

# BIOLOGY, BS

## Program Description

### Purpose of Biology Program

The biology program provides diverse training for careers in the biological sciences. The biology curriculum includes content courses required for

1. teacher certification in life science,
2. acceptance to post-graduate studies, and
3. pre-professional studies in preparation for admission to professional schools.

Students will acquire knowledge and skills to enter a variety of biology-related careers such as research, marine biology, wildlife and coastal management, environmental protection, laboratory technician, biotechnology industry, medical or environmental microbiology, technical writing, pharmaceutical sales, careers in the medical, dental, and allied health fields, and science education.

Field and laboratory courses emphasize acquisition of practical skills for data collection and analysis. Adding the practical aspects of the coursework to the underlying goal of developing and enhancing the ability to think critically, graduates of the program are prepared for careers in the biological sciences and/or to pursue advanced degrees or post-graduate professional training.

## Student Learning Outcomes

Students will:

- Possess a broad understanding of biology.
- Understand the scientific method and use it to develop and conduct biological experiments.
- Have the skills necessary to successfully communicate biological information to a range of audiences.

## The Honors Program

The Honors Program (admission by application only) offers highly motivated students from any academic discipline an enriched program of study in which to develop global perspectives. Appropriate courses approved by both a student's Biology faculty mentor and Honors advisor may count toward the Biology degree. Thus, a Biology student in the Honors track can usually graduate with no additional course work. For more information, consult the section entitled "Honors Program (<http://catalog.tamucc.edu/undergraduate/university-college/programs/honors-program/>)".

## Fast Track from Bachelor's to Master's Degree

The university allows the opportunity for high-achieving students to count a select number of graduate credits toward their undergraduate degree and thereby obtain a graduate degree at an accelerated pace. For more information, see Fast Track Biology, BS to Biology, MS (<http://catalog.tamucc.edu/undergraduate/science/fast-track/fast-track-biology-bs-ms/>).

## General Requirements

The Bachelor of Science in Biology degree requires a minimum of 120 semester credit hours: 42 hours are University Core Curriculum Program

courses, 46 hours are biology core courses and 32 hours are biology career track courses. The biology core provides students with a broad biological background and includes coursework in four key areas: mathematics, the chemistry of life/cell biology, form and function, and organismal biology. In each of these areas students select one course from a list of appropriate courses, depending on their interests and choice of biology career track. The biology career track areas are: (A) Ecology, (B) Marine Biology, (C) Cell/Molecular Biology, (D) Microbiology, (E) Organismal Biology and (F) Integrative Biology. Students should select a biology career track as soon as possible after they complete their freshman year and well before they begin their junior year.

Requirements	Credit Hours
First-Year Seminars (when applicable) <sup>1</sup>	0-2
Core Curriculum Program ( <a href="http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/">http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/</a> ) <sup>2</sup>	42
Biology Core Courses <sup>2</sup>	46
Biology Track Courses	32
<b>Total Credit Hours</b>	<b>120-122</b>

1

Full-time, first time in college students are required to take the first-year seminars. The First-Year Seminars will not count towards the 120 hour minimum requirements to graduate.

- UNIV 1101 University Seminar I (1 sch)
- UNIV 1102 University Seminar II (1 sch)

2

For 4 of the four-hour science and mathematics courses that are required for all Biology students, some or all of the hours may be counted as part of the University Core requirement. For BIOL 1406 Biology I (4 sch), BIOL 1407 Biology II (4 sch), and MATH 2413 Calculus I (4 sch), the 3 lecture hours of each will be counted in the Life and Physical Sciences or Mathematics Foundational Areas; and each one-hour laboratory component will be counted in the Component Area Option of the University Core Curriculum. For CHEM 1411 General Chemistry I (4 sch), the 3 lecture hours will be counted in the Component Area Option of the University Core Curriculum, but the 1 laboratory hour will be counted as part of the Biology Core.

## Program Requirements

Code	Title	Hours
<b>Full-time, First-year Students</b>		
UNIV 1101	University Seminar I	1
UNIV 1102	University Seminar II	1
<b>Core Curriculum Program</b>		
University Core Curriculum <sup>1</sup>		42
Biology majors are required to take:		
BIOL 1406	Biology I	
BIOL 1407	Biology II	
MATH 2413	Calculus I <sup>2</sup>	
CHEM 1411	General Chemistry I <sup>3</sup>	
<b>Biology Core Courses</b>		
BIOL 1406	Biology I (included in University Core)	

BIOL 1407	Biology II (included in University Core)	3
BIOL 2300	Science Communication	3
BIOL 2416	Genetics	4
BIOL 2421	Microbiology	4
BIOL 2371	Principles of Evolution	3
BIOL 3428	Principles of Ecology	4
CHEM 1411	General Chemistry I (lecture included in University Core) <sup>3</sup>	1
CHEM 1412	General Chemistry II	4
CHEM 3411	Organic Chemistry I	4
CHEM 3412	Organic Chemistry II	4
MATH 2413	Calculus I (included in University Core) <sup>2</sup>	
Select one of the following Statistics courses:		3
BIOL 3325	Biostatistics	
MATH 3342	Applied Probability and Statistics	
Select one of the following Chemistry of Life/Cell Biology courses:		4
BIOL 3403	Molecular Biology	
BIOL 3410	Cell Biology	
CHEM 4401	Biochemistry I	
Select one of the following Form and Function courses:		4
BIOL 3425	Comparative Vertebrate Anatomy	
BIOL 3430	Physiology	
BIOL 3455	Plant form and Function	
Select one of the following Organismal Biology courses:		4
BIOL 2472	Principles of Botany	
BIOL 3413	Invertebrate Zoology	
BIOL 3414	Vertebrate Zoology	

### Biology Career Tracks

Select one of the following Tracks:		32
Ecology Track (p. 2)		
Marine Biology Track (p. 2)		
Cell/Molecular Biology Track (p. 3)		
Microbiology Track (p. 3)		
Organismal Biology Track (p. 3)		
Integrative Biology Track (p. 4)		
<b>Total Hours</b>		<b>122</b>

1

For 4 of the four-hour science and mathematics courses that are required for all Biology students, some or all of the hours may be counted as part of the University Core requirement. For BIOL 1406 Biology I (4 sch), BIOL 1407 Biology II (4 sch), and MATH 2413 Calculus I (4 sch), the 3 lecture hours of each will be counted in the Life and Physical Sciences or Mathematics Foundational Areas; and each one-hour laboratory component will be counted in the Component Area Option of the University Core Curriculum.

2

Students who are not eligible to enroll in MATH 2413 Calculus I (4 sch) will need to take additional prerequisite courses (3-9 sem. hrs.) depending on their math placement level (i.e., MATH 0300 Developmental Mathematics (3 sch), MATH 1314 College Algebra (3 sch) and MATH 1316 Trigonometry (3 sch), or MATH 2312 Precalculus (3 sch)).

3

For CHEM 1411 General Chemistry I (4 sch), the 3 lecture hours will be counted in the Component Area Option of the University Core Curriculum, but the 1 laboratory hour will be counted as part of the Biology Core.

### Note:

Students must complete a minimum of 32 additional hours in one of the Biology Career Tracks to earn the 120 hours necessary for graduation. A minimum of 45 hours of upper-division credit (courses numbered 3000 or 4000) is required to graduate. A minimum grade point average of 2.5 in the major field of study (biology core + biology track) is required to graduate. No "D" or "F" grades will be accepted as credit within the biology core or biology track courses.

## Biology Career Tracks

Each biology career track is designed to provide specific background in a biological discipline. The integrative biology track provides a broad background in the biological sciences.

Any track will prepare a student for entry-level biological careers in a variety of academic, governmental, or private sector settings, but many careers will require training beyond the BS degree. A student should consult their faculty mentor to determine the track that is the best fit for their career goals.

Each track consists of 32 hours, including a core of required courses and electives. Students are strongly encouraged to consult their faculty mentor for guidance in choosing the electives.

### Ecology Track

The Ecology Track focuses on interactions between organisms and the physical environment. Students choosing this track will be preparing for careers in fields such as agriculture, environmental protection, conservation, natural resource management, and public education.

A total of at least 120 hours is required to graduate with the B.S. degree.

Code	Title	Hours
<b>Ecology Core Courses</b>		
Select two of the following:		6-8
BIOL 4323	Global Change Ecology	
BIOL 4334	Biology and Ecology of Coral Reefs	
BIOL 4408	Microbial Diversity and Ecology	
BIOL 4336	Marine Ecology	

### Ecology Electives

Select 24-26 hours of upper division electives for a minimum total of 24-26 32 hours for the track (p. 4)

**Total Hours (minimum)** **32**

### Marine Biology Track

The Marine Biology track focuses on organisms in marine and coastal systems. Students choosing this track will be preparing for careers in fisheries and aquaculture, coastal/marine resource management and conservation, outdoor recreation, and aquatic science.

A total of at least 120 hours is required to graduate with the B.S. degree.

Code	Title	Hours
<b>Marine Biology Core Courses</b>		
BIOL 4336	Marine Ecology	3

Select two of the following Marine Organisms courses 7-8

BIOL 4353	Down the River: Biology of Gulf Coast Fishes <sup>2</sup>	
BIOL 4429	Marine Botany	
BIOL 4430	Marine Plankton	
BIOL 4432	Ichthyology	
BIOL 4444	Estuarine Organisms	

Select one of the following Human Impacts courses: 3

ESCI 3351	Oceanography	
BIOL 4330	Conservation Biology	
BIOL 4302	Coral Reef Conservation	
BIOL 4323	Global Change Ecology	
BIOL 4343	Oceans and Human Health	

### Field or Laboratory Experience

Each student must take a minimum of 3 hours of Field or Laboratory Experience from the following list; courses on the list may also be taken as electives. 3

BIOL 4312	Mariculture Techniques	
BIOL 4353	Down the River: Biology of Gulf Coast Fishes <sup>2</sup>	
BIOL 4355	Public Aquarium and Animal Care Operations	
BIOL 4399	Directed Independent Research <sup>1</sup>	
BIOL 4590	Selected Topics <sup>1</sup>	
BIOL 4598	Biology Internship <sup>1</sup>	
BIOL 4609	Field and Sampling Techniques	

### Marine Biology Electives

Select 12-16 hours of upper division electives for a minimum total of 2-16 32 hours for the track (p. 4)

Any course that is listed as a requirement in the Marine Biology Core but is not taken to fulfill a core requirement can be taken as an elective.

**Total Hours (minimum) 32**

1

This course can only be used to fulfill the Field or Laboratory Experience requirement with prior approval from the Undergraduate Biology Program Coordinator.

2

This course (BIOL 4353) can be applied to the Marine Organisms requirement **OR** the Field or Laboratory Experience requirement **BUT NOT BOTH**

### Cell/Molecular Biology Track

The Cell/Molecular Biology track focuses on the chemical, cellular, and tissue levels of biological organization. Students choosing this track will be preparing for careers in biotechnology and healthcare professions, research laboratories, biological/pharmaceutical manufacturing and quality control, agricultural testing, and health- or biotechnology-related sales. This track also prepares students for graduate studies in biology, biotechnology and health-related sciences.

A total of at least 120 hours is required to graduate with the B.S. degree.

Code	Title	Hours
<b>Cell/Molecular Biology Core Courses</b>		
BIOL 3403	Molecular Biology (Include in the Biology Core)	
BIOL 3410	Cell Biology	4
BIOL 4340	Genomics, Proteomics and Bioinformatics	3
CHEM 4401	Biochemistry I	4

CHEM 4402	Biochemistry II	4
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### Cell/Molecular Biology Electives

Select 17 hours of upper division electives (p. 4) 17

**Total Hours 32**

### Microbiology Track

This Microbiology track focuses on bacteria, viruses, fungi and protozoa. Many of these organisms are important to industry, agriculture, and health care. Students choosing this track will be preparing for careers in industrial, environmental, medical, public health, and agricultural laboratories, industrial quality control, health care professions, research, biotechnology, and microbiology-related sales.

A total of at least 120 hours is required to graduate with the B.S. degree.

Code	Title	Hours
<b>Microbiology Core Courses</b>		
BIOL 3403	Molecular Biology (include in the Biology Core)	
BIOL 4406	Immunology	4
BIMS 4374	Medical Microbiology	3
CHEM 4401	Biochemistry I	4
CHEM 4402	Biochemistry II	4
Select one Physics sequence from the following: 8		
PHYS 1401	General Physics I	
& PHYS 1402	and General Physics II	
PHYS 2425	University Physics I	
& PHYS 2426	and University Physics II	
<b>Microbiology Electives</b>		
Select 9 hours of upper division electives (p. 4)		9
<b>Total Hours</b>		<b>32</b>

### Microbiology Core Courses

BIOL 3403	Molecular Biology (include in the Biology Core)	
BIOL 4406	Immunology	4
BIMS 4374	Medical Microbiology	3
CHEM 4401	Biochemistry I	4
CHEM 4402	Biochemistry II	4
Select one Physics sequence from the following: 8		
PHYS 1401	General Physics I	
& PHYS 1402	and General Physics II	
PHYS 2425	University Physics I	
& PHYS 2426	and University Physics II	

### Microbiology Electives

Select 9 hours of upper division electives (p. 4) 9

**Total Hours 32**

### Organismal Biology Track

The Organismal Biology track focuses on the natural history, ecology, structure, and function of plants and/or animals. Students choosing this track will be preparing for careers that include, but are not limited to, wildlife management, fisheries, natural resource management, parks and recreation, biodiversity and conservation, habitat restoration, and agriculture or horticulture. This track also prepares students for graduate studies in biology, wildlife and fisheries sciences, wildlife management, forestry, or taxonomy and systematics.

A total of at least 120 hours is required to graduate with the B.S. degree.

Code	Title	Hours
<b>Organismal Biology Core Course</b>		
All students in the Organismal Biology track must take BIOL 4330 Conservation Biology		
BIOL 4330	Conservation Biology	
The remainder of the credits (29 hours) in the Organismal Biology Track are electives.		
<i>Electives</i>		29
BIOL 2472	Principles of Botany (If not taken in the Biology Core)	
Although this course is a lower-division course it can be used as an elective in the track provided the student has sufficient upper-division hours and it was not used to fulfill a requirement in the Biology Core.		

All students in the Organismal Biology track must take BIOL 4330 Conservation Biology

BIOL 4330 Conservation Biology

The remainder of the credits (29 hours) in the Organismal Biology Track are electives.

*Electives* 29

BIOL 2472 Principles of Botany (If not taken in the Biology Core)

Although this course is a lower-division course it can be used as an elective in the track provided the student has sufficient upper-division hours and it was not used to fulfill a requirement in the Biology Core.

BIOL 3413	Invertebrate Zoology (If not taken in the Biology Core)	
BIOL 3414	Vertebrate Zoology (If not taken in the Biology Core)	
BIOL 3425	Comparative Vertebrate Anatomy (If not taken in the Biology Core)	
BIOL 3430	Physiology (If not taken in the Biology Core)	
BIOL 3455	Plant form and Function (If not taken in the Biology Core)	
BIOL 4301	Embryology	
BIOL 4304	Biology of Viruses	
BIOL 4340	Genomics, Proteomics and Bioinformatics	
BIOL 4360	Computation for 21st Century Biologists	
BIOL 4304	Biology of Viruses	
BIOL 4315	Animal Behavior	
BIOL 4319	Biology of Marine Mammals	
BIOL 4334	Biology and Ecology of Coral Reefs	
BIOL 4340	Genomics, Proteomics and Bioinformatics	
BIOL 4353	Down the River: Biology of Gulf Coast Fishes	
BIOL 4355	Public Aquarium and Animal Care Operations	
BIOL 4360	Computation for 21st Century Biologists	
BIOL 4408	Microbial Diversity and Ecology	
BIOL 4410	Mammalogy	
BIOL 4413	Entomology	
BIOL 4425	Ornithology	
BIOL 4429	Marine Botany	
BIOL 4432	Ichthyology	
BIOL 4433	Parasitology	
BIOL 4442	Herpetology	
BIOL 4444	Estuarine Organisms	
BIMS 4323	Neurobiology	
BIOL 4590	Selected Topics	
<b>Total Hours (minimum)</b>		<b>32</b>

### Integrative Biology Track

The Integrative Biology track emphasizes the integration of physical factors, cells, tissues, organs, and organ systems in producing functional organisms. Students choosing this track will be preparing for careers in health care, government or academic research, agriculture, or biology sales. This track is also a good choice for students planning to attend graduate school because it provides a great deal of flexibility depending on the student's interests and career goals.

A total of at least 120 hours is required to graduate with the B.S. degree.

Code	Title	Hours
<b>Integrative Biology Core Courses</b>		
BIOL 3410	Cell Biology (include in Biology Core)	
BIOL 3425	Comparative Vertebrate Anatomy (include in Biology Core)	
BIOL 3430	Physiology	4
Select one Physics sequence from the following:		8
PHYS 1401 & PHYS 1402	General Physics I and General Physics II	
PHYS 2425 & PHYS 2426	University Physics I and University Physics II	

### Integrative Biology Electives

Select 20 hours of upper division electives (p. 4)	20
<b>Total Hours</b>	<b>32</b>

### Approved Electives

BIOL 2472 Principles of Botany (4 sch), if not taken in the Biology Core, or any 3000- or 4000-level Biology course can be taken for elective credit. In addition to upper-division Biology (BIOL prefix) courses, students may select upper division Biomedical Science (BIMS) courses from the list below. In addition, up to 12 semester hours of electives from other disciplines (e.g. Chemistry, Environmental Science, Physics, Math) may be taken with approval. See your academic advisor for details and guidance to ensure that the 45-hour minimum of upper division coursework required to graduate is met.

### List of Electives

Any upper division Biology course (BIOL 3XXX or 4XXX) may be taken as an elective. The upper division Biomedical (BIMS) courses that are listed below may be taken as electives for the BS Biology degree without seeking approval.

Code	Title	Hours
Any BIOL 3XXX or 4XXX course		
BIMS 3401	Pathophysiology	4
BIMS 4311	Biology of Cancer	3
BIMS 4323	Neurobiology	3
BIMS 4327	Introduction to Toxicology	3
BIMS 4330	Biological Basis of Aging	3
BIMS 4333	Medical Entomology	3
BIMS 4334	Human Genetics	3
BIMS 4335	Endocrinology	3
BIMS 4374	Medical Microbiology	3
BIMS 4375	Mechanisms of Microbial Pathogenesis	3
BIMS 4410	Histology	4

## Course Sequencing

### Ecology Track

#### First Year

Fall		Hours
BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3
UNIV 1101	University Seminar I	1
University Core Curriculum		3
<b>Hours</b>		<b>15</b>

#### Spring

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4
ENGL 1302	Writing and Rhetoric II	3
UNIV 1102	University Seminar II	1
University Core Curriculum		3
<b>Hours</b>		<b>15</b>

#### Summer

MATH 2413	Calculus I	4
University Core Curriculum		3

University Core Curriculum	3
<b>Hours</b>	<b>10</b>

**Second Year****Fall**

BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
CHEM 3411	Organic Chemistry I	4
University Core Curriculum		3
University Core Curriculum		3

<b>Hours</b>	<b>13-14</b>
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**Spring**

BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
CHEM 3412	Organic Chemistry II	4
BIOL 2300	Science Communication	3
University Core Curriculum		3

<b>Hours</b>	<b>13-14</b>
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**Third Year****Fall**

BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
BIOL 3428	Principles of Ecology	4
BIOL Core Topical Area Requirement		4
Upper Level BIOL Electives		4

<b>Hours</b>	<b>15-16</b>
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**Spring**

MATH 3342	Applied Probability and Statistics	3
BIOL Core Topical Area Requirement		4
Ecology CT Core Advanced Ecology		4
Upper Level BIOL Electives		4

<b>Hours</b>	<b>15</b>
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**Fourth Year****Fall**

BIOL Core Topical Requirement		4
Ecology CT Core Advanced Ecology		4
Upper Level BIOL Electives		4

<b>Hours</b>	<b>12</b>
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**Spring**

Upper Level BIOL Electives		12-14
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<b>Hours</b>	<b>12-14</b>
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<b>Total Hours</b>	<b>120-125</b>
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**Marine Biology Track****First Year****Fall**

BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3
UNIV 1101	University Seminar I	1

<b>Hours</b>	
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University Core Curriculum	3
<b>Hours</b>	<b>15</b>

**Spring**

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4
ENGL 1302	Writing and Rhetoric II	3
UNIV 1102	University Seminar II	1
University Core Curriculum		3

<b>Hours</b>	<b>15</b>
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**Summer**

MATH 2413	Calculus I	4
University Core Curriculum		3
University Core Curriculum		3

<b>Hours</b>	<b>10</b>
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**Second Year****Fall**

BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
CHEM 3411	Organic Chemistry I	4
BIOL 2300	Science Communication	3
University Core Curriculum		3
University Core Curriculum		3

<b>Hours</b>	<b>16-17</b>
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**Spring**

CHEM 3412	Organic Chemistry II	4
BIOL 2416	Genetics	4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
University Core Curriculum		3
MATH 3342	Applied Probability and Statistics	3

<b>Hours</b>	<b>14</b>
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**Third Year****Fall**

BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
BIOL 3428	Principles of Ecology	4
BIOL Core Topical Area Requirement		4
Upper Level BIOL Elective		4

<b>Hours</b>	<b>15-16</b>
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**Spring**

BIOL 4336	Marine Ecology	3
MAR Biol CT Core Topical Requirement		3-4
BIOL Core Topical Area Requirement		4

<b>Hours</b>	<b>10-11</b>
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**Fourth Year****Fall**

Biol Core Topical Requirement		4
MAR Biol CT Core Topical Requirement		3-4
Upper Level BIOL Elective		4
Math course		3

<b>Hours</b>	<b>14-15</b>
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<b>Spring</b>	
Upper Level BIOL Electives	11-14
<b>Hours</b>	<b>11-14</b>
<b>Total Hours</b>	<b>120-127</b>

## Cell/Molecular Biology Track

### First Year

<b>Fall</b>		<b>Hours</b>
BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3
UNIV 1101	University Seminar I	1
HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	
<b>Hours</b>		<b>15</b>

### Spring

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4
ENGL 1302	Writing and Rhetoric II	3
UNIV 1102	University Seminar II	1
HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	
<b>Hours</b>		<b>15</b>

### Summer

MATH 2413	Calculus I	4
<b>Hours</b>		<b>4</b>

### Second Year

<b>Fall</b>		<b>Hours</b>
CHEM 3411	Organic Chemistry I	4
POLS 2305	U.S. Government and Politics	3
BIOL 2416	Genetics	4
University Core Curriculum		6
<b>Hours</b>		<b>17</b>

### Spring

CHEM 3412	Organic Chemistry II	4
BIOL 2421	Microbiology	4
BIOL 2300	Science Communication	3
POLS 2306	State and Local Government	3
ARTS 1301	Art and Society	3
or ARTS 1303	or Art History Survey I	
or MEDA 1305	or Film and Culture	
or MUSI 1306	or Understanding and Enjoying Music	
or MUSI 1307	or Elements of Musical Style	
or THEA 1310	or Theatre Appreciation	
<b>Hours</b>		<b>17</b>

### Third Year

<b>Fall</b>		<b>Hours</b>
BIOL 3428	Principles of Ecology	4
BIOL 3410	Cell Biology	4
BIOL 2371	Principles of Evolution	3

Biology Requirement	4
<b>Hours</b>	<b>15</b>

### Spring

CHEM 4401	Biochemistry I	4
BIOL 3403	Molecular Biology	4
MATH 3342	Applied Probability and Statistics	3
or BIOL 3325	or Biostatistics	
<b>Hours</b>		<b>11</b>

### Fourth Year

#### Fall

BIOL 4340	Genomics, Proteomics and Bioinformatics	3
ECON 1301	Introduction to Economics	3
or ECON 2301	or Macroeconomics Principles	
or ECON 2302	or Microeconomics Principles	
or PSYC 2301	or General Psychology	
or SOCI 1301	or Introduction to Sociology	
ENGL 2316	Literature and Culture	3
or ENGL 2332	or Literature of the Western World: From the Classics to the Renaissance	
or ENGL 2333	or Literature of the Western World: From the Enlightenment to the Present	
or PHIL 1301	or Introduction to Philosophy	
or PHIL 2306	or Introduction to Ethics	
or SPAN 3307	or Spanish Literature I	
or SPAN 3308	or Spanish Literature II	
or SPAN 3309	or Spanish American Literature I	
or SPAN 3310	or Spanish American Literature II	

BIOL 3000:4999	4
BIOL 3000:4999	4
<b>Hours</b>	<b>17</b>

### Spring

CHEM 4402	Biochemistry II	4
BIOL 3000:4999	4	
BIOL 3000:4999	4	
BIOL 3000:4999	4	
<b>Hours</b>	<b>16</b>	
<b>Total Hours</b>	<b>127</b>	

## Microbiology Track

### First Year

<b>Fall</b>		<b>Hours</b>
BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3
UNIV 1101	University Seminar I	1
HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	
<b>Hours</b>		<b>15</b>

### Spring

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4
ENGL 1302	Writing and Rhetoric II	3
UNIV 1102	University Seminar II	1

HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	

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**Hours** **15**

**Summer**

MATH 2413	Calculus I	4
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**Hours** **4**

**Second Year****Fall**

CHEM 3411	Organic Chemistry I	4
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BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	

POLS 2305	U.S. Government and Politics	3
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ARTS 1301	Art and Society	3
or ARTS 1303	or Art History Survey I	
or MEDA 1305	or Film and Culture	
or MUSI 1306	or Understanding and Enjoying Music	
or MUSI 1307	or Elements of Musical Style	
or THEA 1310	or Theatre Appreciation	

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**Hours** **13-14**

**Spring**

CHEM 3412	Organic Chemistry II	4
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BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	

MATH 3342	Applied Probability and Statistics	3
or BIOL 3325	or Biostatistics	

ECON 1301	Introduction to Economics	3
or ECON 2301	or Macroeconomics Principles	
or ECON 2302	or Microeconomics Principles	
or PSYC 2301	or General Psychology	
or SOCI 1301	or Introduction to Sociology	

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**Hours** **13-14**

**Summer**

POLS 2306	State and Local Government	3
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**Hours** **3**

**Third Year****Fall**

BIOL 3428	Principles of Ecology	4
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BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	

PHYS 1401	General Physics I	4
or PHYS 2425	or University Physics I	

Biology Requirement		4
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**Hours** **15-16**

**Spring**

BIOL 2300	Science Communication	3
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BIOL 4406	Immunology	4
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BIOL 3403	Molecular Biology	4
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ENGL 2316	Literature and Culture	3
or ENGL 2332	or Literature of the Western World: From	
or ENGL 2333	the Classics to the Renaissance	
or PHIL 1301	or Literature of the Western World: From	
or PHIL 2306	the Enlightenment to the Present	

or SPAN 3307	or Introduction to Philosophy	
or SPAN 3308	or Introduction to Ethics	
or SPAN 3309	or Spanish Literature I	
or SPAN 3310	or Spanish Literature II	
	or Spanish American Literature I	
	or Spanish American Literature II	

PHYS 1402	General Physics II	4
or PHYS 2426	or University Physics II	

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**Hours** **18**

**Fourth Year****Fall**

BIMS 4374	Medical Microbiology	3
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CHEM 4401	Biochemistry I	4
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BIOL 3410	Cell Biology	4
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Biology Requirement		4
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**Hours** **15**

**Spring**

CHEM 4402	Biochemistry II	4
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BIMS 3000:4999		4
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BIOL 3000:4999		4
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BIOL 3000:4999		4
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**Hours** **16**

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**Total Hours** **127-130**

**Organismal-Animal Biology Track****First Year****Fall**

BIOL 1406	Biology I	4
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CHEM 1411	General Chemistry I	4
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ENGL 1301	Writing and Rhetoric I	3
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UNIV 1101	University Seminar I	1
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HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	

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**Hours** **15**

**Spring**

BIOL 1407	Biology II	4
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CHEM 1412	General Chemistry II	4
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ENGL 1302	Writing and Rhetoric II	3
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UNIV 1102	University Seminar II	1
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HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	

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**Hours** **15**

**Summer**

MATH 2413	Calculus I	4
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**Hours** **4**

**Second Year****Fall**

CHEM 3411	Organic Chemistry I	4
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BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	

ENGL 2316	Literature and Culture	3
or ENGL 2332	or Literature of the Western World: From the Classics to the Renaissance	
or ENGL 2333	or Literature of the Western World: From the Enlightenment to the Present	
or PHIL 1301	or Introduction to Philosophy	
or PHIL 2306	or Introduction to Ethics	
or SPAN 3308	or Spanish Literature II	
or SPAN 3309	or Spanish American Literature I	
or SPAN 3310	or Spanish American Literature II	
POLS 2305	U.S. Government and Politics	3
<b>Hours</b>		<b>13-14</b>

**Spring**

CHEM 3412	Organic Chemistry II	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
BIOL 2300	Science Communication	3
BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
POLS 2306	State and Local Government	3
ARTS 1301	Art and Society	3
or ARTS 1303	or Art History Survey I	
or MEDA 1305	or Film and Culture	
or MUSI 1306	or Understanding and Enjoying Music	
or MUSI 1307	or Elements of Musical Style	
or THEA 1310	or Theatre Appreciation	
<b>Hours</b>		<b>15-17</b>

**Third Year**

<b>Fall</b>		
BIOL 3428	Principles of Ecology	4
BIOL 2416	Genetics	4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
BIOL 4315	Animal Behavior	3
BIOL 3413	Invertebrate Zoology	4
<b>Hours</b>		<b>15</b>

**Spring**

BIOL 3414	Vertebrate Zoology	4
BIOL 2472	Principles of Botany	4
Biology Requirement		4
MATH 3342	Applied Probability and Statistics	3
or BIOL 3325	or Biostatistics	
BIOL 3000:4999		3
<b>Hours</b>		<b>18</b>

**Fourth Year**

<b>Fall</b>		
BIOL 3000:4999		3
ECON 1301	Introduction to Economics	3
or ECON 2301	or Macroeconomics Principles	
or ECON 2302	or Microeconomics Principles	
or PSYC 2301	or General Psychology	
or SOCI 1301	or Introduction to Sociology	
BIOL 3000:4999		3
BIOL 3000:4999		3

BIOL 3000:4999	3	
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
Biology Requirement		4
BIOL 3000:4999	4	
BIOL 3000:4999	4	
BIOL 3000:4999	4	
<b>Hours</b>		<b>16</b>
<b>Total Hours</b>		<b>126-129</b>

**Organismal-Plant Biology Track****First Year**

<b>Fall</b>			<b>Hours</b>
BIOL 1406	Biology I		4
CHEM 1411	General Chemistry I		4
ENGL 1301	Writing and Rhetoric I		3
UNIV 1101	University Seminar I		1
HIST 1301	U.S. History to 1865		3
or HIST 1302	or U.S. History Since 1865		
or HIST 2301	or Texas History		
<b>Hours</b>			<b>15</b>

**Spring**

BIOL 1407	Biology II		4
CHEM 1412	General Chemistry II		4
ENGL 1302	Writing and Rhetoric II		3
UNIV 1102	University Seminar II		1
HIST 1301	U.S. History to 1865		3
or HIST 1302	or U.S. History Since 1865		
or HIST 2301	or Texas History		
<b>Hours</b>			<b>15</b>

**Summer**

MATH 2413	Calculus I		4
<b>Hours</b>			<b>4</b>

**Second Year**

<b>Fall</b>		
CHEM 3411	Organic Chemistry I	4
BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
ENGL 2316	Literature and Culture	3
or ENGL 2332	or Literature of the Western World: From the Classics to the Renaissance	
or ENGL 2333	or Literature of the Western World: From the Enlightenment to the Present	
or PHIL 1301	or Introduction to Philosophy	
or PHIL 2306	or Introduction to Ethics	
or SPAN 3307	or Spanish Literature I	
or SPAN 3308	or Spanish Literature II	
or SPAN 3309	or Spanish American Literature I	
or SPAN 3310	or Spanish American Literature II	

POLS 2305	U.S. Government and Politics	3
<b>Hours</b>		<b>13-14</b>

**Spring**

CHEM 3412	Organic Chemistry II	4
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BIOL 2300	Science Communication	3
BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
POLS 2306	State and Local Government	3
ARTS 1301	Art and Society	3
or ARTS 1303	or Art History Survey I	
or MEDA 1305	or Film and Culture	
or MUSI 1306	or Understanding and Enjoying Music	
or MUSI 1307	or Elements of Musical Style	
or THEA 1310	or Theatre Appreciation	
<b>Hours</b>		<b>16-17</b>

**Third Year****Fall**

BIOL 3428	Principles of Ecology	4
BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
BIOL 3000:4999		3
BIOL 3000:4999		3
BIOL 3000:4999		3
<b>Hours</b>		<b>16-17</b>

**Spring**

BIOL 3455	Plant form and Function	4
BIOL 3479	Plant Ecology	4
BIOL 2472	Principles of Botany	4
MATH 3342	Applied Probability and Statistics	3
or BIOL 3325	or Biostatistics	
<b>Hours</b>		<b>15</b>

**Fourth Year****Fall**

Biology Requirement		4
ECON 1301	Introduction to Economics	3
or ECON 2301	or Macroeconomics Principles	
or ECON 2302	or Microeconomics Principles	
or PSYC 2301	or General Psychology	
or SOCI 1301	or Introduction to Sociology	
BIOL 3000:4999		3
BIOL 3000:4999		3
Biology Requirement		4
<b>Hours</b>		<b>17</b>

**Spring**

BIOL 3000:4999		4
BIOL 3000:4999		4
BIOL 3000:4999		4
<b>Hours</b>		<b>12</b>
<b>Total Hours</b>		<b>123-126</b>

**Integrative Biology Track****First Year****Fall**

BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
ENGL 1301	Writing and Rhetoric I	3

UNIV 1101	University Seminar I	1
HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	

**Hours 15****Spring**

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4
ENGL 1302	Writing and Rhetoric II	3
UNIV 1102	University Seminar II	1
HIST 1301	U.S. History to 1865	3
or HIST 1302	or U.S. History Since 1865	
or HIST 2301	or Texas History	

**Hours 15****Summer**

MATH 2413	Calculus I	4
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**Hours 4****Second Year****Fall**

CHEM 3411	Organic Chemistry I	4
BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
POLS 2305	U.S. Government and Politics	3
ARTS 1301	Art and Society	3
or ARTS 1303	or Art History Survey I	
or MEDA 1305	or Film and Culture	
or MUSI 1306	or Understanding and Enjoying Music	
or MUSI 1307	or Elements of Musical Style	
or THEA 1310	or Theatre Appreciation	

**Hours 13-14****Spring**

CHEM 3412	Organic Chemistry II	4
BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
MATH 3342	Applied Probability and Statistics	3
or BIOL 3325	or Biostatistics	
POLS 2306	State and Local Government	3
ECON 1301	Introduction to Economics	3
or ECON 2301	or Macroeconomics Principles	
or ECON 2302	or Microeconomics Principles	
or PSYC 2301	or General Psychology	
or SOCI 1301	or Introduction to Sociology	

**Hours 16-17****Third Year****Fall**

BIOL 2416	Genetics	3-4
or BIOL 2421	or Microbiology	
or BIOL 2371	or Principles of Evolution	
PHYS 1401	General Physics I	4
or PHYS 2425	or University Physics I	
BIOL 3000:4999		3
Biology Requirement		4

**Hours 14-15**

**Spring**

BIOL 2300	Science Communication	3
BIOL 3425	Comparative Vertebrate Anatomy	4
PHYS 1402	General Physics II	4
or PHYS 2426	or University Physics II	
ENGL 2316	Literature and Culture	3
or ENGL 2332	or Literature of the Western World: From the Classics to the Renaissance	
or ENGL 2333	or Literature of the Western World: From the Enlightenment to the Present	
or PHIL 1301	or Introduction to Philosophy	
or PHIL 2306	or Introduction to Ethics	
or SPAN 3307	or Spanish Literature I	
or SPAN 3308	or Spanish Literature II	
or SPAN 3309	or Spanish American Literature I	
or SPAN 3310	or Spanish American Literature II	
<b>Hours</b>		<b>14</b>

**Fourth Year****Fall**

BIOL 3410	Cell Biology	4
BIOL 3430	Physiology	4
Biology Requirement		4
BIOL 3000:4999		3
<b>Hours</b>		<b>15</b>

**Spring**

BIOL 3000:4999		4
BIOL 3000:4999		4
BIOL 3000:4999		3
BIOL 3000:4999		3
BIOL 3000:4999		3
<b>Hours</b>		<b>17</b>
<b>Total Hours</b>		<b>123-126</b>

## Courses

**BIOL 1308 Science for Life I (Non-Majors Biology)****3 Semester Credit Hours (3 Lecture Hours)**

A non-majors science course. Students will learn basic biological principles, identify the relevance of science in everyday life, and will understand the scientific method. This course does NOT substitute for BIOL 1406 - Biology I or BIOL 1407 - Biology II for science majors. Offered in Spring, Summer, Fall.

**TCCNS:** BIOL 1308

**BIOL 1406 Biology I****4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Presentation of basic biological concepts including scientific method, cytology, energetics, nucleic acids and genetics. This course is suitable for all majors. Offered every semester.

**Prerequisite:** (MATH 1314, 1316, 2305, 2413, minimum score of 24 in 'ACT Math' or minimum score of 580 in 'SAT Math').

**Co-requisite:** SMTE 0091.

**TCCNS:** BIOL 1406

**BIOL 1407 Biology II****4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

This course is an overview of the major concepts in biological diversity and plant and animal biology. Laboratory work will include individual/team activities as well as technology-related assignments. Offered every semester.

**Prerequisite:** BIOL 1406.

**Co-requisite:** SMTE 0091.

**TCCNS:** BIOL 1407

**BIOL 2300 Science Communication****3 Semester Credit Hours (3 Lecture Hours)**

This course involves presentation and discussion of selected topics relating to the professional skills of practicing biological scientists, including basic software instruction, a review of library services pertinent to science, the application of scientific literature research skills, hypothesis generation and statistical tests, critical reviews of scientific articles, and an introduction to ethical issues in science. Offered Spring and Fall.

**BIOL 2371 Principles of Evolution****3 Semester Credit Hours (3 Lecture Hours)**

An overview of the mechanisms by which heritable information changes, adaptations develop, and species diversify. Provides a foundation for molecular, cellular, and organismal studies in the biological sciences.

Offered Fall and Spring.

**Prerequisite:** BIOL 1407.

**BIOL 2401 Anatomy and Physiology I****4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Structure and function of the human body emphasizing biological chemistry, cell biology, tissues, and the integumentary, skeletal, muscular, and nervous systems. Offered every semester. Not recommended for majors in the College of Science. To count this course toward a major in the Department of Life Sciences, a student must demonstrate that it is required by professional schools in their career track and obtain approval for a substitution from their faculty mentor. Students may not receive credit for both this course and either BIOL 3425 - Functional Anatomy or BIOL 3430 - Physiology.

**Co-requisite:** SMTE 0091.

**TCCNS:** BIOL 2401

**BIOL 2402 Anatomy and Physiology II****4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Structure and function of the human body emphasizing blood, growth, development, genetics, and the endocrine, digestive, respiratory, cardiovascular, lymphatic, immune and urogenital systems. Offered every semester. Not recommended for majors in the College of Science. To count this course toward a major in the Department of Life Sciences, a student must demonstrate that it is required by professional schools in their career track and obtain approval for a substitution from their mentor. Students may not receive credit for both this course and either BIOL 3425 - Functional Anatomy or BIOL 3430 - Physiology.

**Prerequisite:** BIOL 2401.

**Co-requisite:** SMTE 0091.

**TCCNS:** BIOL 2402

**BIOL 2416 Genetics****4 Semester Credit Hours (3 Lecture Hours)**

Principles of genetic transmissions and molecular basis of heredity and variation. Weekly recitation periods will involve team assignments, problem solving activities, and seminars. Offered Fall and Spring.

**Prerequisite:** BIOL 1406 and 1407.

**TCCNS:** BIOL 2416

**BIOL 2420 Principles of Microbiology****4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introduction to microorganisms with emphasis on those of importance in patient care. Principles of disinfection, sterilization, immunity. This class is intended for nursing majors; it cannot substitute for BIOL 2421 - Microbiology. Offered Fall and Spring.

**Co-requisite:** SMTE 0092.

**TCCNS:** BIOL 2420

**BIOL 2421 Microbiology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

An introduction to microorganisms including the bacteria, fungi, and viruses. Laboratory involves microbiological techniques and development of basic laboratory skills. Offered Fall and Spring.

**Prerequisite:** BIOL 1406, 1407, CHEM 1411 and 1412.

**Co-requisite:** SMTE 0092.

**TCCNS:** BIOL 2421

**BIOL 2472 Principles of Botany****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Introduction to the structure, function, diversity and application of plants. Laboratory focuses on anatomical features, physiological adaptations, classification, and life cycles. Offered odd Spring.

**Prerequisite:** BIOL 1407 and CHEM 1411.

**Co-requisite:** SMTE 0091.

**BIOL 3300 Animal Nutrition****3 Semester Credit Hours (3 Lecture Hours)**

Examines dietary requirements of companion animals and livestock. Includes anatomy, physiology, and biochemistry of the gastrointestinal system, nutrient procurement and use, feed additives, growth stimulants, metabolic diseases, and diet therapy. Offered odd Spring. Cross-listed with BIMS 3300.

**Prerequisite:** BIOL 1407 and CHEM 3411 and (CHEM 3412 or 3412\*).

\* May be taken concurrently.

**BIOL 3325 Biostatistics****3 Semester Credit Hours (3 Lecture Hours)**

The application of statistical analyses to biological data. Students will gain an understanding of how to apply statistical analyses to biological data through study of the principles of experimental design including how to frame informative research questions. At a fundamental level, these concepts are linked to the philosophy of science and our understanding of the way the world works. Juniors or Seniors only. Offered every Spring.

**BIOL 3345 Cell Physiology****3 Semester Credit Hours (3 Lecture Hours)**

Course emphasizes cellular functions that underlie physiological processes, transport across membranes, membrane potential and excitability, the cell nucleus, and organelles and their relationship to energy, metabolism, and transport mechanisms within the cell. Offered odd Spring.

**Prerequisite:** (BIMS 2200 or BIOL 2300) and BIOL 3410.

**BIOL 3403 Molecular Biology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Principles of molecular biology including advanced concepts of gene structure, expression and regulation, chromatin structure, recombination, and current molecular biology techniques. Laboratory emphasis is on basic skills for nucleic acid analyses, including extraction, PCR amplification, quantification, restriction, and electrophoresis. DNA sequencing-based approaches are covered including bioinformatics for sequence comparisons, polymorphisms, and molecular identification. Offered every Spring. Cross listed with BIMS 3403.

**Prerequisite:** BIOL 2416 and 2421.

**Co-requisite:** SMTE 0092.

**BIOL 3410 Cell Biology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Study of cellular architecture and function. Topics include membranes, transport, organelles, cytoskeleton, and signaling mechanisms. Interrelationships of structure, function, energy and metabolism are explored. Laboratory will emphasize basic techniques of cell biology. Offered every Fall.

**Prerequisite:** BIOL 2416 and CHEM 3411.

**Co-requisite:** SMTE 0092.

**BIOL 3413 Invertebrate Zoology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Structure, life history, and evolution of the invertebrates with special emphasis on the phylogeny and ecological relationships of the major phyla. Laboratory will involve field trips and survey collections. Offered every Fall.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 3414 Vertebrate Zoology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Structure, life history, and evolution of the vertebrates with special emphasis on the phylogeny and ecological relationships of the classes. Laboratory focuses on internal and external anatomy and identification of representative organisms. Offered every Spring.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 3425 Comparative Vertebrate Anatomy****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

General trends in morphological development and adaptation as demonstrated by the anatomy of nonhuman vertebrate species. Offered every Spring. Students may not receive credit for both this course and either BIOL 2401 - Anatomy and Physiology I or BIOL 2402 - Anatomy and Physiology II. Juniors or Seniors only.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 3428 Principles of Ecology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Introduction to the interrelationships of organisms and their environment. Population structure, community classification and regulation, and energy flow in ecosystems will also be covered. Laboratory sections will focus on experimental design and field techniques in ecology.

**Prerequisite:** BIOL 1407 and (BIOL 2200, 2300, BIMS 2200 or UNIV 1101 and UNIV 1102) and CHEM 1411 and (MATH 2413 or 2413\*).

\* May be taken concurrently.

**Co-requisite:** SMTE 0091.

**BIOL 3430 Physiology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The study of physiological processes that are the product of complex interactions between tissues, organs and organ systems, with emphasis on the circulatory, respiratory, endocrine, muscular, digestive, and urogenital systems. Particular focus on homeostasis, and the role of the environment and evolution on organ systems. Offered every Fall. Students may not receive credit for both this course and either

BIOL 2401 - Anatomy and Physiology I, or BIOL 2402 - Anatomy and Physiology II.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 3455 Plant form and Function****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Anatomy of vegetative and reproductive organs of plants, unique cellular features, development and differentiation of cell and tissue types.

Emphasis on physiological mechanisms of response and adaptation to the environment. Offered even Spring.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 3479 Plant Ecology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Structure, physiology, life cycles, and economic impact of plants. Factors influencing diversity, succession and ecological distribution of plants. Offered odd Spring.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4301 Embryology****3 Semester Credit Hours (3 Lecture Hours)**

This course explores the events that occur just prior to and during gestation. Includes gametogenesis, chromosomal and single gene aberrations, teratology, and the development of the body systems. Offered every Fall.

**Prerequisite:** BIOL 2416.

**BIOL 4302 Coral Reef Conservation****3 Semester Credit Hours (3 Lecture Hours)**

Survey of challenges and threats facing coral reef ecosystems in the 21st century and discussion of conservation and management strategies.

Topics include biology and ecology of reef ecosystems, climate change impacts, coral bleaching, over-fishing and effectiveness of and design of marine protected areas. Juniors or Seniors only. Offered every Fall.

**BIOL 4304 Biology of Viruses****3 Semester Credit Hours (3 Lecture Hours)**

Introduction to the study of viruses, including viral life cycles, replication schemes and Baltimore classification of representative bacteriophages, plant and animal viruses. Emphasis on analysis and review of primary literature on viruses. Offered Summer II every year.

**Prerequisite:** BIOL 2416, 2421 and CHEM 1411.

**BIOL 4307 Fungal Biology and Ecology****3 Semester Credit Hours (3 Lecture Hours)**

Overview of the fungi, including their characteristics, diversity, and ecology. Interactions between fungi and other organisms are explored along with the role and importance of the fungi. Juniors or Seniors only. Offered odd Spring. Stacked with BIOL 5307.

**Prerequisite:** BIOL 2421.

**BIOL 4308 Biogeography****3 Semester Credit Hours (3 Lecture Hours)**

This course offers an overview of the theories, methods, and current directions in modern biogeography, emphasizing marine and terrestrial plant and animal species and communities. Offered even Spring.

**BIOL 4311 Biological Bases of Behavior****3 Semester Credit Hours (3 Lecture Hours)**

This lecture-based course examines the processes by which neuronal circuits generate behaviors and the mechanisms by which experience modulates the activity of these circuits. Offered every Fall.

**Prerequisite:** BIMS 4323.

**BIOL 4312 Mariculture Techniques****3 Semester Credit Hours (3 Lecture Hours)**

Application of biological, mechanical, and other concepts required to develop the skills and techniques necessary for efficient operation and management of public and private aquaculture facilities. Offered odd Fall.

**Prerequisite:** BIOL 4370.

**BIOL 4315 Animal Behavior****3 Semester Credit Hours (3 Lecture Hours)**

What mechanisms cause behavior? How does behavior develop?

How does behavior affect survival and reproduction? How does behavior evolve? These questions will be explored in vertebrate and invertebrate species. Junior or Senior only. Offered every Fall. Stacked with BIOL 5315.

**BIOL 4319 Biology of Marine Mammals****3 Semester Credit Hours (3 Lecture Hours)**

Introduction to marine mammals, with a focus on their interactions with their biotic and abiotic environment. Juniors or Seniors only. Offered every Fall. Stacked with BIOL 5319.

**Prerequisite:** BIOL 1407.

**BIOL 4323 Global Change Ecology****3 Semester Credit Hours (3 Lecture Hours)**

An introduction to the effects of climatic and anthropogenic change on terrestrial and aquatic structure and function. Includes readings from the current literature and discussion of controversial articles. Offered odd Spring.

**Prerequisite:** BIOL 3428.

**BIOL 4328 Fisheries****3 Semester Credit Hours (3 Lecture Hours)**

A study of theory and techniques in fisheries science, including practical fisheries sampling designs and techniques, behavior of fisheries populations and application to resource management with emphasis in tide-influenced waters. Includes readings in the current literature. Offered even Spring.

**Prerequisite:** BIOL 1407.

**BIOL 4330 Conservation Biology****3 Semester Credit Hours (3 Lecture Hours)**

Principles and theories relating to the conservation of biological diversity, including patterns and processes creating biological diversity, estimates of extinction rates, consequences of losses of biodiversity and causes of diversity loss. Juniors or Seniors only. Offered every Fall.

**Prerequisite:** BIOL 3428.

**BIOL 4334 Biology and Ecology of Coral Reefs****3 Semester Credit Hours (3 Lecture Hours)**

This course will introduce the biology of corals, describe the abiotic and biotic interactions among coral reef ecosystem inhabitants, identify the threats of climate change, and discuss the conservation and management of reefs for the future. Offered every Spring.

**Prerequisite:** BIOL 3428.

**BIOL 4336 Marine Ecology****3 Semester Credit Hours (3 Lecture Hours)**

Habitats and community structure in marine environments; biotic and abiotic factors governing the distribution of marine organisms. Offered every Spring.

**Prerequisite:** BIOL 3428.

**BIOL 4340 Genomics, Proteomics and Bioinformatics****3 Semester Credit Hours (3 Lecture Hours)**

An introduction to integrative biological study using genome-wide approaches and bioinformatics. The "-omics" technologies (Genomics, Proteomics, Metabolomics, etc.) will be surveyed for current and potential contributions to understanding biological function at molecular, cellular, organismal and ecosystem levels. Offered every Fall. Stacked with BIOL 5340.

**Prerequisite:** BIOL 2416 and (BIOL 3410, 3403 or CHEM 4401).

**BIOL 4343 Oceans and Human Health****3 Semester Credit Hours (3 Lecture Hours)**

Healthy oceans are essential to the habitability of our planet – for humans and all other forms of life. Students will explore links between oceans, pollution, human well-being, ecosystem services, resource management, and the science and legislation governing the enforcement of water quality standards. Juniors or Seniors only. Offered every Fall.

**BIOL 4350 Research and Design****1-4 Semester Credit Hours (1-3 Lecture Hours, 3 Lab Hours)**

Course will include experimental design, literature review of a research topic and laboratory work on the research topic. Consent of Instructor.

**BIOL 4353 Down the River: Biology of Gulf Coast Fishes****3 Semester Credit Hours (3 Lecture Hours)**

This course covers aspects of ecology and biogeography of riverine and estuarine fishes while exposing students to field sampling techniques and museum preparation of specimens. This will be a unique opportunity for students to gain an in-depth understanding of the biological complexity of Texas Gulf Coast river systems while gaining hands-on experience in field and museum ichthyological techniques that are employed by state, federal and academic researchers alike. Offered during Maymester.

**Co-requisite:** SMTE 0091.

**BIOL 4355 Public Aquarium and Animal Care Operations****3 Semester Credit Hours (3 Lecture Hours)**

This course examines the unique requirements needed for public aquariums and zoos to balance animal care and health with public display for general education and conservation research. Offered during Summer.

**Co-requisite:** SMTE 0091.

**BIOL 4360 Computation for 21st Century Biologists****3 Semester Credit Hours (3 Lecture Hours)**

This course is designed to prepare and enable students to use computational tools for bioinformatic applications in advanced courses and independent research projects. Students will be introduced to powerful open-source computing tools used in biological research for creation, organization, manipulation, processing, analysis, and archiving of big data. While not a formal requirement, it is assumed that students have a firm command of basic algebra. Juniors or Seniors only. Offered every Fall. Stacked with BIOL 5360.

**BIOL 4370 Mariculture****3 Semester Credit Hours (3 Lecture Hours)**

Survey of the physiological, behavioral, environmental, and economic parameters governing the culture of selected aquatic species. Included are techniques employed worldwide to produce aquatic products. Offered every Fall. Cross-listed with FAMA 5370.

**Prerequisite:** BIOL 1407.

**BIOL 4396 Directed Independent Study****1-3 Semester Credit Hours (1-3 Lecture Hours)**

Research in areas of current interest. Written report required. May be repeated for a maximum of 6 semester hours.

**Prerequisite:** BIOL 1407 and CHEM 1412.

**BIOL 4399 Directed Independent Research****3-6 Semester Credit Hours (3-6 Lecture Hours)**

Independent laboratory- or field-based research project on topic of current interest. Project developed in conjunction with a faculty advisor. Written report required. May be repeated once for a total of 6 semester credit hours. Sophomores or Juniors or Seniors and Permission of Instructor (faculty advisor).

**BIOL 4406 Immunology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

An overview of immunology with emphasis on current knowledge of the immune system. Detailed examination of the specific cells, cytokines, antibodies, and molecules that comprise the immune system. Laboratory exercises demonstrate the basic principles and techniques used in immunologic studies. Offered every Spring semester. Cross listed with BIMS 4406.

**Prerequisite:** BIOL 2421.

**Co-requisite:** SMTE 0092.

**BIOL 4408 Microbial Diversity and Ecology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Biodiversity and roles of microorganisms in natural environments. Interactions with other micro- and macro-organisms (humans, animals and plants) and with abiotic factors. Unique abilities of microorganisms such as nitrogen fixation and adaptation to extreme environments. Offered every Fall. Stacked with BIOL 5408; Cross-listed with MARB 6408.

**Prerequisite:** BIOL 2421 and 3428.

**Co-requisite:** SMTE 0092.

**BIOL 4410 Mammalogy****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Systematics and ecology of mammals including mammalian origins, structure and function, diversity, ecology, behavior, and conservation. Juniors or Seniors only. Offered even Fall. Stacked with BIOL 5410.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4413 Entomology****4 Semester Credit Hours (3 Lecture Hours)**

A broad overview of the natural history, classification, phylogeny, ecology, behavior, development and physiology of insects and their kin. The lab will involve field work, collection and curation. Juniors and Seniors only. Offered even Spring. Stacked with BIOL 5413.

**Prerequisite:** BIOL 3413.

**Co-requisite:** SMTE 0091.

**BIOL 4425 Ornithology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Systematics, anatomy, physiology, ecology, behavior, and field identification of birds. Juniors and Seniors only. Offered odd Fall. Stacked with BIOL 5425.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4429 Marine Botany****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The ecology of marine plants with emphasis on identification, life histories, and environmental factors of distribution. Offered every Fall. Stacked with BIOL 5429.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4430 Marine Plankton****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

In this class we will investigate the systematics, distribution, and ecology of major marine plankton groups and introduce major concepts in biological oceanography. Juniors or Seniors only. Offered odd Spring. Stacked with BIOL 5430; Cross-listed with MARB 6430.

**BIOL 4432 Ichthyology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Systematics, evolution, biology, and ecology of fishes. Laboratory identification of marine and freshwater fishes collected during field excursions. Juniors or Seniors only. Offered every Fall. Stacked with BIOL 5432; Cross-listed with MARB 6432.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4433 Parasitology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

An introduction to parasitology with emphasis on internal parasites and appropriate references to human endoparasites and parasites of veterinary importance. Juniors and Seniors only. Offered every Spring.

**Prerequisite:** BIOL 2421.

**Co-requisite:** SMTE 0092.

**BIOL 4439 Case Work Methods in Forensic Anthropology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

This course combines the study of human bones (osteology) and skeletal anatomy with established and validated forensic anthropological methods to solve theoretical and actual forensic cases involving human remains. BIOL 2401 or permission of Instructor. Offered every Spring. Stacked with BIOL 5439; Cross-listed with BIMS 4439.

**Prerequisite:** BIOL 2401.

**BIOL 4442 Herpetology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Systematics, ecology, and behavior of amphibians and reptiles. Juniors or Seniors only. Offered odd Spring. Stacked with BIOL 5442.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4444 Estuarine Organisms****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Systematics, distribution, and ecology of estuarine macrofauna. Required field trip. Individual study required. Juniors and Seniors only.

**Prerequisite:** BIOL 3413.

**Co-requisite:** SMTE 0091.

**BIOL 4547 Marine Science Field Camp****5 Semester Credit Hours (3 Lecture Hours, 6 Lab Hours)**

Students learn techniques required to properly conduct marine science field research. Practical, hands-on experience is gained in a variety of topics including biotic and abiotic sample collection and processing, quantitative analysis of field data, evaluation of environmental factors, survival and distribution of living organisms, and the structure of biotic communities. Juniors or Seniors. Offered Maymester.

**BIOL 4590 Selected Topics****5 Semester Credit Hours (5 Lecture Hours)**

Variable content. May be repeated for credit.

**BIOL 4598 Biology Internship****6 Semester Credit Hours**

Two to six semester credit hours may be earned by working in an internship position in a governmental agency, private industry, or other appropriate venue.

**BIOL 4609 Field and Sampling Techniques****6 Semester Credit Hours (3 Lecture Hours, 6 Lab Hours)**

The study of techniques required for proper field work in the biological sciences. The course includes ecological sampling methods, safety, logistics, equipment operation and maintenance and travel concerns. Offered in Summer.

**Co-requisite:** SMTE 0091.