Department of Biology

The Department of Biology offers a Bachelor of Science (B.S.) degree in Biology and a B.S. degree in Microbiology and Immunology, as well as a Minor in Biology. The Department also offers Grades 7–12 Biology Teacher Certification in collaboration with UTeachSA, and the Certificate in Pathogenic Outbreak Investigations in collaboration with the Department of Computer Science and the Department Information of Systems and Cyber Security in the College of Business.

The B.S. 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 five area concentrations: Cell and Molecular Biology, Integrative Biology, Neurobiology, Plant Biology, or Grades 7–12 Biology Teacher Certification.

The B.S. 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 UTHealth San Antonio. 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 UTHealth San Antonio Dental School within a seven-year period. For eligibility requirements and application visit the DEAP website (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 UTHealth San Antonio 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 B.S. Degree in Biology and the B.S. 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) or pre-microbiology and immunology (PMI) 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, PBI or PMI, a 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</th>
<th>Title</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 (Students in the teaching concentration can substitute STA 1053.)</td>
<td>3</td>
</tr>
<tr>
<td>PHY 1943</td>
<td>Physics for Scientists and Engineers I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>or PHY 1603 Algebra-based Physics I</td>
<td></td>
</tr>
</tbody>
</table>

PBI and PMI 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 or PMI student and their major will be changed from PBI/PMI 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/PMI requirements, and upon approval of the Biology department.

Academic Standing Policy for the B.S. Degree in Biology and the B.S. Degree in Microbiology and Immunology

All 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 courses (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. See Life and Health Sciences Advising for required forms. All Biology majors and Microbiology and Immunology majors must have the required minimum grade point averages in order to receive the Bachelor of Science degree.

- B.S. degree in Biology (p. 2)
- B.S. degree in Microbiology and Immunology (p. 6)

**Bachelor of Science Degree in Biology**

The minimum number of semester credit hours required for the Bachelor of Science (B.S.) degree in Biology, including the Core Curriculum requirements, is 120. To complete the concentration in Biology Teaching Certification requires a minimum of 126 semester credit hours. 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.

For students wishing to add focus and expertise to their degree, the Department of Biology also offers the B.S. degree with a concentration in one of five areas: Cell and Molecular Biology, Integrative Biology, Neurobiology, Plant Biology, and Grades 7–12 Biology Teacher Certification. Specific grade point average requirements and 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 below.

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

Students seeking the B.S. 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.

MAT 1193 may be used to satisfy the core requirement in Mathematics as well as a major requirement. (Students in the teaching concentration can substitute STA 1053 for MAT 1193.) 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. 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** ([http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/ degreerequirements/corecurriculumcomponentarequirements](http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarequirements))

- First Year Experience Requirement 3
- Communication 6
- Mathematics 3
- Life and Physical Sciences 6

**Degree Requirements**

A. **Required courses in the major**

1. Biology requirements:
   - BIO 1404 Biosciences I 4
   - BIO 1414 Biosciences II 4
   - BIO 2313 Genetics 5
   - & BIO 2322 and Genetics Laboratory 5
   - BIO 3413 Advanced Physiology 5
   - & BIO 3422 and Advanced Physiology Laboratory 5
   - BIO 3513 Biochemistry 5
   - & BIO 3522 and Biochemistry Laboratory 5
   - BIO 3813 Cell Biology 5
   - & BIO 3822 and Cell Biology Laboratory 5
   - 2. Select one of the following sequences: 5
      - BIO 3283 Principles of Ecology 5
      - & BIO 3292 and Principles of Ecology Laboratory 5
      - BIO 3433 Neurobiology 5
      - & BIO 3442 and Neurobiology Laboratory 5
      - BIO 3713 Microbiology 5
      - & BIO 3722 and Microbiology Laboratory 5

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. Biology electives:
   - Additional biology electives at the upper-division level 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:
Concentrations

For students interested in research or graduate programs, the Department of Biology offers five areas of concentration. To declare a concentration or obtain advice, students should consult an undergraduate advisor in Life and Health Sciences Advising. 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.

Concentration in Cell and Molecular Biology

The coursework within the Cell and Molecular Biology concentration must be completed 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.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 3913</td>
<td>Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>Select three of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 3933</td>
<td>Principles of Cancer Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4143</td>
<td>Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4453</td>
<td>Endocrinology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4723</td>
<td>Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4743</td>
<td>Immunology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4923</td>
<td>Laboratory Research: Biology Concentrations (Research must be in a laboratory engaged in molecular biology research.)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 12

Concentration in Integrative Biology

The coursework within the Integrative Biology concentration must be completed 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.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 3283</td>
<td>Principles of Ecology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3292</td>
<td>and Principles of Ecology Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>Select two of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 3213</td>
<td>Animal Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BIO 3323</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4033</td>
<td>Conservation Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4053</td>
<td>Wildlife Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4063</td>
<td>Ornithology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4233</td>
<td>Field Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4923</td>
<td>Laboratory Research: Biology Concentrations (Research must be in a laboratory engaged in integrative biology research.)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 11

Concentration in Neurobiology

The coursework within the Neurobiology concentration must be completed 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.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 3433</td>
<td>Neurobiology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIO 3442</td>
<td>and Neurobiology Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>Select two of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 3213</td>
<td>Animal Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BIO 3623</td>
<td>Neuropsychopharmacology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4583</td>
<td>The Computational Brain</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4813</td>
<td>Brain and Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BIO 4823</td>
<td>Cognitive Neuroscience</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 11
Certification must complete the following:

All candidates for the Concentration in Grades 7–12 Biology Teacher Certification coursework must be completed with a minimum cumulative grade point average of 2.5 or better. Students are also encouraged to enroll in BIO 4923 Laboratory Research: Biology Concentrations as part of their program of study.

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

BIO 3343  Plant Cell Biology  3
Select three of the following:  9
BIO 3263  The Woody Plants
BIO 3273  Biology of Flowering Plants
BIO 3333  Plants and Society
BIO 4643  Medicinal Plants
BIO 4923  Laboratory Research: Biology Concentrations (Research must be in a laboratory engaged in plant-based research.)

Total Credit Hours  12

Concentration in Plant Biology

The coursework within the Plant Biology concentration must be completed 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.

Concentration in Grades 7–12 Biology Teacher Certification

The B.S. degree in Biology with Teacher Certification is designed to prepare students for professional careers in teaching Biology at the level of secondary education. The program of study is structured around a comprehensive Biology core curriculum and state requirements for grades 7–12 life science teaching certification. Students cannot receive a B.S. degree with Teacher Certification without completing the teacher certification coursework. A student who does not complete the Biology teacher certification must transfer to the B.S. degree in Biology or the B.S. degree in Microbiology and Immunology in order to receive a degree in Biology. Undergraduates seeking elementary teacher certification must meet with their academic advisor for individualized degree plans.

The B.S. degree in Biology with Teacher Certification must transfer to the B.S. degree in Biology or the B.S. degree in Microbiology and Immunology in order to receive a degree in Biology. Undergraduates seeking elementary teacher certification must meet with their academic advisor for individualized degree plans.

The minimum number of semester credit hours required for the Bachelor of Science degree in Biology with Teacher Certification, including the Core Curriculum requirements, is 126. Thirty-nine of the total semester credit hours required for the degree must be at the upper-division level. The coursework within the Biology Teacher concentration must be completed with a minimum cumulative grade point average of 2.5 or better.

All candidates for the Concentration in Grades 7–12 Biology Teacher Certification must complete the following:

BIO 3043  UTeachSA Research Methods  3
BIO 3283  Principles of Ecology  3
BIO 3323  Evolution  3
BIO 3713  Microbiology  3
BIO 4813  Brain and Behavior  3
ESL 3063  Second Language Teaching and Learning for Grades 4–8 and 7–12  3
LTED 3773  Reading and Writing Across the Disciplines: Grades 7–12  3
UTE 1111  Introduction to STEM Teaching Step 1  1
UTE 1122  Introduction to STEM Teaching Step 2  2
UTE 3023  Perspectives on Science and Mathematics  3
UTE 3203  Knowing and Learning in Mathematics and Science  3
UTE 3213  Classroom Interactions  3
UTE 4203  Project-Based Instruction  3
UTE 4646  Clinical Teaching  6

Total Credit Hours  42

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

First Year

Fall
AIS 1203  Academic Inquiry and Scholarship (core)  3
BIO 1404  Biosciences I (core and major)  4
CHE 1103  General Chemistry I  3
CHE 1121  General Chemistry I Laboratory  1
WRC 1013  Freshman Composition I (Q) (core)  3

Spring
BIO 1414  Biosciences II (core and major)  4
CHE 1113  General Chemistry II  3
CHE 1131  General Chemistry II Laboratory  1
CS 1173  Data Analysis and Visualization (core and major)  3
MAT 1193  Calculus for the Biosciences (core and major)  3
WRC 1023  Freshman Composition II (Q) (core)  3

Second Year

Fall
CHE 2603  Organic Chemistry I  3
CHE 2612  Organic Chemistry I Laboratory  2
American History core  3
Select one of the following:  4
PHY 1603  Algebra-based Physics I  1
& PHY 1611
PHY 1943  Physics for Scientists and Engineers I  
& PHY 1951

Spring
BIO 2313  Genetics  3
BIO 2322  Genetics Laboratory  2
CHE 3673 or 3643  Organic Chemistry II with Biological Applications  3
STA 1403  Probability and Statistics for the Biosciences  3

Select one of the following:  4
PHY 1623  Algebra-based Physics II & PHY 1631
PHY 1963  Physics for Scientists and Engineers II

Third Year

Fall
BIO 3413  Advanced Physiology  3
BIO 3422  Advanced Physiology Laboratory  2
BIO 3513  Biochemistry  3
BIO 3522  Biochemistry Laboratory  2
Language, Philosophy & Culture core  3
Social & Behavioral Sciences core  3

Spring
BIO 3813  Cell Biology  3
BIO 3822  Cell Biology Laboratory  2
Free elective  3
Upper-division BIO lab (BIO 3XX2)  2
Upper-division BIO lecture (BIO 3XX3)  2
Creative Arts core  3

Fourth Year

Fall
Upper-division BIO elective  3
Upper-division BIO elective  3
Upper-division BIO elective  3
American History core  3
Government-Political Science core  3

Spring
Upper-division BIO elective  3
Upper-division free elective  3
Upper-division free elective  3
Government-Political Science core  3
Free elective (to meet 120 hour minimum)  3

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.

B.S. in Biology with Teaching Certification – Recommended Four-Year Academic Plan

First Year

Fall  Credit Hours
AIS 1203  Academic Inquiry and Scholarship (core)  3

Second Year

Fall
BIO 2313  Genetics  3
BIO 2322  Genetics Laboratory  2
CHE 2603  Organic Chemistry I  3
CHE 2612  Organic Chemistry I Laboratory  2
UTE 3203  Knowing and Learning in Mathematics and Science  3

Spring
CS 1173  Data Analysis and Visualization (core and major)  3
UTE 3023  Perspectives on Science and Mathematics  3

Social & Behavioral Sciences core  3

Third Year

Fall
BIO 3283  Principles of Ecology  3

Fourth Year

Fall
Upper-division BIO elective  3
Upper-division BIO elective  3
Upper-division BIO elective  3
American History core  3
Government-Political Science core  3

Spring
Upper-division BIO elective  3
Upper-division free elective  3
Upper-division free elective  3
Government-Political Science core  3
Free elective (to meet 120 hour minimum)  3

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.
BIO 3513  Biochemistry  3
BIO 3522  Biochemistry Laboratory  2
BIO 3713  Microbiology  3
LTED 3773  Reading and Writing Across the Disciplines-Grades 7–12  3

Spring
BIO 3043  UTeachSA Research Methods  3
BIO 3413  Advanced Physiology  3
BIO 3422  Advanced Physiology Laboratory  2
BIO 4813  Brain and Behavior  3
UTE 3213  Classroom Interactions  3

Fourth Year
Fall
BIO 3323  Evolution  3
BIO 3813  Cell Biology  3
ESL 3063  Second Language Teaching and Learning for Grades 4–8 and 7–12  3
UTE 4203  Project-Based Instruction  3

Spring
UTE 4646  Clinical Teaching  6

Total Credit Hours:  126.0

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 required for the Bachelor of Science (B.S.) 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 listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. 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.

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/corecurriculumcomponentarearequirements)

First Year Experience Requirement 3
Communication 6
Mathematics 3
Life and Physical Sciences 6
Language, Philosophy and Culture 3
Creative Arts 3
American History 6
Government-Political Science 6
Social and Behavioral Sciences 3
Component Area Option 3
Total Credit Hours 42

Gateway Courses

Students pursuing the B.S. 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Semester</th>
</tr>
</thead>
<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>BIO 3413</td>
<td>Advanced Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 3513</td>
<td>Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIO 3713</td>
<td>Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>BIO 3722</td>
<td>Microbiology Laboratory</td>
<td>5</td>
</tr>
</tbody>
</table>
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**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>AIS 1203 Academic Inquiry and Scholarship (core)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 1404 Biosciences I (core and major) 1</td>
<td>4</td>
</tr>
<tr>
<td>CHE 1103 General Chemistry I 1</td>
<td>3</td>
</tr>
<tr>
<td>CHE 1121 General Chemistry I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>WRC 1013 Freshman Composition I (Q) (core)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 1414 Biosciences II (core and major) 1</td>
<td>4</td>
</tr>
<tr>
<td>CHE 1113 General Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHE 1131 General Chemistry II Laboratory 2</td>
<td>1</td>
</tr>
<tr>
<td>MAT 1193 Calculus for the Biosciences (core and major) 1</td>
<td>3</td>
</tr>
<tr>
<td>WRC 1023 Freshman Composition II (Q) (core)</td>
<td>3</td>
</tr>
<tr>
<td>Free elective</td>
<td>3</td>
</tr>
</tbody>
</table>

**Second Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CHE 2603 Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHE 2612 Organic Chemistry I Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>STA 1403 Probability and Statistics for the Biosciences</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following: 4</td>
<td></td>
</tr>
<tr>
<td>PHY 1603 Algebra-based Physics I 1</td>
<td>1</td>
</tr>
<tr>
<td>&amp; PHY 1611 Physics for Scientists and Engineers I</td>
<td>1</td>
</tr>
<tr>
<td>PHY 1943 Physics for Scientists and Engineers I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PHY 1951 Physics for Scientists and Engineers II</td>
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</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>BIO 2313 Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 2322 Genetics Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHE 3673 or 3643 Organic Chemistry II with Biological Applications</td>
<td>3</td>
</tr>
<tr>
<td>CHE 3652 Organic Chemistry II Laboratory 2</td>
<td>2</td>
</tr>
<tr>
<td>Select one of the following: 4</td>
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<tr>
<td>PHY 1623 Algebra-based Physics II</td>
<td>1</td>
</tr>
<tr>
<td>&amp; PHY 1631 Physics for Scientists and Engineers II</td>
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</tr>
</tbody>
</table>

**Third Year**

**Fall**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 1963 Physics for Scientists and Engineers II</td>
<td>1</td>
</tr>
<tr>
<td>&amp; PHY 1971 Physics for Scientists and Engineers II Laboratory</td>
<td>1</td>
</tr>
</tbody>
</table>
BIO 3513  Biochemistry  3
BIO 3522  Biochemistry Laboratory  2
BIO 3713  Microbiology  3
BIO 3722  Microbiology Laboratory  2
Language, Philosophy & Culture core  3
Social & Behavioral Sciences core  3

Spring
BIO 3813  Cell Biology  3
BIO 3822  Cell Biology Laboratory  2
BIO 4743  Immunology  3
BIO 4752  Immunology Laboratory  2
Upper-division BIO elective  3
Creative Arts core  3

Fourth Year
Fall
BIO 3413  Advanced Physiology  3
BIO 4783  Microbial Genetics and Physiology  3
Upper-division BIO elective  3
American History core  3
Government-Political Science core  3

Spring
BIO 4981  Senior Seminar in Microbiology and Immunology  1
Free elective  3
Upper-division BIO elective  3
American History core  3
Government-Political Science core  3
Component Area Option core  3

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
BIO 1404  Biosciences I  4
BIO 1414  Biosciences II  4

B. 3000- or 4000-level organized biology courses
Three upper-division biology courses. Excludes laboratory, independent study, research and seminar courses. Substitutions are not allowed without approval of the Biology department.

Total Credit Hours 20

Certificate in Pathogenic Outbreak Investigations

This interdisciplinary certificate program is designed for students in biology, information systems and cyber security, computer science and computer engineering disciplines to investigate biological and digital pathogen identification, propagation prediction, and mitigation. The required capstone project reinforces the cross-disciplinary learning fostered by the program and provides real-world practice.

This certificate is open only to biology, information systems and cyber security, computer science, and computer engineering majors. To apply for the Pathogenic Outbreak Investigations certificate, students should consult with the Director of the Office of Undergraduate Research for specific information about certificate requirements and consult with their academic advisors to verify that they have met all University requirements. All courses used to satisfy the requirements of this undergraduate certificate program must be college-level courses taken at UTSA. Students must fulfill all prerequisite requirements for elective courses.

Students pursuing the Certificate in Pathogenic Outbreak Investigations must complete a minimum of 15 semester credit hours:

A. Courses required by all majors:

Topic: Introduction to Pathogenic Outbreak Investigations: 3
BIO 4953  Special Studies in Biology
or CS 4953  Special Studies in Computer Science
or IS 4953  Special Studies in Information Systems

Topic: Advanced Research in Pathogenic Outbreak Investigations: 3
BIO 4953  Special Studies in Biology
or CS 4953  Special Studies in Computer Science
or IS 4953  Special Studies in Information Systems

B. Required course according to major: 3
BIO 3713  Microbiology

CS 4953  Special Studies in Computer Science (Topic: Cloud-oriented Big Data and Software Engineering)

IS 4953  Special Studies in Information Systems (Topic: Malware Agent Analysis)

C. Elective courses for each major. Select 6 hours from one of the following groups depending on major: 6

Biology elective options 1
BIO 3513  Biochemistry
BIO 3743  Bacteriology
BIO 4743  Immunology
BIO 5762  Fundamentals of Immunology for Biotechnology
BIO 6973  Special Problems (Comparative Genomics)
BIO 6973  Special Problems (Microbial Genomics)

Information Systems/Cyber Security elective options
IS 3523  Intrusion Detection and Incident Response

1 Other Biology elective options

Department of Biology
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS 4463</td>
<td>Web Application Security</td>
</tr>
<tr>
<td>IS 4483</td>
<td>Digital Forensic Analysis I</td>
</tr>
<tr>
<td>IS 4513</td>
<td>Cyber and Physical Systems</td>
</tr>
<tr>
<td>IS 4523</td>
<td>Digital Forensic Analysis II</td>
</tr>
</tbody>
</table>

**Computer Science elective options**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 3753</td>
<td>Introduction to Data Science</td>
</tr>
<tr>
<td>CS 4223</td>
<td>Bioinformatics and Big Data</td>
</tr>
<tr>
<td>CS 4353</td>
<td>Unix and Network Security</td>
</tr>
<tr>
<td>CS 4373</td>
<td>Introduction to Data Mining</td>
</tr>
<tr>
<td>CS 4593</td>
<td>Topics in Computer Science</td>
</tr>
<tr>
<td>CS 4843</td>
<td>Introduction to Cloud Computing</td>
</tr>
<tr>
<td>CS 4963</td>
<td>Advanced Topics in Systems and Cloud</td>
</tr>
<tr>
<td>CS 4973</td>
<td>Advanced Topics in Data Science</td>
</tr>
</tbody>
</table>

**Total Credit Hours** 15

1 Undergraduate biology students are permitted to take graduate courses based on need, student background/capability, and instructor consent.