DEPARTMENT OF BIOLOGY

No one really knows what the world will be like 50 years from now, but it is certain that biologists will be at the forefront of science attempting to find solutions to many of the world’s problems and to find answers to intriguing questions about animals, plants and microbes at the molecular, cellular, organismal and ecosystem levels. Biologists will be concerned with pollution of the environment, cause and cure of disease, population control, recurring food shortages, preservation of species and many other aspects resulting from the impact of technological changes on life forms. Those who are astounded by the array of living things on the earth and who seek challenging, creative work should consider a career in biology or in a biology-related field. The Department of Biology offers five distinct four-year curricula which lead to the baccalaureate degree. These are the Bachelor of Arts in Biology, Bachelor of Science in Biology, Bachelor of Science in Molecular and Cell Biology, Bachelor of Science in Microbiology and Bachelor of Science in Zoology. The curricula are designed to maximize postbaccalaureate opportunities in:

1. professional schools of medicine, veterinary medicine and dentistry;
2. allied health schools of physical and occupational therapy, physician assistant programs, optometry, pharmacy, and nursing;
3. graduate education leading to teaching and research careers in universities, in industry or in state or national agencies;
4. teaching at junior high or high school levels and
5. jobs in biotechnology, research laboratories, pharmaceutical companies and field biology.

The Department of Biology degree plans will enable students to complete all entrance requirements for graduate and professional schools as well as medical technology, pharmacy, optometry, nursing, physical therapy, and other paramedical and health support fields.

Advising

Because some careers in biology require advanced and/or specialized training, it is essential to take advantage of advising opportunities. In the Department of Biology, there are professional advisors in the Biology Undergraduate Programs Office. The advisor may be consulted prior to each registration period and as the student needs. Questions regarding registration, degree checks, transfers of courses, advanced placements and other academic matters are handled in the Office of Undergraduate Programs. Students with special interests in graduate study should consult the graduate advisor. Information concerning entrance to professional schools of medicine, dentistry and other support fields is available from the Office of Professional School Advising.

Requirements for all Baccalaureate Degrees in the Department of Biology

Each student seeking a baccalaureate degree in the Department of Biology is required to master a common body of knowledge in science. In addition, the student must take courses essential to a liberal education. Students will note that the first two years of all curricula offered by the Department of Biology are similar. Electives must include the 6 hours of international and cultural diversity courses required for graduation. Students must also take at least two writing-intensive courses in biology. Other requirements for graduation are listed in the Texas A&M University Student Rules and this catalog.

Students in the Department of Biology must make a grade of C or better in BIOL 111 and BIOL 112. Additionally, students may have only one D in courses within the major used to satisfy required or directed electives for a given degree plan. It is required that the freshman and sophomore level biology, chemistry and math courses be completed before the start of the 5th full semester and before enrollment in any junior or senior level science.

Common Body of Knowledge

To assure that students have sufficient prerequisite training for advanced courses, Biology majors must complete a series of courses comprising a Common Body of Knowledge (CBK) prior to their junior year (5th full semester) and enrollment in upper level BIOL courses. A Biology student will be admitted into upper level Biology classes when he or she has met the following criteria:

Completion of a set of CBK courses (38 hours) before the student’s 5th full semester to include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 111</td>
<td>Introductory Biology I 1</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 112</td>
<td>Introductory Biology II 1</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 213</td>
<td>Molecular Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 214</td>
<td>Genes, Ecology and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 101</td>
<td>Fundamentals of Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 111</td>
<td>and Fundamentals of Chemistry Laboratory I</td>
<td></td>
</tr>
<tr>
<td>CHEM 102</td>
<td>Fundamentals of Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 112</td>
<td>and Fundamentals of Chemistry Laboratory II</td>
<td></td>
</tr>
<tr>
<td>CHEM 227</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 237</td>
<td>and Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 228</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 238</td>
<td>and Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 147</td>
<td>Calculus I for Biological Sciences &amp; MATH 144and Calculus II for Biological Sciences</td>
<td>8</td>
</tr>
<tr>
<td>MATH 151</td>
<td>Engineering Mathematics I &amp; MATH 152and Engineering Mathematics II</td>
<td></td>
</tr>
<tr>
<td>MATH 171</td>
<td>Analytic Geometry and Calculus &amp; MATH 17:and Calculus</td>
<td></td>
</tr>
</tbody>
</table>

Total Semester Credit Hours 38

1 A grade of C or better must be earned.

A student must be in good academic standing with an overall grade point average of a 2.0 or better overall and in the major.

Process

Students will be audited by the department to monitor progress of the CBK. Students failing to complete the CBK within the first four full semesters (two full semesters for Transfer Students) at Texas A&M University may be blocked and forced to change majors or be required to meet with an academic advisor to see if they can be successful in the major. Students registering for upper-level Biology classes without
completing the CBK, or without approval of the Undergraduate Advising Office, will be dropped from the roster.

Transfer Students
1. Transfer from within Texas A&M University: The Biology Department will accept changes of major from other departments at Texas A&M upon completion of AT LEAST one semester of an applicable BIOL course taken at Texas A&M and AT LEAST one semester of an applicable CHEM course taken at Texas A&M, with a minimum 2.5 grade point average overall for courses taken at Texas A&M, a 2.5 grade point average in BIOL courses taken at Texas A&M, and a 2.5 or better grade point average in CHEM courses taken at Texas A&M. Students still must complete the CBK before being admitted to upper level BIOL courses.
2. Transfer students from other institutions to Biology must have completed the following:
   a. A minimum of 24 accredited college hours
   b. Sixteen hours of prescribed coursework:
      i. Eight hours of General Biology (TAMU BIOL 111 and BIOL 112 or Texas Common Course Numbers BIOL 1406 and 1407) with B's or better, and
      ii. Eight hours of General Chemistry (TAMU CHEM 101/102 or Texas Common Course Numbers CHEM 1411 and CHEM 1412) with B's or better, and
      iii. Eight hours of Calculus (TAMU MATH 147/MATH 148 or MATH 151/MATH 152 or MATH 171/MATH 172 or Texas Common Course Numbers MATH 2413 and MATH 2414) with C's or better
   c. A minimum cumulative grade point average of a 3.0
   d. A minimum Biology and Chemistry grade point average of a 3.0

Biology Honors Program

The Biology Department Honors Program is open to highly talented and motivated students pursuing a major in any of our degree plans. Honors students will be part of a vibrant community within the department with enriched learning experiences in both the classroom and biology research laboratories.

Honors Requirements: Students wishing to graduate with honors distinctions in either Biology (BIOL), Microbiology (MBIO), Zoology (ZOOL), or Molecular and Cellular Biology (BMCB) must earn 21 credits in Honors courses and meet the following minimum honors requirements in addition to those listed in the degree plan:

- 4 credits BIOL 111H or BIOL 112H*
- 3 credits BIOL 213H or BIOL 214H
- 3 credits at 300/400 BIOL honors or honors contract; any 600 BIOL; not to include BIOL 485H, BIOL 491H, or BIOL 495H
- 6 credits BIOL 491H
- 2 credits BIOL 495H
- 3 credits any honors course outside the College of Science

* This requirement may be waived with a score of 5 on the Biology AP exam, a score of 6 on the IB exam, or by taking an additional honors biology course at the 300 or 400 level.

Grade requirements at time of graduation:
- cumulative Texas A&M University GPR of 3.5 or higher
- cumulative honors GPR of 3.25 or higher
- no grade lower than a B in courses counting toward honors. If a student earns less than a B in an honors course, they will still receive University credit. However, they will need to take a different course to fulfill the honors requirement.
- no F*, given in cases of academic dishonesty, on the transcript

Honors recognition: All honors courses will be denoted as honors on students' official transcripts. Furthermore, students completing the honors program will have the departmental honors distinction, as well as, any earned university or college distinction noted on the official transcript.

Admission to the Honors Program in Biology

Incoming Freshmen: Incoming freshmen should indicate their interest in the departmental honors program through the ApplyTexas site and choosing the "Apply to any Honors Program" after August 1. To be admitted, students should have a SAT score of 1350 or above (verbal + math) or a composite score of 30 or above on the ACT.

Students who have already completed their application and now wish to apply to the Biology Honors program can use the "Apply to any Honors Program" link at the Texas A&M Honors program site (http://honorsprograms.tamu.edu/Home).

Current or transfer students: Current or transfer students with a cumulative GPR of 3.5 or better can apply for admission to the Biology Honors Program by writing a short (less than 300 word) email to the department’s Honors Director. When applying, students should keep in mind that they will need to fulfill all honors requirements. Please send email to: biohonors@bio.tamu.edu.

Remaining in the program

In order to remain in the Biology Honors program, students must maintain a cumulative GPR at Texas A&M of 3.5 and honors GPR of 3.25. Students falling below these standards will be placed on probation for the next semester. Students unable to meet these standards for a second semester may be dismissed from the Biology Honors Program.

Contact us

Please direct any questions to biohonors@bio.tamu.edu or the biology advising office.

Human Biology Track

This unofficial track is for students interested in pursuing professional schools including medical, dental and allied health programs (e.g., nursing, occupational therapy, optometry, pharmacy, physical therapy and physician assistant). The focus of the science courses on human biology will better prepare these students for their chosen fields. Suggested courses include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOL 318</td>
<td>Chordate Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 344</td>
<td>Embryology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 388</td>
<td>Principles of Animal Physiology</td>
<td>4</td>
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</table>

Social and Behavioral Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>PSYC 107</td>
<td>Introduction to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>or SOCI 205</td>
<td>Introduction to Sociology</td>
<td>3</td>
</tr>
</tbody>
</table>

Biology Electives
**Department of Biology**

**BIOL 437**  Molecular and Human Medical Mycology  3
**BIOL 454**  Immunology  3
**BIOL 456**  Medical Microbiology  3

**Free Electives**
**HLTH 335**  Human Diseases  3
**HLTH 354**  Medical Terminology for the Health Professions  3
**URPN 370**  Health Systems Planning  3
**PSYC 107**  Introduction to Psychology  3
or **SOCI 205**  or Introduction to Sociology
**BIOL 318**  Chordate Anatomy  4
**BIOL 344**  Embryology  4
**BIOL 388**  Principles of Animal Physiology  4
**BIOL 437**  Molecular and Human Medical Mycology  3
**BIOL 454**  Immunology  3
**BIOL 456**  Medical Microbiology  3

**International and Cultural Diversity**
**HLTH 236**  Race, Ethnicity and Health  3
**HLTH 334**/**WGST 334**  Women's Health  3

Total Semester Credit Hours  63

Students should consult their academic advisor about the courses that best fit their career interests.

**Education Track**
This unofficial track is for students wishing to acquire state certification to teach at the secondary level upon graduation. Students should seek advice from the advisors within their department and from the College of Education and Human Development, as well as from the advisor in charge of their teaching option. The intention is to make the best possible use of social science, humanity, free and directed electives in the Bachelor of Arts in Biology, thereby condensing as many of the certification requirements as possible into the degree plan. Courses should include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
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<tbody>
<tr>
<td>INST 210</td>
<td>Understanding Special Populations</td>
<td>3</td>
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<tr>
<td>INST 222</td>
<td>Foundations of Education in a Multicultural Society</td>
<td>3</td>
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**Biology Electives**
Upper-level BIOL courses, including two writing intensive courses (http://catalog.tamu.edu/undergraduate/course-descriptions/biol)  14

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
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<tbody>
<tr>
<td>BIOL 335</td>
<td>Invertebrate Zoology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 440</td>
<td>Marine Biology</td>
<td>4</td>
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<tr>
<td>Related ZOOL research or field experience (<a href="http://catalog.tamu.edu/undergraduate/course-descriptions/zooll">http://catalog.tamu.edu/undergraduate/course-descriptions/zooll</a>)</td>
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**Free Electives**
**OCNG 251**  Oceanography  3
or **OCNG 42**  or Biological Oceanography
**WFSC 311**  Ichthyology  3
**WFSC 425**  Marine Fisheries  3

Total Semester Credit Hours  32

Students should consult their academic advisor about the courses that best fit their career interests.

**Marine Biology Track**
This unofficial track is for students requiring a more rigorous and in-depth foundation in biological courses that apply to marine environments and ecosystems. This suggested degree plan is ideal for students who intend to pursue graduate studies in marine biology or serve as field biologists at national seashores or sanctuaries. A minimum of 20 hours is required to fulfill this requirement, to be chosen from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 335</td>
<td>Invertebrate Zoology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 440</td>
<td>Marine Biology</td>
<td>4</td>
</tr>
<tr>
<td>Related ZOOL research or field experience (<a href="http://catalog.tamu.edu/undergraduate/course-descriptions/zooll">http://catalog.tamu.edu/undergraduate/course-descriptions/zooll</a>)</td>
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**Free Electives**
**OCNG 251**  Oceanography  3
or **OCNG 42**  or Biological Oceanography
**WFSC 311**  Ichthyology  3
**WFSC 425**  Marine Fisheries  3

Total Semester Credit Hours  20

Students should consult their academic advisor about the courses that best fit their career interests.

**Ecology/Environmental Track**
This unofficial track is particularly designed for students interested in environmental consulting, environmental protection and ecosystem evaluation. This suggested degree plan can be adapted to focus on particular areas or populations within an ecosystem. A minimum of 18 hours is required to fulfill this requirement, to be chosen from the following:

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ENGL 210</td>
<td>Technical and Business Writing</td>
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**Biology Electives**
Select one of the following:  3-4

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 335</td>
<td>Invertebrate Zoology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 357</td>
<td>Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOL 358</td>
<td>Ecology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOL 440</td>
<td>Marine Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 462/ WFSC 462</td>
<td>Amazon River Tropical Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 467</td>
<td>Integrative Animal Behavior</td>
<td></td>
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</tbody>
</table>

**Free Electives**
**CHEM 315**  Fundamentals of Quantitative Analysis and Quantitative Analysis Laboratory  4
ENTO 201 General Entomology 3
MEPS 313 Introduction to Plant Physiology 3
Select one of the following: 3-4
  PLPA 301 Plant Pathology
  & PLPA 303 Plant Pathology Laboratory
  WFS 311 Ichthyology
  WFS 401 General Mammalogy
  WFS 402 General Ornithology
Total Semester Credit Hours 20-21

Students should consult their academic advisor about the courses that best fit their career interests.

Quantitative Biology Track
This unofficial track is for students interested in applying quantitative approaches, including mathematical, statistical, and computational techniques, to fundamental problems in biology. Because courses for this track are still being developed in conjunction with the Departments of Mathematics and Statistics, students should check with their advisor for new quantitative biology courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td>Mathematics</td>
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<tr>
<td>MATH 171</td>
<td>Analytic Geometry and Calculus</td>
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<td>MATH 172</td>
<td>Calculus</td>
<td>4</td>
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<tr>
<td></td>
<td>Electives</td>
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<td>BIOL 289</td>
<td>Special Topics in...</td>
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<tr>
<td>MATH 308</td>
<td>Differential Equations</td>
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Liberal Education Requirements of the University, College or State

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>American history elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#american-history">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#american-history</a>)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Communication elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#communication">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#communication</a>)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Language, philosophy and culture elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#language-philosophy-culture">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#language-philosophy-culture</a>)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Government/Political science elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#government-political-science">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#government-political-science</a>)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Social and behavioral sciences elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#social-behavioral-sciences">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#social-behavioral-sciences</a>)</td>
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<tr>
<td></td>
<td>Creative arts elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#creative-arts">http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/#creative-arts</a>)</td>
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</tr>
<tr>
<td></td>
<td>International and cultural diversity elective (<a href="http://catalog.tamu.edu/undergraduate/general-information/degree-information/international-cultural-diversity-requirements">http://catalog.tamu.edu/undergraduate/general-information/degree-information/international-cultural-diversity-requirements</a>)</td>
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<td></td>
<td>Total Semester Credit Hours</td>
<td>27-33</td>
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</tbody>
</table>

Faculty
Alexander, Michael B, Lab Instructor Biology
PHD, Texas A&M University, 2014

Aramayo, Rodolfo A, Associate Professor Biology
PHD, University of Georgia, 1992

Armstrong, Beth E, Lab Instructor Biology
MS, Texas A&M University, 2006

Aufderheide, Karl J, Associate Professor Biology
PHD, University of Minnesota, 1974

Bell-Pedersen, Deborah, Professor Biology
PHD, State University of New York at Albany, 1991

Benedik, Michael J, Professor Biology
PHD, Stanford University, 1982

Beremand, Phillip D, Lab Instructor Biology
PHD, Indiana University- Bloomington, 1979

Bernardo, Joseph, Research Associate Professor Biology
PHD, Duke University, 1991

Blackmon, Heath L, Assistant Professor Biology
PHD, University of Texas at Arlington, 2015

Carney, Ginger E, Professor Biology
PHD, University of Georgia, 1998

Cohn, William B, Senior Lecturer Biology
PHD, Texas A&M University, 2000

Criscone, Charles D, Associate Professor Biology
PHD, Oregon State University, 2005

Davis, Amanda R, Lecturer Biology
PHD, Texas A&M University, 2017

Dulin, Jennifer N, Assistant Professor Biology
PHD, University of Texas Health Science Center, 2012
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Degree</th>
<th>Institution</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epps, Sharon V</td>
<td>Lab Instructor</td>
<td>MS</td>
<td>Texas A&amp;M University, 2013</td>
<td></td>
</tr>
<tr>
<td>Erickson, James W</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>University of Wisconsin - Madison, 1989</td>
<td></td>
</tr>
<tr>
<td>Garcia, Luis R</td>
<td>Professor</td>
<td>DDS</td>
<td>Texas A&amp;M University Baylor College of Dentistry, 1999</td>
<td></td>
</tr>
<tr>
<td>Erickson, James W</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>University of Wisconsin - Madison, 1989</td>
<td></td>
</tr>
<tr>
<td>Garcia, Luis R</td>
<td>Professor</td>
<td>PHD</td>
<td>University of Texas at Austin, 1996</td>
<td></td>
</tr>
<tr>
<td>Gomer, Richard H</td>
<td>Professor</td>
<td>PHD</td>
<td>California Institute of Technology, 1983</td>
<td></td>
</tr>
<tr>
<td>Greenbaum, Ira F</td>
<td>Professor</td>
<td>PHD</td>
<td>Texas Tech University, 1978</td>
<td></td>
</tr>
<tr>
<td>Griffing, Lawrence R</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>Stanford University, 1981</td>
<td></td>
</tr>
<tr>
<td>Hardin, Paul E</td>
<td>Distinguished Professor</td>
<td>PHD</td>
<td>Indiana University, 1987</td>
<td></td>
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<tr>
<td>Harlow, Mark L</td>
<td>Assistant Professor</td>
<td>PHD</td>
<td>Stanford University, 2001</td>
<td></td>
</tr>
<tr>
<td>Jones, Adam G</td>
<td>Professor</td>
<td>PHD</td>
<td>University of Georgia, 1998</td>
<td></td>
</tr>
<tr>
<td>Jung, Jae Hoon</td>
<td>Research Assistant Professor</td>
<td>PHD</td>
<td>Stanford University, 2009</td>
<td></td>
</tr>
<tr>
<td>Kemp, Walter M</td>
<td>Professor</td>
<td>PHD</td>
<td>The Tulane University of Louisiana, 1969</td>
<td></td>
</tr>
<tr>
<td>Leboeuf, Brigitte L</td>
<td>Lecturer</td>
<td>PHD</td>
<td>Texas A&amp;M University, 2009</td>
<td></td>
</tr>
<tr>
<td>Lee, Christopher P</td>
<td>Lecturer</td>
<td>BS</td>
<td>Texas A&amp;M University, 1993</td>
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</tr>
<tr>
<td>Lekven, Arne C</td>
<td>Professor</td>
<td>PHD</td>
<td>University of California- Los Angeles, 1996</td>
<td></td>
</tr>
<tr>
<td>Lockless, Steve W</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>University of Texas at Dallas, 2002</td>
<td></td>
</tr>
<tr>
<td>Lyons, Jacob I</td>
<td>Lab Instructor</td>
<td>MS</td>
<td>Texas State University, 2010</td>
<td></td>
</tr>
<tr>
<td>Mackenzie, Duncan S</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>University of California, Berkeley, 1980</td>
<td></td>
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<tr>
<td>Manson, Michael D</td>
<td>Professor</td>
<td>PHD</td>
<td>Stanford University, 1976</td>
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<tr>
<td>McKnight, Thomas D</td>
<td>Professor</td>
<td>PHD</td>
<td>University of Georgia, 1983</td>
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<tr>
<td>McMahan, Uel J</td>
<td>Professor</td>
<td>PHD</td>
<td>University of Tennessee, 1964</td>
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<tr>
<td>Menet, Jerome</td>
<td>Assistant Professor</td>
<td>PHD</td>
<td>Louis Pasteur University, 2003</td>
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<tr>
<td>Merlin, Christine</td>
<td>Assistant Professor</td>
<td>PHD</td>
<td>University Pierre and Marie Curie, 2006</td>
<td></td>
</tr>
<tr>
<td>Moyes, Rita J</td>
<td>Instructional Associate Professor</td>
<td>PHD</td>
<td>Texas A&amp;M University, 1992</td>
<td></td>
</tr>
<tr>
<td>Nan, Beiyan</td>
<td>Assistant Professor</td>
<td>PHD</td>
<td>Peking University, 2007</td>
<td></td>
</tr>
<tr>
<td>Norton, Jerry D</td>
<td>Lab Instructor</td>
<td>PHD</td>
<td>The University of Texas at Austin, 1994</td>
<td></td>
</tr>
<tr>
<td>Pepper, Alan E</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>University of California, Davis, 1990</td>
<td></td>
</tr>
<tr>
<td>Pilling, Darrell</td>
<td>Research Assistant Professor</td>
<td>PHD</td>
<td>University of Birmingham, 1995</td>
<td></td>
</tr>
<tr>
<td>Qin, Hongmin</td>
<td>Associate Professor</td>
<td>PHD</td>
<td>Institute of Microbiology, Chinese Academy of Sciences, 1999</td>
<td></td>
</tr>
<tr>
<td>Rao, Asha</td>
<td>Senior Lecturer</td>
<td>PHD</td>
<td>Texas A&amp;M University, 2002</td>
<td></td>
</tr>
<tr>
<td>Riley, Bruce B</td>
<td>Professor</td>
<td>PHD</td>
<td>University of Wisconsin - Madison, 1990</td>
<td></td>
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<tr>
<td>Romney, Sherdina E</td>
<td>Lab Instructor</td>
<td>MS</td>
<td>Texas A&amp;M University, 2017</td>
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</tbody>
</table>
Rosenthal, Gil G, Professor
Biology
PHD, University of Texas at Austin, 2000

Ryan, Kathryn J, Instructional Assistant Professor
Biology
PHD, Baylor College of Medicine, 1998

Sachs, Matthew S, Professor
Biology
PHD, Massachusetts Institute of Technology, 1986

Schartl, Manfred, Visiting Professor
Biology
PHD, University of Gießen, 1980

Scott, Timothy P, Professor
Biology
PHD, Texas A&M University, 1996

Siegele, Deborah A, Associate Professor
Biology
PHD, University of Wisconsin - Madison, 1989

Smith, James L, Associate Professor
Biology
PHD, University of Florida, 2002

Smotherman, Michael S, Associate Professor
Biology
PHD, University of California, Los Angeles, 1998

Sorg, Joseph A, Associate Professor
Biology
PHD, University of Chicago, 2006

Szule, Joseph A, Research Assistant Professor
Biology
PHD, University of Calgary, 2005

Tag, Andrew G, Senior Lecturer
Biology
PHD, Texas A&M University, 2003

Taylor, Lathrop, Senior Lecturer
Biology
PHD, Texas A&M University, 1985

Thomas, Terry L, Professor
Biology
PHD, The University of Georgia, 1975

Thompson, Wesley J, Professor
Biology
PHD, University of California-Berkeley, 1975

Versaw, Wayne K, Associate Professor
Biology
PHD, University of Wisconsin - Madison, 1995

Wan, Wei, Senior Lecturer
Biology
PHD, University of California, Davis, 2005

Whitaker, Gregory H, Lab Instructor
Biology
PHD, Texas A&M University, 2015

Wicksten, Mary K, Professor
Biology
PHD, University of Southern California, 1977

Winemiller, Leslie K, Instructional Assistant Professor
Biology
PHD, University of Texas at Austin, 1989

Wright, Rachel N, Lab Instructor
Biology
PHD, Texas A&M University, 2011

Zoran, Mark J, Professor
Biology
PHD, Iowa State University, 1987

**Majors**

- Bachelor of Arts in Biology ([http://catalog.tamu.edu/undergraduate/science/biology/ba](http://catalog.tamu.edu/undergraduate/science/biology/ba))
- Bachelor of Science in Biology ([http://catalog.tamu.edu/undergraduate/science/biology/bs](http://catalog.tamu.edu/undergraduate/science/biology/bs))
- Bachelor of Science in Microbiology ([http://catalog.tamu.edu/undergraduate/science/biology/microbiology-bs](http://catalog.tamu.edu/undergraduate/science/biology/microbiology-bs))
- Bachelor of Science in Zoology ([http://catalog.tamu.edu/undergraduate/science/biology/zoology-bs](http://catalog.tamu.edu/undergraduate/science/biology/zoology-bs))

**Minors**

- Bioinformatics Minor ([http://catalog.tamu.edu/undergraduate/science/biology/bioinformatics-minor](http://catalog.tamu.edu/undergraduate/science/biology/bioinformatics-minor))
- Biology Minor ([http://catalog.tamu.edu/undergraduate/science/biology/minor](http://catalog.tamu.edu/undergraduate/science/biology/minor))

**Courses**

- Biology (BIOL) (p. 6)
- Microbiology (MICR) (p. 10)
- Zoology (ZOOL) (p. 11)

**Biology**

BIOL 100 Horizons in Biology
Credit 1. 1 Lecture Hour.
Introduction to the study of biology at Texas A&M University; gain knowledge of departmental and campus resources to assist and enhance the pursuit of a degree in biology, microbiology, molecular and cellular biology or zoology.

**Prerequisites:** First-semester and first-time-in-college freshman majoring in BIOL, MICR, BMCB and ZOOL.
BIOL 101 Botany  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(BIOL 1311 and 1111, BIOL 1411) Botany. Structure, physiology and development of plants with an emphasis on seed plants. (Not open to students who have taken BIOL 111 and BIOL 112 or BIOL 113.); includes laboratory that reinforces and provides supplemental information related to the lecture topics.

BIOL 107 Zoology  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(BIOL 1313 and 1113, 1413) Zoology. Survey of animal life with respect to cell organization, genetics, evolution, diversity of invertebrates/vertebrates, anatomy/physiology, and interaction of animals with their environment; includes laboratory that reinforces and provides supplemental information related to the lecture topics. (Not open to students who have taken BIOL 111 and BIOL 112 or BIOL 113).

BIOL 111 Introductory Biology I  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(BIOL 1306 and 1106, 1406) Introductory Biology I. First half of an introductory two-semester survey of contemporary biology that covers the chemical basis of life, structure and biology of the cell, molecular biology and genetics; includes laboratory that reinforces and provides supplemental information related to the lecture topics.

BIOL 112 Introductory Biology II  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(BIOL 1307 and 1107, 1407) Introductory Biology II. The second half of an introductory two-semester survey of contemporary biology that covers evolution, history of life, diversity and form and function of organisms; includes laboratory that reinforces and provides supplemental information related to the lecture topics.  
Prerequisite: BIOL 111.

BIOL 113 Essentials in Biology  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(BIOL 1308 and 1108) Essentials in Biology. One-semester in introductory biology for non-majors; chemical basis of life, cellular and molecular biology, genetics, evolution, biodiversity and interaction of organisms with their environment; includes a laboratory to supplement and reinforce lecture topics.

BIOL 206 Introductory Microbiology  
Credits 4. 3 Lecture Hours. 4 Lab Hours.  
(BIOL 2321 and 2121, 2421) Introductory Microbiology. Basic microbiology of prokaryotes and eukaryotes; main topics include morphology, physiology, genetics, taxonomy, ecology, medically important species and immunology; mandatory laboratory designed to give hands-on experience and to reinforce basic principles.  
Prerequisites: BIOL 101, BIOL 107, BIOL 111, or BIOL 113; CHEM 101 and CHEM 111 or CHEM 103 and CHEM 113. May not be used for credit by biology, molecular and cell biology, microbiology, zoology, predentistry or premedicine majors.

BIOL 213 Molecular Cell Biology  
Credits 3. 3 Lecture Hours.  
Explores the molecular basis of cell structure, function and evolution; gene regulation, cell division cycle, cancer, immunity, differentiation, multicellularity and photosynthesis; may not take concurrently with, or after the completion of, BIOL 413.  
Prerequisites: BIOL 112; CHEM 102 and CHEM 112.

BIOL 214 Genes, Ecology and Evolution  
Credits 3. 3 Lecture Hours.  
A genetically-based introduction to the study of ecology and evolution; emphasis on the interactions of organisms with each other and with their environment.  
Prerequisite: BIOL 112.

BIOL 285 Directed Studies  
Credits 1 to 4. 1 to 4 Other Hours.  
Problems in various phases of plant, animal and microbial science.  
Prerequisites: Freshman or sophomore classification; approval of ranking professor in field chosen and Undergraduate Advising Office.

BIOL 289 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of biology. May be repeated for credit.  
Prerequisite: Approval of instructor.

BIOL 291 Research  
Credits 0 to 4. 0 to 4 Other Hours.  
Active research of basic nature under the supervision of a Department of Biology faculty member. May be repeated for credit.  
Prerequisites: Freshman or sophomore classification and approval of faculty member.

BIOL 302 Careers in Biology  
Credit 1. 1 Lecture Hour.  
Development of job search skills; utilization of career resources; self-assessment of career interests and career objectives; strategies for professional correspondence and networking; business etiquette and interviewing techniques; insight into life science career opportunities.  
Prerequisites: Junior or senior classification; department of biology majors only; or approval of instructor.

BIOL 318 Chordate Anatomy  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Classification, phylogeny, comparative anatomy, and biology of chordates; diversity, protochordates, vertebrate skeletons, shark and cat anatomy studied in laboratory.  
Prerequisite: BIOL 214 or approval of instructor.

BIOL 319 Integrated Human Anatomy and Physiology I  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Integrated approach to cellular, neural, skeletal, muscular anatomy and physiology; includes some histology, histopathology, radiology and clinical correlations.  
Prerequisite: BIOL 111 and BIOL 112, or BIOL 107.

BIOL 320 Integrated Human Anatomy and Physiology II  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Continuation of BIOL 319. Integrated approach to endocrine, cardiovascular, respiratory, digestive, urinary, reproductive and developmental anatomy and physiology; includes some histology, histopathology, radiology and clinical correlations.  
Prerequisite: BIOL 319 or approval of instructor.

BIOL 328 Plants and People  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Development and uses of principal economically important plants of the world; plants and plant parts used in production of important commodities; vascular plants.  
Prerequisite: BIOL 101 or BIOL 111 or BIOL 112 or approval of instructor.
**BIOL 335 Invertebrate Zoology**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Morphology, taxonomy, natural history and phylogeny of invertebrate animals, with emphasis on biodiversity; class includes both lecture and lab. Labs include study of preserved material and demonstration of living animals in aquaria and terraria.  
**Prerequisite:** BIOL 214 or approval of instructor.

**BIOL 344 Embryology**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Introduction to general and comparative embryology; molecular and cellular mechanisms of development; genetics and early development of selected invertebrates (C. elegans, Drosophila and sea urchin) and emphasis on vertebrates (frog, fish, chick and mouse).  
**Prerequisite:** BIOL 213 or GENE 302.

**BIOL 350 Computational Genomics**  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Hands-on approach to obtaining, organizing and analyzing genome-related data; emphasis on asking and answering biologically relevant questions by designing and performing experiments using computers; understanding biology from a computational perspective.  
**Prerequisite:** Junior or senior classification in life sciences, engineering, mathematics, chemistry.

**BIOL 351 Fundamentals of Microbiology**  
Credits 4. 3 Lecture Hours. 4 Lab Hours.  
Introduction to modern microbiology with emphasis on prokaryotes; includes microbial cell structure, function, and physiology; genetics, evolution, and taxonomy; bacteriophage and viruses; pathogenesis and immunity; and ecology and biotechnology; includes laboratory experience with microbial growth and identification.  
**Prerequisites:** BIOL 112; CHEM 227, and CHEM 237 or CHEM 231; or approval of instructor.

**BIOL 352 Diagnostic Bacteriology**  
Credits 4. 2 Lecture Hours. 6 Lab Hours.  
Practical experience in handling, isolation and identification of pathogenic microorganisms using biochemical tests and rapid identification techniques.  
**Prerequisite:** BIOL 351 or approval of instructor.

**BIOL 357 Ecology**  
Credits 3. 3 Lecture Hours.  
Analysis of ecosystems at organismal, population, interspecific and community levels. BIOL 358 is the laboratory for this lecture course.  
**Prerequisite:** BIOL 214 or approval of instructor.

**BIOL 358 Ecology Laboratory**  
Credit 1. 3 Lab Hours.  
Quantitative analyses of freshwater and terrestrial ecosystems; includes data sampling and presentation of results in written and oral formats; required fieldtrips; analysis of competition and predator-prey interactions using ecological models.  
**Prerequisite:** BIOL 357 or concurrent enrollment; junior or senior classification.

**BIOL 357 or concurrent enrollment; junior or senior classification.**

**BIOL 358 Principles of Animal Physiology**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Introduction to how animals function, including basics of neurophysiology, endocrinology, muscular, cardiovascular, respiratory, endocrine, and metabolic physiology; broadly comparative in scope and encompassing adaptation of physiological systems to diverse environments; the laboratory stresses techniques used for monitoring and investigating physiological mechanisms and responses to environmental changes.  
**Prerequisites:** BIOL 214 or CHEM 228 or approval of instructor.

**BIOL 395 Directed Investigation in Bioinformatics**  
Credits 2. 1 Lecture Hour. 2 Lab Hours.  
Second course of four in capstone research program in biology; conduct individual research projects utilizing bioinformatic tools.  
**Prerequisite:** BIOL 213 or approval of instructor.

**BIOL 401 Critical Writing in Biology**  
Credit 1. 1 Lecture Hour.  
Reading scientific papers and writing short synopses of papers with a focus on learning how to think and write like a scientist; fills the current Writing Intensive "W" course requirement for biology.  
**Prerequisites:** BIOL 213 and BIOL 214; junior or senior classification.

**BIOL 405 Comparative Endocrinology**  
Credits 3. 3 Lecture Hours.  
Basic principles of endocrinology including structure and functions of hormones in vertebrates; hormonal control of growth, metabolism, osmoregulation, and reproduction; endocrine and mechanism of hormone action.  
**Prerequisites:** BIOL 214 and CHEM 227.

**BIOL 406/GENE 406 Bacterial Genetics**  
Credits 3. 3 Lecture Hours.  
A problem oriented course surveying the manipulation and mechanisms of genetic systems in bacteria; recombination, structure and regulation of bacterial genes, plasmids and phages.  
**Prerequisites:** BIOL 351; GENE 302.  
**Cross Listing:** GENE 406/BIOL 406.

**BIOL 413 Cell Biology**  
Credits 3. 3 Lecture Hours.  
Structure, function, and biogenesis of cells and their components; interpretation of dynamic processes of cells, including protein trafficking, motility, signaling and proliferation.  
**Prerequisites:** BIOL 213 or GENE 302; BICH 410 or BICH 440.

**BIOL 414 Developmental Biology**  
Credits 3. 3 Lecture Hours.  
Concepts of development in systems ranging from bacteriophage to the mammalian embryo; use of recombinant DNA technology and embryo engineering to unravel the relationships between growth and differentiation, morphogenesis and commitment, aging and cancer.  
**Prerequisite:** BIOL 413 or concurrent enrollment or approval of instructor.

**BIOL 423 Cell Biology Laboratory**  
Credits 2. 1 Lecture Hour. 3 Lab Hours.  
Modern methods of study of cell structure and cell function.  
**Prerequisites:** BICH 410 and BIOL 413, or concurrent enrollment or approval of instructor.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<th>Lab Hours</th>
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<td>BIOL 430</td>
<td>Biological Imaging</td>
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<td>Still and video photography and photomicrography, computer-based digital image analysis and processing of biological images; theory and principles of light and electron microscopy including transmission and scanning electron microscopy; optical contrast methods for light microscopy including phase contrast, DIC, polarizing light and confocal laser scanning microscopy. Prerequisite: Junior classification or approval of instructor.</td>
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<td>BIOL 434</td>
<td>Regulatory and Behavioral Neuroscience</td>
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<td>Cell biology and biophysics of neurons; functional organization of the vertebrate nervous system; physiological basis of behavior. Prerequisites: BIOL 213; BIOL 319, BIOL 320, BIOL 388, BIOL 413; NRSC 335/PSYC 335, or PSYC 335/NRSC 335, or approval of instructor.</td>
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<tr>
<td>BIOL 435</td>
<td>Laboratory for Regulatory and Behavioral Neuroscience</td>
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<td>Lab</td>
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<td>Study of modern methods and tools used to investigate nervous system structure and function. Prerequisite: BIOL 213; BIOL 319, BIOL 320, BIOL 388, BIOL 413, BIOL 434, NRSC 434/BIOL 434, NRSC 335/PSYC 335, or PSYC 335/NRSC 335, or approval of instructor.</td>
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<td>BIOL 437</td>
<td>Molecular and Human Medical Mycology</td>
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<td>Principles of fungal pathogenesis, diagnosis and antifungal therapies, and relevant genetic and molecular tools for studying human pathogens and drug delivery. Prerequisites: BIOL 351; junior or senior classification; or approval of instructor.</td>
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<td>BIOL 438</td>
<td>Bacterial Physiology</td>
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<td>Structure and function of prokaryotic cells, with emphasis on evolutionary adaptations to different environmental, developmental, and pathogenic selection pressures; formation of teams and preparation of presentations on specific topics in microbiology. Prerequisites: BIOL 351; BIOL 406/GENE 406 or concurrent enrollment; BICH 410, BICH 431/GENE 431 and GENE 302 strongly recommended.</td>
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<td>BIOL 440</td>
<td>Marine Biology</td>
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<td>Introduction to biology of common organisms inhabiting bays, beaches and near-shore oceanic waters with special reference to Gulf of Mexico biota; emphasis on classification, distribution, history, ecology, physiology, mutualism, predation, major community types and economic aspects of marine organisms. Prerequisite: BIOL 214 or approval of instructor.</td>
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<td>BIOL 445</td>
<td>Biology of Viruses</td>
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<td>Structure, composition and life cycles of viruses; methods used to study viruses; their interaction with host cells; mechanisms of pathogenicity and cellular transformation; responses of the host to viral infection, and vaccine applications; in-depth study of the life cycles of the major classes of viruses and discussion of emerging viruses. Prerequisite: BIOL 213 or BIOL 351 or approval of instructor.</td>
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<td>BIOL 450</td>
<td>Bich 450 Genomics</td>
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<td>The study of genomic data includes consideration of the logic behind the most important genomic approaches, as well as their capabilities and limitations in investigating biological processes; the science of accessing and manipulating genomic data; and practical applications, including development of an hypotheses-driven datamining experiment. Prerequisites: BIOL 213, GENE 301 or GENE 302, BICH 431/GENE 431 or GENE 431/BICH 431, or BIOL 351; junior or senior classification or approval of instructor. Cross Listing: BIOL 450/BICH 450.</td>
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<td>BIOL 451</td>
<td>Bioinformatics</td>
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<td>Introduction to the entire field of bioinformatics; theoretical background of computational algorithms, with an emphasis on application of computational tools related to modern molecular biological research. Prerequisite: BIOL 213, GENE 301, or GENE 302, or BIMS 320/GENE 320 or GENE 320/BIMS 320 and junior or senior classification, or approval of instructor.</td>
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<td>BIOL 452</td>
<td>Fungal Functional Genomics</td>
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<td>Extensive research experience in eukaryotic molecular genetics using the fungus Neurospora crassa as the primary model system; analysis of Neurospora gene-deletion strain collection to examine the effects of genes on the organism's traits; introduction of molecular techniques for genome manipulation and analysis. Prerequisite: Junior or senior classification in any life science major or approval of instructor.</td>
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<td>BIOL 454</td>
<td>Immunology</td>
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<td>Introduction to basic immunological concepts and principles of serology. Prerequisite: BIOL 351 or equivalent or approval of instructor.</td>
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<td>BIOL 455</td>
<td>Laboratory in Immunology</td>
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<td>Practical application of serological principles which include precipitation, agglutination and blood banking principles; techniques in tissue culture and hybridoma technology also included. Prerequisite: BIOL 454 or registration therein.</td>
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<td>BIOL 456</td>
<td>Medical Microbiology</td>
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<td>Microbiology, epidemiology and pathology of human pathogens with an emphasis on bacterial agents. Prerequisite: BIOL 351 or approval of instructor.</td>
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<td>BIOL 461</td>
<td>Antimicrobial Agents</td>
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<td>Understanding of antimicrobial agents, limitations of use, biosynthesis and regulation, and challenges in development as new therapeutics. Prerequisites: BICH 410 or BICH 440 and BIOL 351 or VTPB 405.</td>
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<td>BIOL 462</td>
<td>Amazon River Tropical Biology</td>
<td>3.3</td>
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<td>History, ecology, evolutionary-biology, geography and culture of the Amazon River and Rio Negro; exploration of the world's most bio-diverse river during a 10-day expedition from Manaus, Brazil; survey biota, record observations about the ecosystem, select research topics, development of presentations. Prerequisites: BIOL 107, BIOL 112, BIOL 113, BIOL 357 or RENR 205; or approval of instructor. Cross Listing: WFSC 462/BIOL 462.</td>
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</tbody>
</table>
BIOL 466 Principles of Evolution  
Credits 3. 3 Lecture Hours.  
Evolutionary patterns, mechanisms and processes at the organismal, chromosomal and molecular levels; modes of adaptation and the behavior of genes in populations.  
Prerequisite: GENE 302 or approval of instructor.  

BIOL 467 Integrative Animal Behavior  
Credits 3. 3 Lecture Hours.  
Examines how behavior contributes to survival and reproduction, and how evolutionary history and ecological circumstance interact to shape the expression of behavior; focus on integrative nature of behavior; how the interaction of evolutionary processes, mechanistic constraints, and ecological demands determine behavioral strategies.  
Prerequisite: BIOL 214, BIOL 357, BIOL 388, BIOL 405, BIOL 434, or BIOL 466, or approval of instructor.  

BIOL 480 Departmental Colloquium  
Credit 1. 1 Lecture Hour.  
Attend presentations given by renowned scientists from various fields of biology; learn about new developments in science; stay abreast of current and trending research topics.  
Prerequisites: Senior classification; majors in BIOL, MICRO, BMCB and ZOOL.  

BIOL 481 Seminar in Biology  
Credit 1. 1 Lecture Hour.  
Recent advances. Restricted to senior undergraduate majors in biology, microbiology, botany or zoology.  

BIOL 484 Internship  
Credits 0 to 4. 0-1 Other Hours.  
Directed internship in a private firm or public agency to provide research experience appropriate to the student’s degree program and career objectives. May be taken two times.  
Prerequisite: Approval of internship agency and advising office.  

BIOL 485 Directed Studies  
Credits 1 to 12. 1 to 12 Other Hours.  
Problems in various phases of plant, animal and bacteriological science.  
Prerequisites: Junior classification; approval of ranking professor in field chosen and Undergraduate Advising Office.  

BIOL 487/VTPB 487 Biomedical Parasitology  
Credits 4. 3 Lecture Hours. 2 Lab Hours.  
Helminth and protozoan parasites of medical and veterinary importance; life cycles, morphology, taxonomic classification, economic and public health aspects and current topics in parasitic diseases.  
Prerequisites: BIOL 107 or BIOL 114; junior classification or approval of instructor.  
Cross Listing: VTPB 487/BIOL 487.  

BIOL 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 10 Lab Hours.  
Selected topics in an identified area of biology. May be repeated once for credit.  

BIOL 491 Research  
Credits 0 to 4. 0 to 4 Other Hours.  
Active research of basic nature under the supervision of a Department of Biology faculty member. May be taken two times. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.  
Prerequisite: Approval of departmental faculty member.  

BIOL 492 Biomedical Therapeutics Development  
Credit 1. 1 Lecture Hour.  
Basic aspects of the biotechnology business; includes key aspects of biotechnology patents, the main steps in preclinical drug development and company structure and funding.  
Prerequisites: BIOL 213 or equivalent; CHEM 227 and CHEM 228.  

BIOL 495 Biology Capstone: Research Communication in the Life Sciences  
Credits 2. 2 Lecture Hours.  
Culmination of capstone research experience; formalization of research results in written and oral forms; introduction to primary genres or scientific writing; apply principles of rhetoric and composition to diverse methods of professional communication.  
Prerequisite: BIOL 452, BICH 464, BIOL 400, BIOL 493 or BIOL 491 or approval of instructor.  

BIOL 496 Ethics in Biological Research  
Credit 1. 1 Lecture Hour.  
Fraud in science, how to recognize it, and how to avoid committing fraud; includes the basis of ethics and plagiarism, negotiation techniques and conflict management, the regulations and ethics covering animal and human experiments, record-keeping, data management and peer review.  
Prerequisites: BIOL 491, NRSC, 491, BICH 491, GENE 491, BIMS 491, or CHEM 491, or concurrent enrollment, or approval of instructor.  

Microbiology  

MICR 289 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of microbiology. May be repeated for credit.  
Prerequisite: Approval of instructor.  

MICR 291 Research  
Credits 1 to 4. 1 to 4 Other Hours.  
Active research of basic nature under the supervision of a Department of Biology faculty member.  
Prerequisites: Freshman or sophomore classification and approval of instructor.  

MICR 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of microbiology. May be repeated once for credit.  

MICR 491 Research  
Credits 1 to 4. 1 to 4 Other Hours.  
Active research of basic nature under the supervision of a Department of Biology faculty member.  
Prerequisites: Junior or senior classification and approval of instructor.  

MICR 499 Seminar  
Credit 1. 1 Lecture Hour.  

MICR 681 Seminar  
Credit 1. 1 Other Hour.  
Detailed reports on specific topics in field chosen. Students may register in up to but no more than three sections of this course in the same semester.  

MICR 685 Directed Studies  
Credits 1 to 6. 1 to 6 Other Hours.  
Limited investigations in fields other than those chosen for thesis or dissertation.  

MICR 689 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of microbiology.
MICR 691 Research  
Credits 1 to 12. 1 to 12 Other Hours.  
Research for thesis or dissertation.

Zoology

ZOOL 289 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of zoology. May be repeated for credit.  
Prerequisite: Approval of instructor.

ZOOL 291 Research  
Credits 1 to 4. 1 to 4 Other Hours.  
Active research of basic nature under the supervision of a Department of Biology faculty member.  
Prerequisites: Freshman or sophomore classification and approval of instructor.

ZOOL 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of zoology. May be repeated once for credit.

ZOOL 491 Research  
Credits 1 to 4. 1 to 4 Other Hours.  
Active research of basic nature under the supervision of a Department of Biology faculty member.  
Prerequisites: Junior or senior classification and approval of instructor.