MAJOR IN BIOLOGY

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

Course Work Requirements
The thesis-based master of arts degree with a major in biology requires a minimum of 30 semester hours of course work including:

<table>
<thead>
<tr>
<th>Biology Courses</th>
<th>3-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option A - Choose 3 hours from the following:</td>
<td></td>
</tr>
<tr>
<td>BIO 5110 Seminar in Biology</td>
<td></td>
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<tr>
<td>BIO 7102 Seminar in Aquatic Resources</td>
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<tr>
<td>BIO 7120 Population Biology Seminar</td>
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<tr>
<td>Option B - Take 2 hours of seminar courses from Option A and:</td>
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<tr>
<td>BIO 5295 Fundamentals of Research</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Biology Electives</th>
<th>15</th>
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<tbody>
<tr>
<td>Select a minimum of 15 additional hours of 5000- or 7000-level BIO course work.</td>
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<tr>
<td>Thesis</td>
<td>6</td>
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<tr>
<td>Choose a minimum 6 hours from:</td>
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<tr>
<td>BIO 5199B Thesis</td>
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<td>BIO 5299B Thesis</td>
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<td>BIO 5399A Thesis</td>
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<td>BIO 5399B Thesis</td>
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<td>BIO 5599B Thesis</td>
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<tr>
<td>BIO 5999B Thesis</td>
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<tr>
<td>Non-science Minor</td>
<td>6</td>
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<tr>
<td>Total Hours</td>
<td>30-31</td>
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</tbody>
</table>

Students wishing to pursue a minor may choose one from outside the College of Science and Engineering. This option reduces the Biology Electives requirement to 15 hours and adds a minimum of 6 hours in an approved graduate minor.

Elective Course Work
A maximum of two courses offered in other departments may be substituted for elective course work towards the M.A. 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 5385</td>
<td>MPMetabolism</td>
<td>3</td>
</tr>
<tr>
<td>HR 5330</td>
<td>Biostatistics for Health Professionals</td>
<td>3</td>
</tr>
<tr>
<td>HR 5331</td>
<td>Research Methods in Health Services</td>
<td>3</td>
</tr>
<tr>
<td>HR 5339</td>
<td>Advanced Multivariate Health Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>HR 5351</td>
<td>Principles of Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 5415</td>
<td>Geographic Applications of Remote Sensing</td>
<td>4</td>
</tr>
<tr>
<td>GEO 5418</td>
<td>Geographic Information Systems I</td>
<td>4</td>
</tr>
</tbody>
</table>

GEO 5419 Geographic Information Systems II 4
GEO 7417 Geographic Information Systems II 4

Comprehensive Exam
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, 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):

1. The Thesis/Dissertation Committee Approval form bearing original signatures of the student and all committee members.
2. One (1) copy of the thesis in final form, approved by all committee members, on standard paper (Hard-copy Submission Option) or PDF of the thesis in final form, approved by all committee members, uploaded in the on-line Vireo submission system (Vireo On-line Submission Option).

After the dean of The Graduate College approves the thesis, the process is as follows:

1. For the Vireo On-line Submission Option:
   a. No copies are required to be submitted to the Alkek Library. However, Alkek will bind copies submitted that the student wants bound for personal use. Personal copies are not required to be printed on archival quality paper. The student will take the personal copies to the Alkek Library and pay the binding fee for personal copies.

**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.

**Course Attribute(s):** Graduate Assistantship|Exclude from Graduate GPA

**Grade Mode:** Leveling/Assistantships

**about Professional Development**

**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.

**Course Attribute(s):** Exclude from 3-peat Processing

**Grade Mode:** Standard Letter

**about Seminar in Biology**

**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.

**Course Attribute(s):** Exclude from 3-peat Processing

**Grade Mode:** Standard Letter

**about Collaborative Research**

**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.

**Course Attribute(s):** Exclude from 3-peat Processing

**Grade Mode:** Standard Letter

**about Medical Microbiology Laboratory**

**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.

**Course Attribute(s):** Exclude from 3-peat Processing

**Grade Mode:** Credit/No Credit

**about Thesis**

Master’s level courses in Biology: BIO
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.  
Grade Mode: Standard Letter  
about Collaborative Research  
2 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.  

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.  
Grade Mode: Standard Letter  
about Fundamentals of Research  
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.  

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.  
Grade Mode: Credit/No Credit  
about Thesis  
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.  

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

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.  
Grade Mode: Standard Letter  
about Evolution  
3 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.  

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

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.  
Grade Mode: Standard Letter  
about Methods of Nature Study for Teachers  
3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours. 

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

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

BIO 5319A. Statistical Methods in Biology.  
Selected topics in Biology.  
Grade Mode: Standard Letter  
about Statistical Methods in Biology  
3 Credit Hours. 2.5 Lecture Contact Hours. 3 Lab Contact Hours. 

Texas State University
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Grade Mode</th>
<th>Course Attribute(s)</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 5319C</td>
<td>Ecotoxicology</td>
<td></td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>This course will cover topics such as 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.</td>
</tr>
<tr>
<td>BIO 5319F</td>
<td>Watershed Management Frameworks and Applications</td>
<td>Standard Letter</td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>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. Prerequisite: Instructor approval.</td>
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<tr>
<td>BIO 5324</td>
<td>Natural History and Conservation of Large Mammals</td>
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<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>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.</td>
</tr>
<tr>
<td>BIO 5335</td>
<td>Fisheries Management</td>
<td></td>
<td>3 Credit Hours. 2 Lecture Contact Hours. 4 Lab Contact Hours.</td>
<td>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.</td>
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<tr>
<td>BIO 5350G</td>
<td>Medical Microbiology</td>
<td></td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>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.</td>
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<tr>
<td>BIO 5350H</td>
<td>Immunobiology</td>
<td>Standard Letter</td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>This course will cover both classic and recent advances in immunobiology. Emphasis on immune cell-cell interaction and its relationship to the immune response.</td>
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<tr>
<td>BIO 5350I</td>
<td>Emerging Infectious Diseases</td>
<td></td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>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 pursing advanced degrees and courses in microbiology, biochemistry, and cell and molecular biology.</td>
</tr>
<tr>
<td>BIO 5350J</td>
<td>Environmental Physiology of Animals</td>
<td>Standard Letter</td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>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.</td>
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<tr>
<td>BIO 5350K</td>
<td>Genomics</td>
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<td>3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.</td>
<td>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.</td>
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<tr>
<td>BIO 5350L</td>
<td>Graduate Bacterial Genetics</td>
<td></td>
<td>3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.</td>
<td>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.</td>
</tr>
</tbody>
</table>
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.

Grade Mode: Standard Letter
about Wildlife Policy and Law in North America

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 Virology

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.

Grade Mode: Standard Letter
about Virology

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

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.

Grade Mode: Standard Letter
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 Environmental Impact Analysis

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.

Grade Mode: Standard Letter
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 Medical Microbiology

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.

Grade Mode: Standard Letter
about Medical Microbiology

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Problems in the Biological Sciences

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

Grade Mode: Standard Letter
about Problems in the Biological Sciences

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

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 used. Graded on a credit (CR), progress (PR), no-credit (F) basis.

Grade Mode: Credit/No Credit
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.

Grade Mode: Credit/No Credit
about Thesis

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
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.

Grade Mode: Standard Letter
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.

Grade Mode: Standard Letter
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 broad-field structure and integration of major science concepts and research-based science pedagogy. This course must 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. Requires independent scientific and science education research and presentation of findings in a professional context.

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 geology, geography, soils, and vegetational regions of Central Texas. Requires independent scientific and science education research and presentation of findings in a professional context.

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. Requires independent scientific and science education research and presentation of findings in a professional context.

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. Requires independent scientific and science education research and presentation of findings in a professional context.

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. Requires independent scientific and science education research and presentation of findings in a professional context.

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. Requires independent scientific and science education research and presentation of findings in a professional context.

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.

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

BIO 5420. Natural History of the Vertebrates.
Environmental relationships and natural history of vertebrates. Emphasis is on evolution taxonomy, specialization, 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.

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

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.

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

BIO 5422. Mammalogy.
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.

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

BIO 5423. Wildlife Management.
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.

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

BIO 5424B. Ecology of Infectious Diseases of Wildlife.
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.

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

BIO 5426. Immunology.
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.

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

BIO 5434. Herpetology.
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.

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

BIO 5435. Techniques in Wildlife Management.
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.

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

BIO 5441. Cellular Physiology.
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. Prerequisites: Cell biology, organic chemistry, or consent of instructor.

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
**BIO 5442. Experimental Techniques.**
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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Experimental Techniques**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**BIO 5450. Physiological Ecology of Animals.**
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. Prerequisites: Organic chemistry or consent of instructor.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Physiological Ecology of Animals**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**BIO 5454. Plant Ecology.**
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. Prerequisites: Undergraduate ecology course, undergraduate plant physiology course, and an undergraduate cellular biology course, or consent of the instructor.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Plant Ecology**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**BIO 5455. 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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about General Entomology**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**BIO 5464. 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, and WWW resources. Students will learn how to address questions in their own research using phylogenetic methodologies. Prerequisite: Genetics course or consent of instructor.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Phylogenetic Methods**

**4 Credit Hours. 2 Lecture Contact Hours. 3 Lab Contact Hours.**

**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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Limnology**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Reservoir Ecology**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Animal Behavior**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Cytology and Micro-technique**

**4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.**

**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 course 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.

**Grade Mode:** Lab Required
**Course Attribute(s):** Lab Required
**about Internship in Biological Laboratory Technologies**

**4 Credit Hours. 0 Lecture Contact Hours. 15 Lab Contact Hours.**
**BIO 5485. Scanning Electron Microscopy.**
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

**Course Information:**

**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.

*5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.*

**Grade Mode:** Credit/No Credit

**Course Information:**

**BIO 5999B. 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