field and laboratory physiology equipment.</td>
<td>Standard Letter</td>
<td>Lab Required</td>
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BIO 5465. General Entomology.
Principles of morphology, physiology, and taxonomy of insects. Laboratory time will be devoted to a taxonomic study of the common orders and families of insects. Prerequisite: Biology undergraduate zoology course or consent of instructor.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
Course Attribute(s): Lab Required
about General Entomology

BIO 5466. Phylogenetic Methods.
Reconstructing phylogenies is important in most fields of biology. Course emphasis is on practical data collection, management, and analysis. Laboratory exercises will introduce phylogenetic and DNA analysis software. Students will learn how to address questions in their own research using phylogenetic methodologies. Prerequisite: Genetics course or consent of instructor.
4 Credit Hours. 2 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Phylogenetic Methods

BIO 5470. Limnology.
Physical, chemical, and biological factors affecting productivity in lakes, ponds, and streams. Limnology sampling methods, chemical and biological analysis of samples, and hydrographic surveying are included in the laboratory. Prerequisite: One year of chemistry, or consent of instructor.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
about Limnology

BIO 5471. Reservoir Ecology.
Study of the physical, geological, chemical, and biological factors that influence and make up reservoir ecosystems. Prerequisites: Limnology course or consent of instructor.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
about Reservoir Ecology

BIO 5472. Animal Behavior.
This course presents all the major facets of the study of animal behavior, giving special attention to its evolution and ecological significance. We will discuss major conceptual models guiding past and present research in the field. Laboratories will emphasize experimental techniques and statistical analysis. Prerequisites: One course in statistics, or consent of instructor.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
about Animal Behavior

BIO 5475. Cytology and Micro-technique.
Study of cellular ultra-structure and electron micro technique. Lecture portion of course will cover cytology of all cell types and theoretical aspects of light microscopy and electron microscopy. Laboratory portion will train students to proficiency in microscopy.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Cytology and Micro-technique

BIO 5480. Cytology and Micro-technique.
Study of cellular ultra-structure and electron micro technique. Lecture portion of course will cover cytology of all cell types and theoretical aspects of light microscopy and electron microscopy. Laboratory portion will train students to proficiency in microscopy.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Cytology and Micro-technique

BIO 5481. Internship in Biological Laboratory Technologies.
The student will participate in the work of a selected biology unit (private, commercial, or governmental). A research paper reporting the internship experience conducted at the biological unit under the supervision of a faculty member will be required. This may be credited toward a biology major with prior approval of the graduate advisor and department chair. Graded on a credit (CR), no credit (F) basis.
4 Credit Hours. 0 Lecture Contact Hours. 15 Lab Contact Hours.
Grade Mode: Standard Letter
about Internship in Biological Laboratory Technologies

A course on theory of operation and practical use of the scanning electron microscope as applied to biological materials. The course includes aspects of specimen preparation, photomicroscopy, micrograph interpretation, and microscope maintenance procedures. The course will provide the student training necessary to independently do scanning electron microscopy.
4 Credit Hours. 2 Lecture Contact Hours. 6 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Scanning Electron Microscopy

BIO 5499B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Cannot be taken unless a Thesis Proposal has been submitted. Students working toward the M.A. or M.S. with a thesis are expected to enroll in thesis each semester in which faculty supervision is received or laboratory facilities are utilized. Graded on a credit (CR), progress (PR), no-credit (F) basis.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis

BIO 5599B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Cannot be taken unless a Thesis Proposal has been submitted. Students working toward the M.A. or M.S. with a thesis are expected to enroll in thesis each semester in which faculty supervision is received or laboratory facilities are utilized. Graded on a credit (CR), progress (PR), no-credit (F) basis.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis