Department of Biology

The Department of Biology offers a Bachelor of Science degree in Biology, a Minor in Biology, a Bachelor of Science degree in Microbiology and Immunology, and a Bachelor of Science degree in Environmental Science.

The Bachelor of Science degree in Biology is designed to prepare students for professional careers in the biological sciences, medical and health service fields, research, industry, and education. The program of study is structured around a comprehensive core curriculum that includes genetics, physiology, cell biology, chemistry, physics, computer science, and mathematics. At the upper-division level, students wanting to specialize can choose one of four area concentrations: Cell and Molecular Biology, Integrative Biology, Neurobiology, or Plant Biology.

The Bachelor of Science degree in Microbiology and Immunology is designed to prepare students for professional careers in the medical and health service fields, research, industry, education and as specialists in industrial quality testing and control, and as regulatory workers in government agencies and public health laboratories. The program of study is structured around a comprehensive core curriculum that is similar to the Biology degree but upper-division level coursework is designed to achieve a deeper education in several specialized areas of microbiology. Due to extensive curriculum overlap, students cannot receive a double major in Biology and Microbiology and Immunology. Students must choose between a B.S. in Biology or a B.S. in Microbiology and Immunology.

The UTSA Department of Biology offers two accelerated degree programs in conjunction with the University of Texas Health Science Center at San Antonio (UTHSCSA). The DEAP program allows students to earn both the Bachelor of Science (B.S.) degree in Biology from UTSA and their Doctor of Dental Surgery (D.D.S.) degree at the UTHSCSA Dental School within a seven year period. For eligibility requirements and application visit the DEAP web site (http://utsa.edu/healthprofessions/deap.html). The FAME program allows students to earn both the Bachelor of Science (B.S.) degree in Biology from UTSA and their Doctor of Medicine (M.D.) degree at the UTHSCSA Medical School within a seven year period. For eligibility requirements and application visit the FAME Web site (http://utsa.edu/healthprofessions/fame.html).

Admission Policy for the Bachelor of Science Degree in Biology and the Bachelor of Science Degree in Microbiology and Immunology

The goal of the Department of Biology is to provide undergraduate students a program of study with the highest possible standards. To achieve this goal, the admission policy of the Department of Biology is designed to identify those students most likely to succeed in their undergraduate biology education. All applicants for admission to the Department of Biology will be admitted to the Department as prebiology (PBI) students. In order to declare a major in Biology or a major in Microbiology and Immunology, a student’s academic performance will be evaluated after the five courses listed below have been completed. To declare either major, a PBI student must have:

- a grade point average of at least 2.0 for all UTSA coursework
- a grade point average of at least 2.25 for all Biology coursework (UTSA and/or transfer credit). Transfer students in addition must have a grade point average of at least 2.0 for all UTSA Department of Biology coursework.
- successfully satisfied all three sections (mathematics, reading, and writing) of the Texas Success Initiative (TSI)
- successfully completed the following or equivalent courses with a grade of "C-" or better:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 1404</td>
<td>Biosciences I</td>
<td>4</td>
</tr>
<tr>
<td>BIO 1414</td>
<td>Biosciences II</td>
<td>4</td>
</tr>
<tr>
<td>CHE 1103</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>MAT 1193</td>
<td>Calculus for the Biosciences</td>
<td>3</td>
</tr>
<tr>
<td>PHY 1943</td>
<td>Physics for Scientists and Engineers I</td>
<td>3</td>
</tr>
<tr>
<td>or PHY 1603</td>
<td>Algebra-based Physics I</td>
<td>3</td>
</tr>
</tbody>
</table>

PBI students are restricted from registering for upper-division (3000- and 4000-level) Biology courses without the consent of an undergraduate academic advisor in Life and Health Sciences Advising. A student who does not meet all the above requirements after completing 60 hours of credit will no longer be considered a PBI student and their major will be changed from PBI to undeclared (UND) in the University student record system. The student must choose a major other than Biology or Microbiology and Immunology. A biology minor is, however, available to all UTSA students who seek to complement a different academic major with a strong foundation in biology. Students can be reinstated as a Biology major or Microbiology and Immunology major, but only after successfully completing all the PBI requirements, and upon approval of the Biology Department.

Academic Standing Policy for the Bachelor of Science Degree in Biology and the Bachelor of Science Degree in Microbiology and Immunology

All B.S. Majors in Biology or Microbiology and Immunology must maintain:

- a minimum overall UTSA grade point average of 2.0.
- a minimum overall grade point average of 2.25 in all Biology coursework (UTSA and transfer credit). Transfer students in addition must have a grade point average of at least 2.0 for all UTSA Department of Biology coursework.

Students who do not meet these requirements are placed on Department of Biology academic probation. Students on Department of Biology academic probation must achieve the minimum required grade point averages by the end of the next enrolled long semester at UTSA (Fall or Spring) that follows the semester in which the student falls below the required grade point averages. Students who do not meet the minimum requirements by the end of the next subsequent-enrolled long semester will be dismissed from the B.S. degree in Biology or the B.S. degree in Microbiology and Immunology and classified as undeclared (UND) in the University student record system. The student must choose a major other than Biology or Microbiology and Immunology. A biology minor is, however, available to all UTSA students who seek to complement a different academic major with a strong foundation in biology. Dismissed students may appeal one time for reinstatement to either B.S. degree program: such appeals will be granted only under extraordinary circumstances. The deadline for appeal is no later than...
The minimum number of semester credit hours required for the Bachelor of Science degree in Biology, including the Core Curriculum requirements, is 120. Thirty-nine of the total semester credit hours required for the degree must be at the upper-division level. All major and support work courses and the required prerequisites must be completed with a grade of “C-” or better, in addition, students must meet the grade point average requirements under the Academic Standing Policy. Students seeking teacher certification should contact the Teacher Advising and Certification Center in the College of Education and Human Development for information. Undergraduates seeking elementary teacher certification must complete the Interdisciplinary Studies degree.

For students wishing to add focus and expertise to their degree, the Department of Biology also offers the Bachelor of Science degree with a concentration in one of four areas: Cell and Molecular Biology, Integrative Biology, Neurobiology, and Plant Biology. Adding an area of concentration does not require additional coursework beyond the normal Bachelor of Science degree program. Students do, however, have to restrict their selection of biology electives to a predefined list of complementary courses and complete the coursework within the concentration with a minimum cumulative grade point average of 3.0 or better. Students are also encouraged to enroll in BIO 4923 Laboratory Research: Biology Concentrations as part of their program of study. Specific courses required for each concentration are listed following the general degree requirements.

Due to extensive curriculum overlap, students cannot receive a double major in Biology and Microbiology and Immunology. Students must choose between a B.S. in Biology or a B.S. in Microbiology and Immunology.

All candidates for this degree must fulfill the Core Curriculum requirements and the degree requirements, which are listed on the following pages.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the Bachelor of Science degree in Biology must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree. For a complete listing of courses that satisfy the Core Curriculum requirements, see below.

MAT 1193 may be used to satisfy the core requirement in Mathematics as well as a major requirement. Two of the following courses may be used to satisfy the core requirement in Natural Sciences, as well as major requirements: BIO 1404, BIO 1414, PHY 1943 or PHY 1963. CS 1173 may be used to satisfy the core requirement in Component Area Option as well as a major requirement.

Core Curriculum Component Area Requirements

Gateway Courses

Students pursuing the Bachelor of Science degree in Biology must successfully complete each of the following Gateway Courses with a grade of “C-” or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of “W” or taking an equivalent course at another institution, will be required to change his or her major.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 1404</td>
<td>Biosciences I</td>
</tr>
<tr>
<td>BIO 1414</td>
<td>Biosciences II</td>
</tr>
<tr>
<td>BIO 2313</td>
<td>Genetics</td>
</tr>
<tr>
<td>&amp; BIO 2322</td>
<td>and Genetics Laboratory</td>
</tr>
<tr>
<td>BIO 3413</td>
<td>Advanced Physiology</td>
</tr>
<tr>
<td>&amp; BIO 3422</td>
<td>and Advanced Physiology</td>
</tr>
<tr>
<td>BIO 3513</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>&amp; BIO 3522</td>
<td>and Biochemistry Laboratory</td>
</tr>
<tr>
<td>BIO 3813</td>
<td>Cell Biology</td>
</tr>
<tr>
<td>&amp; BIO 3822</td>
<td>and Cell Biology Laboratory</td>
</tr>
</tbody>
</table>

Degree Requirements

A. Required courses in the major

1. Biology requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
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<tbody>
<tr>
<td>BIO 1404</td>
<td>Biosciences I</td>
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</tr>
<tr>
<td>BIO 1414</td>
<td>Biosciences II</td>
<td>4</td>
</tr>
<tr>
<td>BIO 2313</td>
<td>Genetics</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 2322</td>
<td>and Genetics Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIO 3413</td>
<td>Advanced Physiology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3422</td>
<td>and Advanced Physiology</td>
<td></td>
</tr>
<tr>
<td>BIO 3513</td>
<td>Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3522</td>
<td>and Biochemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIO 3813</td>
<td>Cell Biology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3822</td>
<td>and Cell Biology Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

2. Select one of the following sequences:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 3283</td>
<td>Principles of Ecology</td>
<td>4</td>
</tr>
<tr>
<td>&amp; BIO 3292</td>
<td>and Principles of Ecology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIO 3433</td>
<td>Neurobiology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3442</td>
<td>and Neurobiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIO 3713</td>
<td>Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3722</td>
<td>and Microbiology Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Note: A laboratory section adds a valuable dimension to the understanding of the material presented in a lecture. In general, students are encouraged to add the appropriate laboratory section to any lecture beyond the minimum 5- semester-credit-hour requirement.

3. Additional biology electives at the upper-division level

Electives: 12

B. Support work

The support courses listed below are mandatory prerequisites for various biology courses starting in a student’s sophomore year. Students need to complete their support work as soon as possible, in their freshman and sophomore years, to be eligible to register for upper-division biology core courses and electives. Failure to complete the support courses listed below in a timely fashion will significantly delay a student’s progress toward graduation.

1. Required chemistry courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 1103</td>
<td>General Chemistry I</td>
</tr>
<tr>
<td>&amp; CHE 1121</td>
<td>and General Chemistry I Laboratory</td>
</tr>
</tbody>
</table>
CHE 1113 General Chemistry II 4 & CHE 1131 and General Chemistry II Laboratory
CHE 2603 Organic Chemistry I 5 & CHE 2612 and Organic Chemistry I Laboratory
CHE 3673 Organic Chemistry II with Biological Applications 3 or CHE 3643 Organic Chemistry II

2. Required mathematics and statistics courses:
MAT 1193 Calculus for the Biosciences 3
STA 1403 Probability and Statistics for the Biosciences 3

3. Required physics courses:
Option 1:
PHY 1603 & PHY 1611 Algebra-based Physics I and Algebra-based Physics I Laboratory
PHY 1623 & PHY 1631 Algebra-based Physics II and Algebra-based Physics II Laboratory
Option 2:
PHY 1943 & PHY 1951 Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory
PHY 1963 & PHY 1971 Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory

4. Computer-based data visualization and analysis:
CS 1173 Data Analysis and Visualization using MATLAB 3

C. Free electives
Select 9 semester credit hours of free electives, at least 4 hours of which must be at the upper-division level to reach the minimum requirement of 39 upper-division semester credit hours

Total Credit Hours 87

Concentrations
For students interested in research or graduate programs, the Department of Biology offers four areas of concentration. To declare a concentration or obtain advice, students should consult an undergraduate advisor in Life and Health Sciences Advising. It is highly recommended that the student complete a research project related to the specific concentration by taking BIO 4923 Laboratory Research: Biology Concentrations. If a student takes any of the courses listed below that satisfy both the Biology degree and concentration requirements, then the student may need to take additional upper-division Biology courses in order to meet the minimum number of semester credit hours required for the Biology degree. The coursework within the concentration must be completed with a minimum cumulative grade point average of 3.0 or better.

Concentration in Cell and Molecular Biology
All candidates for the Concentration in Cell and Molecular Biology must complete the following:

BIO 3913 Molecular Biology 3
Select three of the following:
BIO 3933 Principles of Cancer Biology
BIO 4143 Developmental Biology
BIO 4453 Endocrinology
BIO 4723 Virology

BIO 4743 Immunology
BIO 4923 Laboratory Research: Biology Concentrations
(Research must be in a laboratory engaged in molecular biology research.)

Total Credit Hours 12

Concentration in Integrative Biology
All candidates for the Concentration in Integrative Biology must complete the following:

BIO 3283 Principles of Ecology & BIO 3292 and Principles of Ecology Laboratory
Select two of the following:
BIO 3003 Introduction to Marine Ecology
BIO 3063 Invertebrate Biology
BIO 3213 Animal Behavior
BIO 3323 Evolution
BIO 4033 Conservation Biology
BIO 4053 Wildlife Biology
BIO 4063 Ornithology
BIO 4233 Field Biology
BIO 4923 Laboratory Research: Biology Concentrations
(Research must be in a laboratory engaged in integrative biology research.)

Total Credit Hours 11

Concentration in Neurobiology
All candidates for the Concentration in Neurobiology must complete the following:

BIO 3433 Neurobiology & BIO 3442 and Neurobiology Laboratory
Select two of the following:
BIO 3213 Animal Behavior
BIO 3623 Neuropsychopharmacology
BIO 4583 The Computational Brain
BIO 4813 Brain and Behavior
BIO 4823 Cognitive Neuroscience
BIO 4923 Laboratory Research: Biology Concentrations
(Research must be in a laboratory engaged in neurobiology research.)

Total Credit Hours 11

Concentration in Plant Biology
All candidates for the Concentration in Plant Biology must complete the following:

BIO 3343 Plant Cell Biology 3
Select three of the following:
BIO 3263 The Woody Plants
BIO 3273 Biology of Flowering Plants
BIO 3333 Plants and Society
BIO 4643 Medicinal Plants
BIO 4773 Plant-Microbe Interactions

Total Credit Hours 9
### Course Sequence Guide for B.S. Degree in Biology

This course sequence guide is designed to assist students in completing their UTSA undergraduate Biology degree requirements. This is merely a guide and students must satisfy other requirements of this catalog and meet with their academic advisor for individualized degree plans. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

#### B.S. in Biology – Recommended Four-Year Academic Plan

<table>
<thead>
<tr>
<th>First Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>AIS 1203</td>
<td>Academic Inquiry and Scholarship (core) 3</td>
</tr>
<tr>
<td>BIO 1404</td>
<td>Biosciences I (core and major) 4</td>
</tr>
<tr>
<td>CHE 1103</td>
<td>General Chemistry I 3</td>
</tr>
<tr>
<td>CHE 1121</td>
<td>General Chemistry I Laboratory 1</td>
</tr>
<tr>
<td>WRC 1013</td>
<td>Freshman Composition I (Q) (core) 3</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIO 1414</td>
<td>Biosciences II 4</td>
</tr>
<tr>
<td>CHE 1113</td>
<td>General Chemistry II 3</td>
</tr>
<tr>
<td>CHE 1131</td>
<td>General Chemistry II Laboratory 1</td>
</tr>
<tr>
<td>CS 1173</td>
<td>Data Analysis and Visualization using MATLAB (core) 3</td>
</tr>
<tr>
<td>MAT 1193</td>
<td>Calculus for the Biosciences (core and major) 3</td>
</tr>
<tr>
<td>WRC 1023</td>
<td>Freshman Composition II (Q) (core) 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHE 2603</td>
<td>Organic Chemistry I 3</td>
</tr>
<tr>
<td>CHE 2612</td>
<td>Organic Chemistry I Laboratory 2</td>
</tr>
<tr>
<td>American History core</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:
- PHY 1603 & PHY 1611: Algebra-based Physics I 4
- PHY 1943 & PHY 1951: Physics for Scientists and Engineers I 4

<table>
<thead>
<tr>
<th><strong>Spring</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 2313</td>
<td>Genetics 3</td>
</tr>
<tr>
<td>BIO 2322</td>
<td>Genetics Laboratory 2</td>
</tr>
<tr>
<td>CHE 3673 or 3643</td>
<td>Organic Chemistry II with Biological Applications 3</td>
</tr>
<tr>
<td>STA 1403</td>
<td>Probability and Statistics for the Biosciences 3</td>
</tr>
</tbody>
</table>

Select one of the following:

**Total Credit Hours:** 120.0

1. In order to declare Biology as a major, a student’s academic performance will be evaluated after these five courses have been completed. Students must see their academic advisor to declare a Biology major.

2. These laboratory courses include a lecture component as indicated on the University Schedule of Classes.

Note: Some courses are only offered once a year; Fall or Spring. Check with the Department of Biology for scheduling of courses.

### Bachelor of Science Degree in Microbiology and Immunology

The minimum number of semester credit hours (SCH) required for the Bachelor of Science degree in Microbiology and Immunology, including the Core Curriculum requirements, is 120. Thirty-nine of the total semester credit hours required for the degree must be at the upper-division level. All major and support work courses and the required prerequisites must be completed with a grade of “C-” or better, in addition, students must meet the grade point average requirements under the Academic Standing Policy. Students seeking teacher certification should contact the Teacher Advising and Certification Center in
the College of Education and Human Development for information. Undergraduates seeking elementary teacher certification must complete the Interdisciplinary Studies degree.

Due to extensive curriculum overlap, students cannot receive a double major in Biology and Microbiology and Immunology. Students must choose between a B.S. in Biology or a B.S. in Microbiology and Immunology.

All candidates for this degree must fulfill the Core Curriculum requirements and the degree requirements, which are on the following pages.

**Core Curriculum Requirements (42 semester credit hours)**

Students seeking the Bachelor of Science degree in Microbiology and Immunology must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree. For a complete listing of courses that satisfy the Core Curriculum requirements, see below.

MAT 1193 may be used to satisfy the core requirement in Mathematics as well as a major requirement. Two of the following courses may be used to satisfy the core requirement in Life and Physical Sciences, as well as major requirements: BIO 1404, BIO 1414, PHY 1943 or PHY 1963.

**Core Curriculum Component Area Requirements** (http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarequirements)

**Gateway Courses**

Students pursuing the Bachelor of Science degree in Microbiology and Immunology must successfully complete each of the following Gateway Courses with a grade of "C-" or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of "W" or taking an equivalent course at another institution, will be required to change his or her major.

BIO 1404  Biosciences I
BIO 1414  Biosciences II
BIO 2313  Genetics

**Degree Requirements**

**A. Required courses in the major, 34 of which must be at the upper-division level**

1. Required biology courses
   - BIO 1404  Biosciences I 4
   - BIO 1414  Biosciences II 4
   - BIO 2313  Genetics 5
   - BIO 3413  Advanced Physiology 3
   - BIO 3513  Biochemistry 5
   - BIO 3713  Microbiology 5
   - & BIO 3813  Cell Biology and Cell Biology Laboratory 5
   - & BIO 3822  and Cell Biology Laboratory 5
   - BIO 4743  Immunology 5
   - & BIO 4752  and Immunology Laboratory 5
   - BIO 4783  Microbial Genetics and Physiology 3
   - BIO 4981  Senior Seminar in Microbiology and Immunology 1

2. All candidates must complete three of the following prescribed upper-division elective courses
   - BIO 3013  Introduction to Clinical Medicine and Pathology
   - BIO 3743  Bacteriology
   - BIO 4473  Advanced Clinical Medicine and Pathology
   - BIO 4483  Medical Mycology
   - BIO 4723  Virology
   - BIO 4763  Parasitology
   - BIO 4923  Laboratory Research: Biology Concentrations (Research must be in a laboratory engaged in microbiology or immunology research.) 9

3. Two free elective courses 6

**B. Support work**

The support courses listed below are mandatory prerequisites for various biology courses starting in a student’s sophomore year. Students need to complete their support work as soon as possible, in their freshman and sophomore years, to be eligible to register for upper-division biology core courses and electives. Failure to complete the support courses listed below in a timely fashion will significantly delay a student’s progress toward graduation.

1. Required chemistry courses 18
   - CHE 1103  General Chemistry I
   - & CHE 1121  and General Chemistry I Laboratory
   - CHE 1113  General Chemistry II
   - & CHE 1131  and General Chemistry II Laboratory
   - CHE 2603  Organic Chemistry I
   - & CHE 2612  and Organic Chemistry I Laboratory
   - CHE 3673  Organic Chemistry II with Biological Applications
   - & CHE 3652  and Organic Chemistry II Laboratory

2. Required mathematics and statistics courses 6
   - MAT 1193  Calculus for the Biosciences
   - STA 1403  Probability and Statistics for the Biosciences

3. Required physics courses selected from one of the following options 8
   - Option 1
     - PHY 1603  Algebra-based Physics I
     - & PHY 1611  and Algebra-based Physics I Laboratory
     - PHY 1623  Algebra-based Physics II
     - & PHY 1631  and Algebra-based Physics II Laboratory
   - Option 2
     - PHY 1943  Physics for Scientists and Engineers I
     - & PHY 1951  and Physics for Scientists and Engineers I Laboratory
     - PHY 1963  Physics for Scientists and Engineers II
     - & PHY 1971  and Physics for Scientists and Engineers II Laboratory

**Total Credit Hours** 87
Course Sequence Guide for B.S. Degree in Microbiology and Immunology

This course sequence guide is designed to assist students in completing their UTSA undergraduate Microbiology and Immunology degree requirements. This is merely a guide and students must satisfy other requirements of this catalog and meet with their academic advisor for individualized degree plans. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

B.S. in Microbiology and Immunology – Recommended Four-Year Academic Plan

**First Year**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>Fall</td>
<td>AIS 1203</td>
<td>Academic Inquiry and Scholarship (core)</td>
<td>3</td>
</tr>
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<td>BIO 1404</td>
<td>Biosciences I (core and major)</td>
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<td>CHE 1103</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHE 1121</td>
<td>General Chemistry I Laboratory</td>
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<td>WRC 1013</td>
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<td>General Chemistry II</td>
<td>3</td>
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<td>General Chemistry II Laboratory</td>
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<tr>
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<td>WRC 1023</td>
<td>Freshman Composition II (Q) (core)</td>
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</tr>
<tr>
<td></td>
<td>Free elective</td>
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**Second Year**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>Fall</td>
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<td>Organic Chemistry I</td>
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<td>CHE 2612</td>
<td>Organic Chemistry I Laboratory</td>
<td>2</td>
</tr>
<tr>
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<td>STA 1403</td>
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**Third Year**

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<td>BIO 3713</td>
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<td>Social &amp; Behavioral Sciences core</td>
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<td>BIO 3813</td>
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<td>Cell Biology Laboratory</td>
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<td>BIO 4743</td>
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<td>BIO 4752</td>
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<td>Creative Arts core</td>
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**Fourth Year**

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<td>BIO 4783</td>
<td>Microbial Genetics and Physiology</td>
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<td>American History core</td>
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<td>Government-Political Science core</td>
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<td>BIO 4981</td>
<td>Senior Seminar in Microbiology and Immunology</td>
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<td>Upper-division BIO elective</td>
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<tr>
<td></td>
<td>American History core</td>
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<td></td>
<td>Government-Political Science core</td>
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<td>Component Area Option core</td>
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**Total Credit Hours:** 120.0

1 In order to declare Microbiology and Immunology as a major, a student’s academic performance will be evaluated after these five courses have been completed. Students must see their academic advisor to declare a Microbiology and Immunology major.

2 These laboratory courses include a lecture component as indicated on the University Schedule of Classes.

Note: Some courses are only offered once a year; Fall or Spring. Check with the Department of Biology for scheduling of courses.

Minor in Biology

The Minor in Biology is open to all majors in the University. To declare a Minor in Biology or obtain advice, students should consult with their academic advisor. All students pursuing the minor must complete a minimum of 20 semester credit hours of Biology courses. It should be noted that students seeking a minor must also complete applicable support coursework in chemistry, computer science, physics, mathematics and statistics as needed to fulfill the normal prerequisites for any course listed below. All Biology courses and their prerequisites must be completed with a grade of “C-” or better, and students must achieve a grade point average of at least 2.0 on all work used to satisfy the requirements of the minor.

**A. Required courses**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>BIO 1404</td>
<td>Biosciences I</td>
<td>4</td>
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</table>
BIO 1414. Biosciences II. (3-4) 4 Credit Hours. (TCCN = BIOL 1407)
Prerequisite: BIO 1404. This is the second course in a two-part introduction to the science of biology for students majoring in biology or interested in pre-health professions. Topics include evolutionary biology, biotic diversity, plant structure and function, and ecology. The course includes 3 hours of lecture and a mandatory 3.5-hour laboratory per week. May be applied toward the Core Curriculum requirement in Life and Physical Sciences. (Formerly BIO 1143, BIO 1223 and BIO 1413. Credit cannot be earned for more than one of the following: BIO 1143, BIO 1223, BIO 1413, BIO 1414, or ES 2013.).

BIO 1511. Biomedical Research as a Career. (1-0) 1 Credit Hour.
Intended for science majors of any discipline, this course is designed to introduce students to career options in the biosciences, particularly biomedical research. Students will explore the opportunities available in research and learn what they can do now to successfully launch a future career as a scientist.

BIO 1882. Introduction to Health Professions. (2-0) 2 Credit Hours.
This course is designed to provide an overview of careers in the health professions. Medical terminology, professional roles and concepts, career opportunities, and specialties within each profession will be discussed. (Formerly AHS 1883. Credit cannot be earned for both BIO 1882 and AHS 1883.)

BIO 2003. Biology of Human Reproduction. (3-0) 3 Credit Hours.
An in-depth look at human reproductive anatomy, physiology, and behavior. Topics to be considered include anatomy, sex differentiation, neuroendocrine physiology, conception and development, birth control, and sexually transmitted diseases. (Formerly BIO 1023. Credit cannot be earned for both BIO 2003 and BIO 1023.)

BIO 2043. Nutrition. (3-0) 3 Credit Hours. (TCCN = BIOL 1322)
Prerequisite: BIO 1233 or BIO 1404. In-depth study of nutrient classes in foods: their ingestion, digestion, absorption and utilization by the human body. Clinical consequences of nutrient deficiency or excess, and Medical Nutrition Therapy to complement management of disease. (Formerly AHS 2043. Credit cannot be earned for both BIO 2043 and AHS 2043.)

BIO 2051. Human Anatomy and Physiology Laboratory I. (0-3) 1 Credit Hour. (TCCN = BIOL 2101)
Prerequisite: BIO 1233 or BIO 1404. Concurrent enrollment in BIO 2053 is recommended. This laboratory supplements the BIO 2053 lecture. It is the first of a two-course laboratory sequence that uses both dissections of representative organisms and laboratory experimentation to study human anatomical systems and physiological processes. (Credit cannot be earned for both BIO 2051 and BIO 2091 or BIO 2111. BIO 2051 cannot substitute for BIO 3422.)

BIO 2053. Human Anatomy and Physiology Laboratory II. (0-3) 3 Credit Hours. (TCCN = BIOL 2301)
Prerequisite: BIO 1233 or BIO 1404. Concurrent enrollment in BIO 2051 is recommended. This is the first of a two-course sequence that provides an integrative study of the anatomy and physiology of the human body with an emphasis on the structure/function interrelationships between organ systems. Topics covered include cell and tissue biology, the integumentary, skeletal, muscular, and nervous systems. (Credit cannot be earned for both BIO 2053 and BIO 2083 or BIO 2103. BIO 2053 cannot substitute for BIO 3413.).
BIO 2061. Human Anatomy and Physiology Laboratory II. (0-3) 1 Credit Hour. (TCCN = BIOL 2102)
Prerequisite: BIO 2051. Concurrent enrollment in BIO 2063 is recommended. This laboratory supplements the BIO 2063 lecture. It is the second of a two-course laboratory sequence that uses both dissections of representative organisms and laboratory experimentation to study human anatomical systems and physiological processes. (Credit cannot be earned for both BIO 2061 and BIO 2091 or BIO 2111. BIO 2061 cannot substitute for BIO 3422.)

BIO 2063. Human Anatomy and Physiology II. (3-0) 3 Credit Hours. (TCCN = BIOL 2302)
Prerequisite: BIO 2053. Concurrent enrollment in BIO 2061 is recommended. This is the second of a two-course sequence that provides an integrative study of the anatomy and physiology of the human body with an emphasis on the structure/function interrelationships between organ systems. Topics covered include the endocrine, digestive, respiratory, cardiovascular, lymphatic/immune, renal and reproductive systems. Human growth and development will also be covered. (Credit cannot be earned for both BIO 2063 and BIO 2083 or BIO 2103. BIO 2063 cannot substitute for BIO 3413.)

BIO 2083. Human Anatomy. (3-0) 3 Credit Hours. (TCCN = BIOL 2301)
Prerequisites: BIO 1233 or BIO 1404. This course is only for students who have successfully completed BIO 2103 in a catalog previous to 2015-16. Students who have not successfully completed BIO 2103 are required to take BIO 2053/BIO 2051 instead of BIO 2083/BIO 2091 and BIO 2103/BIO 2111. Systemic anatomy of the human organism. Includes cell biology, histology, and gross anatomy of major organ systems. (Formerly AHS 2083. Credit cannot be earned for both BIO 2083 and AHS 2083.)

BIO 2091. Human Anatomy Laboratory. (0-3) 1 Credit Hour. (TCCN = BIOL 2101)
Prerequisites: BIO 1233 or BIO 1404, and completion of or concurrent enrollment in BIO 2083. This course is only for students who have successfully completed BIO 2103 in a catalog previous to 2015-16. Students who have not successfully completed BIO 2103 are required to take BIO 2053/BIO 2051 instead of BIO 2083/BIO 2091 and BIO 2103/ BIO 2111. The study of human anatomical systems using dissection of representative organisms. (Formerly AHS 2091. Credit cannot be earned for both BIO 2091 and AHS 2091.)

BIO 2103. Human Physiology. (3-0) 3 Credit Hours. (TCCN = BIOL 2302)
Prerequisites: BIO 1233 or BIO 1404. This course is only for students who have successfully completed BIO 2083 in a catalog previous to 2015-16. Students who have not successfully completed BIO 2083 are required to take BIO 2053/BIO 2051 instead of BIO 2103/BIO 2111 and BIO 2083/BIO 2091. Human physiological processes will be examined at the chemical, cellular, tissue and organ system levels. (Formerly AHS 2103. Credit cannot be earned for both BIO 2103 and AHS 2103. BIO 2103 cannot substitute for BIO 3413.)

BIO 2111. Human Physiology Laboratory. (0-3) 1 Credit Hour. (TCCN = BIOL 2102)
Prerequisites: BIO 1233 or BIO 1404, and completion of or concurrent enrollment in BIO 2103. This course is only for students who have successfully completed BIO 2083 in a catalog previous to 2015-16. Students who have not successfully completed BIO 2083 are required to take BIO 2053/BIO 2051 instead of BIO 2103/BIO 2111 and BIO 2083/ BIO 2091. Lab based investigations of system physiological processes with emphasis on humans. (Formerly AHS 2111. Credit cannot be earned for both BIO 2111 and AHS 2111. BIO 2111 cannot substitute for BIO 3422.)

BIO 2313. Genetics. (3-0) 3 Credit Hours. (TCCN = BIOL 2316)
Prerequisites: BIO 1414 and completion or concurrent enrollment in one of the following: MAT 1093 (or higher) or STA 1053. Concurrent enrollment in BIO 2322 is recommended. Principles governing transmission of hereditary factors in plants and animals, with emphasis on molecular, biochemical, and population genetics.

BIO 2303. Introduction to Marine Ecology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. An introduction to the study of marine ecology with an emphasis on the physio-chemical and biological factors that determine biodiversity and the affect the biology and distribution of marine organisms. Topics covered include functional biology, biodiversity, ecology and conservation of organisms in marine environments.

BIO 3013. Introduction to Clinical Medicine and Pathology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1404. Introduction to concepts of human disease, diagnosis, and underlying pathology. (Formerly titled “Introductory Pathology.”).

BIO 3063. Invertebrate Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. A comprehensive study of the invertebrates that aims to 1) examine the biodiversity of invertebrates in their mode of behavior, physiology, genetics and ecology, 2) understand the functional morphology of invertebrate phyla and their evolutionary relationships, and 3 appreciate the importance of invertebrates in ecosystems.

BIO 3123. Comparative Vertebrate Anatomy. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. Concurrent enrollment in BIO 3132 is recommended. A comparative analysis of developmental and adult anatomy of vertebrates (including human). Emphasis is placed on phylogenetic relationships between form, function and evolution. (Formerly BIO 2123. Credit cannot be earned for both BIO 2123 and BIO 3123.)

BIO 3172. Histology and Cytology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: BIO 2313 and completion of or concurrent enrollment in BIO 3163. Microscopic study of tissues and organs. Basic techniques to prepare tissues will be studied.

BIO 3213. Animal Behavior. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414 or consent of instructor. A detailed study of animal behaviors and their biological determinants.
BIO 3263. The Woody Plants. (2-3) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours. A study of the woody plants emphasizing the characteristics of family, genus, and species. Includes identification of the common woody plants. Leaf, stem, and flower morphology, anatomy, and collecting techniques. Lecture, laboratory, and fieldwork will be included as part of the course. (Same as ES 3223. Credit cannot be earned for both BIO 3263 and ES 3223.).

BIO 3273. Biology of Flowering Plants. (2-3) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours. A study of the wildflowers of Texas emphasizing identification of the more common wildflowers, as well as family characteristics, flower anatomy, plant morphology, and plant-collecting techniques will be included. Lecture, laboratory, and fieldwork will be included as part of the course. (Same as ES 3213. Credit cannot be earned for both BIO 3273 and ES 3213.).

BIO 3283. Principles of Ecology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. Concurrent enrollment in BIO 3292 is recommended for biology majors. A study of the interaction of organisms with their environment, with focus on ecological principles, adaptations of organisms, environmental pollution, and principles of conservation. (Credit cannot be earned for both BIO 3283 and ES 3033.).

BIO 3292. Principles of Ecology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: BIO 1414 and completion of or concurrent enrollment in BIO 3283. A field-oriented course emphasizing modern ecological techniques, including examinations of plant and animal populations and measurement of selected chemical and physical parameters. (Credit cannot be earned for both BIO 3292 and ES 3042.).

BIO 3323. Evolution. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. A discussion of theories and possible mechanisms for evolutionary changes at various levels of organization.

BIO 3333. Plants and Society. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. The importance of plants and plant-derived products to human health and wellbeing through the provision of food, pharmaceuticals, and other important natural products. (Formerly BIO 2343. Credit cannot be earned for both BIO 3333 and BIO 2343.).

BIO 3343. Plant Cell Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. A comprehensive study of the molecular structures and functions of plant cells and their integration into the whole plant system. (Formerly titled “Plant Sciences.”).

BIO 3413. Advanced Physiology. (3-0) 3 Credit Hours.
Prerequisites: BIO 2313 and MAT 1193. Concurrent enrollment in BIO 3422 is also recommended. This course is designed to develop the skills and competencies needed by students to understand the dynamic physiological processes underlying the maintenance of homeostatic balance in animals. Topics to be covered include endocrine, neural, muscular, cardiopulmonary and renal physiology. (BIO 2103 or BIO 3153 cannot substitute for BIO 3413.).

BIO 3422. Advanced Physiology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: BIO 2313, one of the following: MAT 1093 (or higher) or STA 1053 and completion or concurrent enrollment in BIO 3413. Basic understanding of the physiological processes in living systems employing methods and instruments of biological research. (BIO 2111 cannot substitute for BIO 3422.).

BIO 3433. Neurobiology. (3-0) 3 Credit Hours.
Prerequisite: Completion of or concurrent enrollment in BIO 3413. Concurrent enrollment in BIO 3442 is recommended. Anatomy and physiology of nervous systems; the mechanisms of neuronal functions.

BIO 3442. Neurobiology Laboratory. (0-6) 2 Credit Hours.
Prerequisite: Completion of or concurrent enrollment in BIO 3433. A laboratory course emphasizing principles presented in BIO 3433.

BIO 3513. Biochemistry. (3-0) 3 Credit Hours.
Prerequisites: CHE 2603 and CHE 2612; BIO 2313 and CHE 3673 are highly recommended. Concurrent enrollment in BIO 3522 is recommended. Introduction to biochemistry: amino acids, protein structure, enzymes, lipids, metabolism, nucleic acid structure, bioenergetics, and carbohydrates. (Credit cannot be earned for both BIO 3513 and CHE 4303.).

BIO 3522. Biochemistry Laboratory. (1-4) 2 Credit Hours.
Prerequisites: CHE 2603 and CHE 2612, and completion of or concurrent enrollment in BIO 3513. Basic biochemical laboratory techniques: Protein assay, centrifugation, protein purification, chromatography, electrophoresis, western blotting, and enzyme kinetics. This laboratory includes a lecture component.

BIO 3533. FAME-Biophysics. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. Biophysics is an algebra-based introduction to the science of physics with an emphasis on the life sciences and the practice of medicine. Topics include mechanics, fluids, sounds, and electromagnetism and their biomedical applications.

BIO 3543. FAME-Behavioral Health. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. This course is designed to introduce students to the challenges and opportunities of treating patients with mental illness. Students will learn key ethical principles, differential diagnosis, and pharmacological and psychotherapeutic interventions for managing serious mental illnesses including schizophrenia, bipolar disorder, depression, and anxiety disorders. Students will also learn how to conduct a psychiatric interview and prepare a new patient intake including patient history, mental status exam, assessment, and plan.

BIO 3553. FAME-Geriatrics. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. Using interdisciplinary perspectives, students will learn about medical and psychosocial aspects of aging including physiological, societal, social, physical, and psychological changes as they relate to the aging process, geriatric health care, palliative care and end of life care. Hands-on educational experiences will involve interaction with healthy elders, clinical rotations at hospital consult services, long term care communities and hospice care. All activities will be case-based, interactive and will have an online learning component.

BIO 3563. FAME-Maternal Health/Pediatrics. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. This course is designed to provide an overview and historical perspective in the evolution of maternal health and pediatrics as fields of practice in medicine. Topics discussed will include public health and policy, representations of the field in the arts, literature and media, and the development of careers in pediatric medicine. Opportunities for interactive community and clinically based experiences will be incorporated in the coursework.

BIO 3573. FAME-Obesity/Nutrition. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. Students will explore the physiological, socio-behavioral, public health and philosophical implications of obesity and nutrition through acute and preventive medicine perspectives.
BIO 3583. FAME-Cardiovascular Disease/Diabetes. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. Students will explore the genetic, biologic, physiologic, cultural, and economic implications of cardiovascular disease through didactic sessions, group projects, self-study and direct patient contact.

BIO 3593. FAME-Cancer. (3-0) 3 Credit Hours.
This course is only open to students who are participating in the FAME Program. Students will explore the historical, genetic, biologic, social, ethical, legal and economic implications of cancer, its predisposing factors and treatments. This will be accomplished through readings, didactic sessions, group projects, self-study, and clinical contact with patients and cancer center health care providers.

BIO 3613. The Biology of Aging. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. The biological principles of human life and health; changes that occur with aging and their implications for the lives of students and their families.

BIO 3623. Neuropsychopharmacology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414; BIO 3433 is recommended. A study of the pharmacology of drugs that affect the function of the central nervous system. Topics include drug-receptor interactions, drugs of abuse, and drugs used to treat mental illness.

BIO 3663. Human Embryology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. Development of the human embryo from fertilization to the birth of the fetus. The origin of various tissues and organs will be followed during development. Environmental and genetic factors that can alter development will be discussed.

BIO 3713. Microbiology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. Concurrent enrollment in BIO 2313 and BIO 3722 is recommended. A comprehensive study of microorganisms, including their composition, morphology, growth, metabolism, classification, ecology, and significance in disease. (BIO 1053 cannot substitute for BIO 3713. Credit cannot be earned for both BIO 3713 and ES 3103.).

BIO 3722. Microbiology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: BIO 1414, and completion of or concurrent enrollment in BIO 3713. Basic microbiology techniques with emphasis on microscopy; cell staining and characterization; species isolation techniques; bacterial cultivation, nutrition, and physical requirements; and the physical and chemical control of microbes. Immunodeficient and pregnant students must contact the Coordinator, Microbiology Teaching Labs, for additional instructions prior to the class start date. (BIO 1061 cannot substitute for BIO 3722. Credit cannot be earned for both BIO 3722 and ES 3112.).

BIO 3743. Bacteriology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3713; BIO 3722 is recommended. A study of the phylogeny of prokaryotes; structure and function of prokaryotic cells; ecology and physiological diversity of prokaryotes; growth and control of microorganisms; genetics of bacteria and bacteriophages; bacteria as agents of disease; antibiotics and other chemotherapeutics; human applications of microbiology, microbial genomics and principles of microbial biotechnology.

BIO 3813. Cell Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3513 is recommended. Concurrent enrollment in BIO 3822 is recommended. A study of cellular molecules and metabolic processes; synthesis and regulation of macromolecules; differential gene expression; membranes and organelles; cytoskeleton; cell cycle and growth of normal and neoplastic cells.

BIO 3822. Cell Biology Laboratory. (1-4) 2 Credit Hours.
Prerequisites: BIO 2313 and either BIO 2322 or CHE 1131, and completion of or concurrent enrollment in BIO 3813. A study of the microscopic, biochemical and molecular approaches used to investigate cellular structure and function, including the principles involved in the techniques, their practical application, and analysis of the data generated. This laboratory includes a lecture component.

BIO 3913. Molecular Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3513 is recommended. A study of nucleotides, DNA, replication, recombination, RNA, transcription, genetic code, translation, genomes, and chromosomes.

BIO 3933. Principles of Cancer Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414; BIO 3813 is recommended. A comprehensive study of the molecular mechanisms responsible for cellular and organismal function including: nucleic acid structure, replication, repair and recombination of DNA, transcription (RNA), RNA processing, translation (proteins), regulation of gene expression, organization of genomes and chromosomes, epigenetics, and related scientific methods and approaches.

BIO 4033. Conservation Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3283. The class topics will include studying the nature of the biosphere, threats to its integrity, and ecologically sound responses to these threats. Also included will be the origin and preservation of biotic diversity, how the rich variety of plant and animal life around us arose, how it has been maintained by natural processes, and how we can prevent its destruction. (Same as ES 4213. Credit cannot be earned for both BIO 4033 and ES 4213.).

BIO 4053. Wildlife Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3283. An introduction to wildlife biology and management including ecological principles dealing with ecosystems, natural communities, and populations. The importance of animal behavior, the availability of food, cover, wildlife diseases, predators, hunting, and trapping will be included. Field studies will allow students to observe and apply classroom topics. (Same as ES 4243. Credit cannot be earned for both BIO 4053 and ES 4243.).

BIO 4063. Ornithology. (2-3) 3 Credit Hours.
Prerequisite: BIO 1404. A course covering various aspects of the biology of birds, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips will be included. (Same as ES 3163. Credit cannot be earned for both BIO 4063 and ES 3163.).

BIO 4073. Law, Ethics, and the Life Sciences. (3-0) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours. Current societal issues which require an understanding of biology (e.g., stem cell research, assisted suicide, abortion, reproductive options, global warming, Intelligent Design, etc.) are considered.

BIO 4143. Developmental Biology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313. Overview of developmental biology focusing on the origins of classical concepts as well as modern molecular approaches. Emphasis will be placed on the mechanisms underlying developmental processes using both invertebrate and vertebrate examples. Subjects include axis formation, induction, morphogenesis, embryonic pattern formation, cell differentiation, and organogenesis. (Formerly BIO 3143. Credit cannot be earned for both BIO 4143 and BIO 3143.).
BIO 4233. Field Biology. (3-0) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. Concurrent enrollment in BIO 4241 is recommended. A study of the natural history of plants and animals in their native environment. Techniques for the identification of birds, mammals, reptiles, amphibians, insects, and the dominant flowering plants will be discussed. (Same as ES 4113. Credit cannot be earned for both BIO 4233 and ES 4113.).

BIO 4241. Field Biology Laboratory. (0-3) 1 Credit Hour.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. Concurrent enrollment in BIO 4233 is recommended. A field-oriented course offering the opportunity for practical experience observing, collecting, and identifying Texas plants and animals. (Same as ES 4111. Credit cannot be earned for both BIO 4241 and ES 4111.).

BIO 4453. Endocrinology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. Molecular, cellular and physiological effects of hormones in health and disease. Topics include molecular mechanisms of hormone action in reproductive physiology, growth and development as well as defects in hormonal regulation underlying clinically important syndromes (e.g., diabetes, hypertension, osteoporosis and cancer).

BIO 4473. Advanced Clinical Medicine and Pathology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3013. Advanced concepts of human disease, diagnosis, and underlying pathology.

BIO 4483. Medical Mycology. (3-0) 3 Credit Hours.
Prerequisites: BIO 3713 and BIO 3722. Comprehensive study of causative agents, pathogenesis, and treatment of human fungal diseases.

BIO 4583. The Computational Brain. (3-0) 3 Credit Hours.
Prerequisite: BIO 3433. Principles of cellular neurophysiology and neuroanatomy are used to explore the computational operations performed by neurons and networks of neurons.

BIO 4643. Medicinal Plants. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3513 is recommended. Ethnobotanical, biochemical and pharmacological aspects of some of our most important plant-derived drugs.

BIO 4723. Virology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313; BIO 3513 is recommended. Introduction to the molecular, genetic, and biological properties of viruses. Course will cover the basic concepts of virus structure, replication, virus/host interactions, pathogenesis, and evolution.

BIO 4743. Immunology. (3-0) 3 Credit Hours.
Prerequisites: BIO 2313 and BIO 3713. Concurrent enrollment in BIO 4752 is recommended. A study of the properties of antigens and antibodies and current concepts of humoral and cell-mediated immunity and the cells involved.

BIO 4752. Immunology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: BIO 3713 and BIO 3722, and completion or concurrent enrollment in BIO 4743. Laboratory applications of principles presented in BIO 4743. (Formerly BIO 4751. Credit cannot be earned for both BIO 4751 and BIO 4752.).

BIO 4763. Parasitology. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. A study of the animal parasites of medical and veterinary importance, with emphasis on their epidemiology, life cycles, pathology, and control.

BIO 4773. Plant-Microbe Interactions. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3713. The study of molecular and cellular aspects of the interaction between plants and microorganisms in the environment, such as mycorrhizae, pathogenic fungi, Agrobacterium, pathogenic bacteria and plant viruses. Topics include microbial virulence, signaling, gene expression, and disease resistance in plants.

BIO 4783. Microbial Genetics and Physiology. (3-0) 3 Credit Hours.
Prerequisite: BIO 2313 and BIO 3713. A study of the genetic, physiological and molecular processes that influence gene transfer, pathogenesis, and drug resistance related to bacteria, fungi, and viruses.

BIO 4813. Brain and Behavior. (3-0) 3 Credit Hours.
Prerequisite: BIO 1414. Basic physiological functions of the brain and how they relate to behavior.

BIO 4823. Cognitive Neuroscience. (3-0) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours; BIO 3433 (or PSY 3103) is recommended. The biological foundations of mental phenomena, including perception, attention, learning, memory, language, motor control, and executive function, as well as functional specialization, development and plasticity, through various methodologies.

BIO 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: Permission in writing (form available) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Only 6 semester credit hours of BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor’s degree.

BIO 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Only 6 semester credit hours of BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor’s degree.

BIO 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Only 6 semester credit hours of BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor’s degree.
BIO 4923. Laboratory Research: Biology Concentrations. (0-0) 3 Credit Hours.
Permission in writing (form available in the Biology Department Office) from the faculty mentor, the student’s advisor, the Department Chair, and the Dean of the College. Supervised laboratory research mentored by a faculty member engaged in active research within the student’s designated area of concentration. May be repeated for credit, but no more than 6 semester credit hours will apply to a bachelor’s degree. Only 6 semester credit hours of BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor’s degree.

BIO 4951. Special Studies in Biology. (1-0) 1 Credit Hour.
An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

BIO 4952. Special Studies in Biology. (2-0) 2 Credit Hours.
An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

BIO 4953. Special Studies in Biology. (3-0) 3 Credit Hours.
An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

BIO 4981. Senior Seminar in Microbiology and Immunology. (1-0) 1 Credit Hour.
Prerequisite: Senior status, a minimum of 90 semester credit hours. This course is only open to seniors in the Microbiology and Immunology degree program. Students will learn how to interpret the scientific literature and to organize and present scientific research findings as reported in the current literature. May be repeated for credit. The grade report for the course is either “CR” (satisfactory performance) or “NC” (unsatisfactory performance).

BIO 4993. Honors Research. (0-0) 3 Credit Hours.
Enrollment limited to biology majors who are members of the Honors College or who are pursuing College of Sciences Honors, and who are in their last two semesters of study. Approval by the Honors College or College Honors Committee is required. Supervised research and preparation of an Honors Thesis. May be repeated for credit with approval, but no more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Only 6 semester credit hours of BIO 4911-3, BIO 4923 and BIO 4993, in any combination, can be taken as BIO electives. Additional research hours of these courses may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor’s degree.