

# BIOMEDICAL SCIENCES, BS

## Program Description

### Purpose of the Biomedical Sciences Program

The Biomedical Sciences Program serves the Coastal Bend region, the state of Texas, and the nation by preparing students for biomedical career opportunities including health services, research, forensic science, genetic engineering, biotechnology, bioinformatics, product sales, and services dealing with analysis, assessment and inspection. A few biomedical careers are available to a student with a baccalaureate degree, but most will require the student to complete post-baccalaureate course work or to earn a graduate degree. Core courses in biology and chemistry provide students with critical thinking skills in the pure sciences; specific courses allow students to further develop these skills and utilize them in solving problems. This unique combination provides students with a strong conceptual framework and also allows students to focus upon applied biomedical sciences. The two options in the Biomedical Sciences Program prepare students

- to enter post-baccalaureate or graduate programs in the health professions (e.g., medicine, dentistry, pharmacy, physician assistant, physical therapy, occupational therapy, etc.) or in related sciences.
- for careers and/or graduate training in forensic science and related areas.

## Student Learning Outcomes

Students will:

- Possess a broad understanding of science and its in-depth application to their specific option within the biomedical sciences major.
- Demonstrate critical thinking skills
- Practice the oral and written communication skills necessary to share biomedical information with a range of audiences and in a variety of venues.

## 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 BIMS faculty mentor and Honors advisor may count toward the BIMS degree. BIMS students wishing to participate in the Honors track may require some additional course work. For more information, consult the section entitled "Honors Program (<http://catalog.tamucc.edu/undergraduate/university-college/programs/honors-program/>)".

## Related Programs

Numerous undergraduate programs complement a major in Biomedical Sciences. In addition to the "traditional" partners (Biology, Chemistry, Physics), students should also examine courses in the Department of Computing Sciences, the Department of Mathematics and Statistics and the College of Nursing and Health Sciences. Students should also consider courses in the College of Liberal Arts (social sciences, languages, criminal justice), in the College of Business, and in the College of Education and Human Development (kinesiology). Details of these programs are available in their respective sections of this catalog.

## Minor

Although Biomedical Sciences does not offer a minor, many upper-division BIMS courses may count toward the Biology Minor (see the Biology (<http://catalog.tamucc.edu/undergraduate/science/minors/biology-minor/>) section of this catalog). Students majoring in Biomedical Sciences **may not** minor in Biology.

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

The university allows the opportunity for high-achieving students to waive a select number of undergraduate credits in order to obtain a graduate degree at an accelerated pace. For more information, see Fast Track Biomedical Sciences, BS to Biology, MS (<http://catalog.tamucc.edu/undergraduate/science/fast-track/fast-track-biomedical-sciences-bs-ms/>).

## General Requirements

The Bachelor of Science in Biomedical Sciences degree requires a minimum of 120 semester hours: 42 are from designated Core Curriculum Program courses, 17 are from biomedical sciences core courses, and 61 are from biomedical sciences option courses. Students select one of two biomedical sciences options: (A) Pre-Professional Option or (B) Forensic Science Option. A student should select an option after completion of a minimum of 35 semester hours of university course work, but before the completion of 50 semester hours. After their sophomore year (60 semester hours), students must have (and maintain) a cumulative GPA of 2.50 or above in their course work, with no course work older than 5 years. No "D" or "F" grades will be accepted as credit within the biomedical sciences core or option courses. Students may take a maximum of 9 SCH as BIMS 4590 courses.

## Grade-Point Average

A minimum cumulative grade-point average of 2.0 ("C") on a 4 point scale (4.0 = A) in all work taken and a minimum grade-point average of 2.25 in all courses in the major field of study taken at this University are required. The courses in the major field of study are defined for each major, and can be found on the pages for that major. For teacher certification, grade point average requirements are higher. Refer to "Teacher Certification Programs" in the College of Science and Engineering.

Requirements	Credit Hours
First-Year Seminars (when applicable) or Professional Skills <sup>1</sup>	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
Biomedical Sciences Core Courses	17
Biomedical Sciences Option Courses	59-61
<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.

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

Students entering with some college credit may not be required to take one or both of the First-Year Seminar courses (see The First Year Learning Communities Program for rules and exceptions concerning these courses). Students in the Pre-Professional or Forensic Science options who are not required to take these First-Year Seminar courses must take BIMS 2200 Professional Skills (2 sch) Professional Skills (see below).

2

Three 4-hour science and mathematics courses are required for all Biomedical Sciences students: BIOL 1406 Biology I (4 sch), BIOL 1407 Biology II (4 sch), and MATH 1442 Statistics for Life (4 sch). Only the 3 lecture hours of each will apply to the Core Curriculum Program. Each one-hour laboratory component will be counted in the Component Area Option of the University Core Curriculum. The 3 lecture hours of General Chemistry I (CHEM 1411 General Chemistry I (4 sch)) will also be counted in the Component Area Option of the University Core Curriculum, but the 1 laboratory hour will be counted as part of the Biomedical Science core.

## Program Requirements

Code	Title	Hours
<b>Full-time, First-year Students/Professional Skills</b>		
UNIV 1101	University Seminar I	1
UNIV 1102	University Seminar II	1
Students in the Pre-Professional or Forensic Science option who are not required to take these First-Year Seminars must take:		
BIMS 2200	Professional Skills	
<b>Core Curriculum Program</b>		
University Core Curriculum		42
Biomedical Sciences majors must take: <sup>1</sup>		
BIOL 1406	Biology I	
BIOL 1407	Biology II	
MATH 1442	Statistics for Life	
CHEM 1411	General Chemistry I	
<b>Biomedical Sciences Core Courses</b>		
BIOL 1406	Biology I (included in University Core)	
BIOL 1407	Biology II (included in University Core)	
BIOL 2416	Genetics	4
BIOL 2421	Microbiology	4
CHEM 1411	General Chemistry I (lecture hours included in University Core)	1
CHEM 1412	General Chemistry II	4
CHEM 3411	Organic Chemistry I	4
<b>Biomedical Sciences Options</b>		
Select one of the following Options:		59-61
Pre-Professional Option (p. 2)		
Forensic Science Option (p. 3)		
<b>Total Hours</b>		<b>120-122</b>

1

Only the 3 lecture hours of each will apply to the Core Curriculum Program. Each one-hour laboratory component will be counted in the Component Area Option of the University Core Curriculum. The 3 lecture hours of General Chemistry I (CHEM 1411 General Chemistry I (4 sch)) will also be counted in the Component Area Option of the University Core Curriculum, but the 1 laboratory hour will be counted as part of the Biomedical Science core.

2

Unless student has credit for MATH 1442 Statistics for Life (4 sch)

+

Select at least one Forensic Science Option—Elective

## Biomedical Sciences Options

Each multi-disciplinary option provides specific background in an area of biomedical sciences that corresponds to the student's career choice. For the baccalaureate degree, an option consists of requirements and electives totaling 59-61 semester hours of course work.

### Pre-Professional Option

This option is designed for students who plan to continue their education in a professional school (e.g., medicine, dentistry, veterinary medicine, pharmacy, physical therapy, occupational therapy, physician assistant, etc.) or graduate school. Students in this option must choose either MATH 1442 Statistics for Life (4 sch) or MATH 2413 Calculus I (4 sch) to satisfy the University Core requirement in mathematics, and they must complete BIMS 4085 Major Field Test in Biology (0 sch) during their senior year, prior to graduation.

Code	Title	Hours
<b>Pre-Professional Option Required Courses</b>		
BIMS 4085	Major Field Test in Biology	0
CHEM 3412	Organic Chemistry II	4
MATH 1442	Statistics for Life (lecture hours included in University Core) <sup>1</sup>	1
<b>Pre-Professional Option Electives</b>		
Select 49 hours of the following:		49
BIMS 2171	Medical Terminology	
BIMS 3300	Animal Nutrition	
BIMS 3301	Introduction to Animal Science	
BIMS 3401	Pathophysiology	
BIMS 3403	Molecular Biology	
BIMS 4170	Biomedical Seminar	
BIMS 4295	Biomedical Practicum	
BIMS 4296	Clinical Research	
BIMS 4299	Directed Independent Research	
BIMS 4311	Biology of Cancer	
BIMS 4323	Neurobiology	
BIMS 4327	Introduction to Toxicology	
BIMS 4330	Biological Basis of Aging	
BIMS 4341	Health Disparities	
BIMS 4333	Medical Entomology	
BIMS 4334	Human Genetics	
BIMS 4335	Endocrinology	
BIMS 4374	Medical Microbiology	
BIMS 4375	Mechanisms of Microbial Pathogenesis	

BIMS 4396	Directed Independent Study
BIMS 4406	Immunology
BIMS 4410	Histology
BIMS 4590	Selected Topics (with approval of faculty mentor)
BIOL 3345	Cell Physiology
BIOL 3410	Cell Biology
BIOL 3425	Functional Anatomy <sup>3</sup>
BIOL 3430	Physiology <sup>3</sup>
BIOL 4301	Embryology
BIOL 4304	Biology of Viruses
BIOL 4340	Genomics, Proteomics and Bioinformatics
BIOL 4350	Research and Design
BIOL 4408	Microbial Diversity and Ecology
BIOL 4433	Parasitology
BIOL 4435	Biological Microtechniques
CHEM 4320	Drugs, Toxins and Natural Products Chemistry
CHEM 4401	Biochemistry I
CHEM 4402	Biochemistry II
MATH 2413	Calculus I (if not counted in the University Core)
MATH 3342	Applied Probability and Statistics <sup>2</sup>
PHYS 1401	General Physics I
PHYS 1402	General Physics II
12 hours of other approved electives	

**Total Hours** **54**

1

The 3 lecture hours count as Math foundations in the University core. The 1 hour of lab counts in the Component Area Option

2

Unless student has credit for MATH 1442 Statistics for Life (4 sch)

3

May not apply elective credit for either BIOL 2401 & 2402 if they take either BIOL 3430 or BIOL 3425.

#### Additional Information

This option has flexible degree requirements with many electives to accommodate the different professional schools' diverse entrance requirements. In the list of electives above, however, not every course is appropriate for every student and some courses are best taken at a particular time. For example:

Students should take basic science courses such as BIMS 3403 Molecular Biology (4 sch), BIMS 4406 Immunology (4 sch), BIOL 3425 Functional Anatomy (4 sch), BIOL 3430 Physiology (4 sch), CHEM 4401 Biochemistry I (4 sch), CHEM 4402 Biochemistry II (4 sch), PHYS 1401 General Physics I (4 sch), PHYS 1402 General Physics II (4 sch) before they attempt standardized admissions tests (usually at the end of their junior year). Most professional schools encourage applicants to have a broad background in the basic sciences, and these courses are helpful even if they are not specifically required for admission to a particular career area.

To decide which electives to choose, students should:

- consult their faculty mentor and academic advisor who can also provide information about the "other mentor approved electives" which may include nonlisted courses in natural sciences

(biology, biomedical sciences, chemistry, physics), social sciences (psychology, sociology), computer science, health sciences, criminal justice, kinesiology, or business.

- contact the appropriate school(s) to determine their specific entrance requirements.
- obtain a sample degree plan for a particular career field. These are available on the BIMS web site, from the student's faculty mentor or academic advisor, or through the Pre-professional website (<http://prepro.tamucc.edu>).

### Forensic Science Option

This interdisciplinary option allows students to prepare for careers in forensic science (including entrance into graduate programs in forensic science and related areas). Prospective students should be aware that employers in forensic science typically require employees to meet personal suitability requirements (e.g., honesty, integrity, and scientific objectivity). Background checks and drug tests similar to those required for law enforcement officers are likely to be a condition of employment. Students in this option must choose MATH 2413 Calculus I (4 sch) to satisfy the University Core requirement in mathematics. Elective courses allow the student to begin to specialize in an emphasis area such as forensic biology (mainly biology and biomedical sciences courses), forensic chemistry (mainly chemistry courses), or general forensic science. A student's degree plan may include a maximum of six hours of internship, research, or independent study (e.g., BIMS 4295 Biomedical Practicum (2 sch), BIMS 4299 Directed Independent Research (1-2 sch), BIMS 4396 Directed Independent Study (1-3 sch), or BIOL 4350 Research and Design (1-3 sch)). Students in this option must take a standardized assessment test during their senior year, prior to graduation.

Code	Title	Hours
<b>Forensic Science Option Required Courses</b>		
CLSC 3200	Essentials for Applied Laboratory Sciences	2
BIMS 3103	Essentials Laboratory for Forensic Science	1
BIMS 3320	Survey of Forensic Science	3
BIMS 3325	Professional Practice in Forensic Science	3
CHEM 3412	Organic Chemistry II	4
CHEM 3418	Instrumental Analysis	4
CRIJ 4340	Criminal Investigation	3
Select one of the following:		3-4
MATH 1442	Statistics for Life	
MATH 3342	Applied Probability and Statistics	
MATH 2413	Calculus I (3 hours included in University Core)	1
Select one of the following:		4
PHYS 2425	University Physics I (preferred)	
PHYS 1401	General Physics I	
Select one of the following:		4
PHYS 2426	University Physics II (preferred)	
PHYS 1402	General Physics II	
<b>Forensic Science Option Electives</b>		
Select 21-22 hours of the following:		21-22
BIMS 3401	Pathophysiology	
BIMS 3402	Introduction to Forensic Anthropology	
BIMS 3403	Molecular Biology <sup>1</sup>	
BIMS 4295	Biomedical Practicum	
BIMS 4299	Directed Independent Research	
BIMS 4395	Forensic Science Internship	

CLSC 4325	Clinical Chemistry I	
CLSC 4326	Clinical Chemistry II	
BIMS 4327	Introduction to Toxicology	
BIMS 4333	Medical Entomology	
BIMS 4340	Forensic Science in Criminal Law	
BIMS 4396	Directed Independent Study	
BIMS 4406	Immunology	
BIMS 4410	Histology	
BIMS 4428	Medicolegal Death Investigations	
BIMS 4439	Case Work Methods in Forensic Anthropology	
BIMS 4590	Selected Topics (with approval of faculty mentor)	
BIOL 2472	Principles of Botany	
BIOL 3410	Cell Biology <sup>1</sup>	
BIOL 3425	Functional Anatomy <sup>2</sup>	
BIOL 3430	Physiology <sup>2</sup>	
BIOL 4340	Genomics, Proteomics and Bioinformatics	
BIOL 4350	Research and Design	
BIOL 4371	Population Genetics	
BIOL 4433	Parasitology	
BIOL 4435	Biological Microtechniques	
CHEM 3417	Quantitative Analysis <sup>1</sup>	
CHEM 4320	Drugs, Toxins and Natural Products Chemistry	
CHEM 4401	Biochemistry I <sup>1</sup>	
CHEM 4402	Biochemistry II	
CHEM 4407	Advanced Inorganic Chemistry <sup>1</sup>	
CHEM 4420	Physical Biochemistry	
CHEM 4423	Physical Chemistry I	
CHEM 4424	Physical Chemistry II	
ENGL 3301	Technical and Professional Writing	
MATH 2414	Calculus II <sup>1</sup>	
12 hours of other approved electives		
<b>Total Hours</b>		<b>53-55</b>

1

Select at least one of these courses

2

May not apply elective credit for either BIOL 2401 &amp; 2402 if they take either BIOL 3430 or BIOL 3425.

## Course Sequencing

### Pre-Professional

#### First Year

		Hours
<b>Fall</b>		
BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
UNIV 1101	University Seminar I	1
COMM 1311	Foundation of Communication	3
MATH 2312	Precalculus	3
<b>Hours</b>		<b>15</b>

#### Spring

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4

UNIV 1102	University Seminar II	1
ENGL 1302	Writing and Rhetoric II	3
MATH 2413	Calculus I	4
<b>Hours</b>		<b>16</b>

#### Summer

HIST 1301	U.S. History to 1865	3
HIST 1302	U.S. History Since 1865	3
<b>Hours</b>		<b>6</b>

#### Second Year

##### Fall

BIOL 2416	Genetics	4
CHEM 3411	Organic Chemistry I	4
BIOL 2371	Principles of Evolution	3
Creative Arts Core Requirement		3
<b>Hours</b>		<b>14</b>

##### Spring

BIOL 2421	Microbiology	4
CHEM 3412	Organic Chemistry II	4
PSYC 2301	General Psychology	3
or SOCI 1301	or Introduction to Sociology	
<b>Hours</b>		<b>11</b>

#### Summer

POLS 2305	U.S. Government and Politics	3
POLS 2306	State and Local Government	3
<b>Hours</b>		<b>6</b>

#### Third Year

##### Fall

PHYS 1401	General Physics I	4
CHEM 4401	Biochemistry I	4
Language, Philosophy & Culture Core Requirement (ENGL 2316, 2332, 2333)		3
BIOL 3410	Cell Biology	4
<b>Hours</b>		<b>15</b>

##### Spring

PHYS 1402	General Physics II	4
CHEM 4402	Biochemistry II	4
or BIMS 3403	or Molecular Biology	
MATH 1442	Statistics for Life	3-4
or MATH 3342	or Applied Probability and Statistics	
or BIOL 3325	or Biostatistics	
BIOL 4334	Biology and Ecology of Coral Reefs	3
or BIOL 3345	or Cell Physiology	
<b>Hours</b>		<b>14-15</b>

#### Summer

BIMS 4327	Introduction to Toxicology	3
or BIOL 4304	or Biology of Viruses	
<b>Hours</b>		<b>3</b>

#### Fourth Year

##### Fall

BIOL 3430	Physiology	4
or BIMS 3401	or Pathophysiology	
BIMS 4311	Biology of Cancer	3
or BIMS 4374	or Medical Microbiology	

BIOL 4340	Genomics, Proteomics and Bioinformatics (or other BIMS/BIOL/CHEM elective)	3
BIMS 4335 or BIOL 4408 or BIMS 4410 or BIMS 4375	Endocrinology or Microbial Diversity and Ecology or Histology or Mechanisms of Microbial Pathogenesis	3-4
<b>Hours</b>		<b>13-14</b>
<b>Spring</b>		
BIMS 4323	Neurobiology (OR BIOL)	3
BIMS 4406	Immunology	4
BIOL or BIMS OR CHEM elective		4
BIMS 4085	Major Field Test in Biology	0
<b>Hours</b>		<b>11</b>
<b>Total Hours</b>		<b>124-126</b>

## Forensic Science

### First Year

Fall		Hours
BIOL 1406	Biology I	4
CHEM 1411	General Chemistry I	4
UNIV 1101	University Seminar I	1
COMM 1311	Foundation of Communication	3
MATH 2312 or MATH 2413	Precalculus or Calculus I	3-4
<b>Hours</b>		<b>15-16</b>

### Spring

BIOL 1407	Biology II	4
CHEM 1412	General Chemistry II	4
UNIV 1102	University Seminar II	1
ENGL 1302	Writing and Rhetoric II	3
MATH 2413 or PSYC 2301 or SOCI 1301	Calculus I or General Psychology or Introduction to Sociology	3-4
<b>Hours</b>		<b>15-16</b>

### Summer

HIST 1301	U.S. History to 1865	3
HIST 1302	U.S. History Since 1865	3
<b>Hours</b>		<b>6</b>

### Second Year

Fall		Hours
BIOL 2416	Genetics	4
CHEM 3411	Organic Chemistry I	4
BIOL 2401	Anatomy and Physiology I	4
BIMS 3320	Survey of Forensic Science	3
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
BIOL 2421	Microbiology	4
CHEM 3412	Organic Chemistry II	4
MATH 3342	Applied Probability and Statistics	3
BIOL 2402	Anatomy and Physiology II	4
<b>Hours</b>		<b>15</b>

### Summer

POLS 2305	U.S. Government and Politics	3
POLS 2306	State and Local Government	3
<b>Hours</b>		<b>6</b>

### Third Year

Fall		Hours
PHYS 1401 or PHYS 2425	General Physics I or University Physics I	4
CHEM 4401	Biochemistry I	4
Creative Arts Core Requirement		3
ENGL 2316 or ENGL 2332 or ENGL 2333	Literature and Culture or Literature of the Western World: From the Classics to the Renaissance or Literature of the Western World: From the Enlightenment to the Present	3
BIMS Forensic Science Elective		3
<b>Hours</b>		<b>17</b>
<b>Spring</b>		
PHYS 1402 or PHYS 2426	General Physics II or University Physics II	4
CHEM 4402	Biochemistry II	4
CHEM 3418	Instrumental Analysis	4
BIMS 3325 or BIMS 4340	Professional Practice in Forensic Science or Forensic Science in Criminal Law	3
<b>Hours</b>		<b>15</b>

### Summer

BIMS 4327	Introduction to Toxicology	3
<b>Hours</b>		<b>3</b>

### Fourth Year

Fall		Hours
BIMS 4410 or BIOL 3410	Histology or Cell Biology	4
ENGL 3301	Technical and Professional Writing	3
BIMS Forensic Science Elective		3
BIMS Forensic Science Elective		4
<b>Hours</b>		<b>14</b>
<b>Total Hours</b>		<b>121-123</b>

## Courses

### Biology 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.

**Co-requisite:** SMTE 0091.

**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.

**Prerequisite:** (MATH 1314, 1316, 2305, 2413, minimum score of 21 in 'ACT Math' or minimum score of 550 in 'SAT Math').

**Co-requisite:** SMTE 0091.

**TCCNS:** BIOL 1406

**BIOL 1407 Biology II****4 Semester Credit Hours (4 Lecture 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.

**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.

**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.

**Prerequisite:** BIOL 1407.

**BIOL 2401 Anatomy and Physiology I****4 Semester Credit Hours (4 Lecture Hours)**

Structure and function of the human body emphasizing biological chemistry, cell biology, tissues, and the integumentary, skeletal, muscular, and nervous systems. Not recommended for majors in the College of Science and Engineering. 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 his or her career track and obtain approval for a substitution from his or her 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 (4 Lecture Hours)**

Structure and function of the human body emphasizing blood, growth, development, genetics, and the endocrine, digestive, respiratory, cardiovascular, lymphatic, immune and urogenital systems. Not recommended for majors in the College of Science and Engineering. 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 his or her career track and obtain approval for a substitution from his or her faculty 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.

**Prerequisite:** BIOL 1406 and 1407.

**TCCNS:** BIOL 2416

**BIOL 2420 Principles of Microbiology****4 Semester Credit Hours (4 Lecture 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.

**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.

**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 focus on anatomical features, physiological adaptations, classification, and life cycles.

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

**Co-requisite:** SMTE 0091.

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

Examines the dietary requirements of both companion animals and livestock. Includes the anatomy, physiology and biochemistry of the gastrointestinal system, nutrient procurement and use, feed additives, growth stimulants, metabolic diseases, and diet therapy. 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.

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

Emphasis on 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 during Spring semester of odd-numbered years

**Prerequisite:** BIMS 2200 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. Cross listed with BIMS 3403.

**Prerequisite:** BIOL 2416 and 2421.

**Co-requisite:** SMTE 0092.

**BIOL 3410 Cell Biology****4 Semester Credit Hours (4 Lecture 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.

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

**Co-requisite:** SMTE 0092.

**BIOL 3413 Invertebrate Zoology****4 Semester Credit Hours (3 Lecture Hours, 1 Lab Hour)**

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 fall semester every year.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

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

Structure, life history, and evolution of the vertebrates with special emphasis on the phylogeny and ecological relationships of the classes. Laboratory will involve field trips and survey collections. Offered only in Spring semester.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 3425 Functional Anatomy****4 Semester Credit Hours (4 Lecture Hours)**

General trends in morphological development and adaptation as demonstrated by the anatomy and embryology of living and extinct chordates. 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 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 (4 Lecture 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. 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.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

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

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

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4100 Research Ethics and Professionalism****1 Semester Credit Hour (1 Lecture Hour)**

A course designed to enhance the professionalism of undergraduate researchers. This course discusses the codified aspects of research ethics, including fabrication, falsification and plagiarism of data; assigning authorship, submitting manuscripts to more than one journal and management of lab teams. It also addresses careers in science, resume writing, producing the successful application and interviewing skills.

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

Studies 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.

**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 the effectiveness and design of marine protected areas.

**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.

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

**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.

**BIOL 4309 Biological Systematics and Phylogenetics****3 Semester Credit Hours (3 Lecture Hours)**

Introduction to the theories of biological systematics and phylogenetics. Including species concepts, biological classification, nomenclature, and phylogenetic methods including ancestral state reconstruction and divergence time estimation. Offered in the spring semester of odd years.

Stacked with BIOL 5309

**Prerequisite:** BIOL 1407.

**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.

**Prerequisite:** BIMS 4323.

**BIOL 4312 Mariculture Techniques****3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)**

The study and hands-on 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 in Fall of odd-numbered years.

**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. Offered in the fall semester 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

**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.

**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.

**Prerequisite:** BIOL 1407.

**BIOL 4329 Fisheries Techniques****3 Semester Credit Hours (2 Lecture Hours)**

This class is designed to provide practical experience in the theory and application of traditional and modern fisheries sampling and analytical techniques used in Fisheries Science and Management. This is a hands-on field- and laboratory-based course that will develop skills that are most commonly used by fisheries biologists and technicians. Offered in Fall of even-numbered years.

**Prerequisite:** BIOL 4328.

**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.

**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.

**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.

**Prerequisite:** BIOL 2416 and 3410 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.

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

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

**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.

**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.

**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. Offered every Fall semester. 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.

**Prerequisite:** BIOL 1407.

**BIOL 4371 Population Genetics****3 Semester Credit Hours (3 Lecture Hours)**

An introduction to evolutionary processes and their genetic basis, this course focuses on theoretical and experimental approaches to the study of population genetics, quantitative genetics, evolutionary ecology, and molecular evolution.

**Prerequisite:** BIOL 2416 and MATH 2413.

**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.

**BIOL 4405 Limnology****4 Semester Credit Hours (4 Lecture Hours)**

The study of the functional relationships and productivity of aquatic communities as they are affected by their physical, chemical, and biotic environment. The influence of man's activities on these systems will be the focus of the course.

**Prerequisite:** BIOL 3428.

**Co-requisite:** SMTE 0091.

**BIOL 4406 Immunology****4 Semester Credit Hours (4 Lecture 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. Cross listed with BIMS 4406.

**Prerequisite:** BIOL 2421.

**Co-requisite:** SMTE 0092.

**BIOL 4407 BIOLOGY OF THE FUNGI****4 Semester Credit Hours (3 Lecture Hours, 1 Lab Hour)**

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.

**Prerequisite:** BIOL 2421.

**Co-requisite:** SMTE 0092.

**BIOL 4408 Microbial Diversity and Ecology****4 Semester Credit Hours (4 Lecture 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.

**Prerequisite:** (BIOL 2421 or 4328).

**Co-requisite:** SMTE 0092.

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

Systematics and ecology of mammals. Offered in even Fall semesters.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4413 Entomology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab 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. Offered in spring semester of even years. Stacked with BIOL 5413.

**Prerequisite:** BIOL 3413.

**Co-requisite:** SMTE 0091.

**BIOL 4417 Field Biology****4 Semester Credit Hours (1 Lecture Hour, 6 Lab Hours)**

is a hands-on course designed to teach students key concepts by immersing them in nature. Topics include adaptations of plants and animals in different habitats, food web interactions, and how biotic and abiotic forces interact to structure natural communities including spatial and temporal variation in communities.

**Prerequisite:** BIOL 3428.

**Co-requisite:** SMTE 0091.

**BIOL 4422 Plant Taxonomy****4 Semester Credit Hours (4 Lecture Hours)**

Principles and practice in the classification of flowering plants. Field trips are required.

**Prerequisite:** BIOL 1407.

**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. Offered in odd Fall semester.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

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

The ecology of marine plants with emphasis on identification, life histories, and environmental factors of distribution.

**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. Offered in Spring of odd-numbered years.

**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.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

**BIOL 4433 Parasitology****4 Semester Credit Hours (4 Lecture Hours)**

An introduction to parasitology with emphasis on internal parasites and appropriate references to human endoparasites and parasites of veterinary importance.

**Prerequisite:** BIOL 2421.

**Co-requisite:** SMTE 0092.

**BIOL 4435 Biological Microtechniques****4 Semester Credit Hours (4 Lecture Hours)**

Theory and techniques of processing specimens for histochemistry and microscopic examination. Laboratory includes preparation of tissues and small specimens for analysis and display.

**Prerequisite:** BIOL 1407 and CHEM 3411.

**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. Offered during the spring semester. Stacked with BIOL 5439.

Cross-listed with BIMS 4439.

**Prerequisite:** BIOL 2401.

**BIOL 4442 Herpetology****4 Semester Credit Hours (4 Lecture Hours)**

Systematics, ecology, and behavior of amphibians and reptiles.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0091.

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

Systematics, distribution, and ecology of estuarine macrofauna and macroflora. Weekend field trips and individual study required.

**Prerequisite:** BIOL 3413.

**Co-requisite:** SMTE 0091.

**BIOL 4446 Tropical Ecosystems & Conservation****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Survey of the ecology and conservation issues of the major ecosystems in the tropics and field techniques used to study tropical forest ecology.

**Prerequisite:** BIOL 3428.

**Co-requisite:** SMTE 0091.

**BIOL 4452 Ecology and Evolution of Fishes****4 Semester Credit Hours (3 Lecture Hours, 4 Lab Hours)**

This course covers aspects of fish ecology from individual, population, community, and ecosystem levels. We discuss the role of the environment on fish physiology and behavior, food-web dynamics, community assembly and diversity, ecosystem interactions, and anthropogenic impacts on fishes with a focus on conservation.

**Prerequisite:** BIOL 4432.

**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.

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

Variable content. May be repeated for credit.

**BIOL 4598 Biology Internship****2-6 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, 3 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.

**Co-requisite:** SMTE 0091.

**Biomedical Sciences Courses****BIMS 2171 Medical Terminology****1 Semester Credit Hour (2 Lecture Hours)**

This course stresses familiarity with and facility in scientific terminology. Areas of focus include: an introduction to scientific terminology, word analysis, etymologies, spelling and pronunciation. Offered fall and spring semesters every year.

**Prerequisite:** (BIOL 1406 and 1407) or (BIOL 2401 and 2402).

**BIMS 2200 Professional Skills****2 Semester Credit Hours (2 Lecture Hours)**

Presentation and discussion of selected topics relating to the professional skills of practicing scientists including literature searches, reviews, paper presentation, professional opportunities and job requirements. Biomedical Sciences and Biology majors only.

**BIMS 3100 Essentials for Applied Forensics Laboratory Sciences****1 Semester Credit Hour (1 Lecture Hour)**

Introduction to general laboratory procedures related to the criminal investigation system and regulations (especially related to Texas), lab safety, quality assurance and quality control, professional ethics, specimen acquisition and maintenance and chain of custody.

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

**Co-requisite:** BIMS 3103, SMTE 0092.

**BIMS 3103 Essentials Laboratory for Forensic Science****1 Semester Credit Hour (1 Lab Hour)**

Application of essential practices for forensic science. Offered fall semester every year.

**Prerequisite:** BIMS 3200\*.

\* May be taken concurrently.

**Co-requisite:** SMTE 0092.

**BIMS 3200 Essentials for App Lab Science****2 Semester Credit Hours (1 Lecture Hour)**

ESSENTIALS FOR LAB SCIENCE Introduction to general laboratory procedures, laboratory safety and regulations, quality assurance, professional ethics, specimen acquisition, sample maintenance and microscopy. Includes an introduction to the health care, public health and criminal investigation system.

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

**Co-requisite:** SMTE 0092.

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

Examines the dietary requirements of both companion animals and livestock. Includes the anatomy, physiology and biochemistry of the gastrointestinal system, nutrient procurement and use, feed additives, growth stimulants, metabolic diseases, and diet therapy. Cross listed with BIOL 3300. Offered spring semester every year.

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

\* May be taken concurrently.

**BIMS 3301 Introduction to Animal Science****3 Semester Credit Hours (3 Lecture Hours)**

This course is an orientation into animal science as it relates to agriculture and veterinary medicine. Students will also be guided on issues to ensure successful veterinary school matriculation.

**BIMS 3320 Survey of Forensic Science****3 Semester Credit Hours (3 Lecture Hours)**

A survey of the methods and materials used to gather and process evidence at potential crime scenes. Students are introduced to the legal rules of evidence and their practical ramifications during scientific criminal investigations. In laboratory, students use commonly available processing items and tools to investigate a simulated crime scene. Offered fall semester every year.

**Co-requisite:** SMTE 0092.

**BIMS 3325 Professional Practice in Forensic Science****3 Semester Credit Hours (3 Lecture Hours)**

An introduction to industry standards and ethics for professional forensic scientists. This course analyzes cognitive processes, scientific methods and quality control/quality assurance issues in forensic investigations. It also stresses maintaining credibility in an adversarial legal system through the development of technical/scientific speaking and writing skills. Offered spring semester every year.

**Prerequisite:** BIMS 3320.

**BIMS 3401 Pathophysiology****4 Semester Credit Hours (4 Lecture Hours)**

This course is a study of the biological basis of human disease. It includes an investigation of inflammation, immunity, and neoplasia, as well as the more common presenting dysfunctions of body systems. Offered every fall. Offered fall semester every year.

**Prerequisite:** CHEM 1411 and BIOL 1407 or BIOL 2401.

**BIMS 3402 Introduction to Forensic Anthropology****4 Semester Credit Hours (3 Lecture Hours)**

This course introduces the student to the osteological examination of the human skeletal system as practiced by professional forensic anthropologists. It is designed to equip the student with introductory understanding of the anatomy and normal appearance of the human skeleton as well as some of its variations, including pathological conditions, traumatic injury, and postmortem damage.

**BIMS 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. Cross listed with BIOL 3403. Offered spring semester every year.

**Prerequisite:** BIOL 2416, 2421 and SMTE 0092\*.

\* May be taken concurrently.

**Co-requisite:** SMTE 0092.

**BIMS 4085 Major Field Test in Biology****0 Semester Credit Hours**

The Major Field Test (MFT) in Biology is a national examination given in the Fall and Spring semesters only. It is a graduation requirement for all Biology and some Biomedical Sciences students. Students enroll in this course during the semester that they plan to take the MFT. There is no cost to the student for either this course or for the MFT. Admission is limited to students who have completed 90 or more semester credit hours.

**BIMS 4111 Contemporary Scientific Readings****1 Semester Credit Hour (1 Lecture Hour)**

Students read one non-fiction book per month addressing some aspect of medicine, science or history (four books per semester), then meet once per month to discuss, analyze and defend their perceptions about the book. Only open to students accepted into the Partnership for Primary Care and the Joint Admissions Medical Program (JAMP), those who are seeking admission into JAMP by participating in the pre-JAMP and students in other sponsored programs. This course may be repeated once for full credit in subsequent semesters.

**BIMS 4170 Biomedical Seminar****1 Semester Credit Hour (1 Lecture Hour)**

A series of seminars on current topics of biomedical research. This course may be repeated once for full credit in subsequent semesters.

**Prerequisite:** BIOL 1407.

**BIMS 4295 Biomedical Practicum****2 Semester Credit Hours**

Supervised learning experience with a community professional in health care (e.g., physician, dentist, veterinarian, chiropractor, pharmacist, physician assistant or physical therapist). On-campus meetings, oral and written reports are required. (Cannot be taken by Clinical Laboratory Science students in lieu of CLSC 4297 - Professional Practicum I.) This course may be repeated once for full credit in subsequent semesters. Requires permission of instructor. Offered fall and spring semesters every year.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0092.

**BIMS 4296 Clinical Research****2 Semester Credit Hours**

Students will actively perform clinical research and learn from and interact with health care professionals such as physicians, nurses, physical therapists, pharmacists, etc. The student will be a functioning member of a research team with specific, measurable responsibilities in clinical studies.

**Prerequisite:** BIOL 1407.

**Co-requisite:** SMTE 0092.

**BIMS 4297 Professional Practicum I****2 Semester Credit Hours (2 Lecture Hours)**

PROFESSIONAL PRACTICUM I Supervised learning experience in selected departments of the clinical laboratories. Clinical Laboratory Science students only. Requires permission of instructor and application.

**BIMS 4299 Directed Independent Research****1-2 Semester Credit Hours (1-2 Lab Hours)**

Independent laboratory- or field-based research project on topic of current interest. Project developed and funded in conjunction with a faculty advisor. Written report required. May be repeated for a maximum of 4 semester credit hours. Offered any semester upon request by a student and consent of the instructor.

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

**Co-requisite:** SMTE 0092.

**BIMS 4311 Biology of Cancer****3 Semester Credit Hours (3 Lecture Hours)**

This course is a study of the profile of a cancer cell, and the various causes of human cancer. Contribution of heredity, environmental factors, and infectious agents to oncogenesis will be studied. Cancer screening, diagnosis, and treatment will be discussed. Various types of cancer will be presented. Offered fall semester of even-numbered years.

**Prerequisite:** BIOL 2416.

**BIMS 4323 Neurobiology****3 Semester Credit Hours (3 Lecture Hours)**

Studies the anatomy and physiology of the nervous system. Includes an examination of evolutionary trends in nervous system development, neural function, nerve impulse transmission, sensory and motor systems, behavior, emotional states, learning and memory. Particular emphasis is placed on human functioning. Offered spring semester every year.

**Prerequisite:** BIOL 2416.

**BIMS 4327 Introduction to Toxicology****3 Semester Credit Hours (3 Lecture Hours)**

Principles of toxicology including absorption and excretion, biotransformation, chemical carcinogenesis, developmental toxicology and toxic agents.

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

**BIMS 4330 Biological Basis of Aging****3 Semester Credit Hours (3 Lecture Hours)**

Molecular aspects of aging and disease, including biological mechanisms and theories involving cells, tissues, and organ systems.

**Prerequisite:** BIOL 1407 and CHEM 3411.

**BIMS 4333 Medical Entomology****3 Semester Credit Hours (3 Lecture Hours)**

An introduction to arthropods of medical and veterinary importance with particular emphasis on the critical roles that they play in their host group's health and well-being.

**Prerequisite:** BIOL 1407.

**BIMS 4334 Human Genetics****3 Semester Credit Hours (3 Lecture Hours)**

Introduction to the genetic aspects of health and disease. Classic Mendelian and chromosomal disorders are examined as well as the relationship of genetic predisposition to the healthy state and to diseases/conditions.

**Prerequisite:** BIOL 2416 and CHEM 3412.

**BIMS 4335 Endocrinology****3 Semester Credit Hours (3 Lecture Hours)**

Basic biochemical and molecular aspects of hormone physiology, basic endocrine function and hormone action, immune-endocrine interactions, and clinical examples of the outcomes of abnormal function in human disease.

**Prerequisite:** BIMS 2200, BIOL 2416 and CHEM 3412.

**BIMS 4340 Forensic Science in Criminal Law****3 Semester Credit Hours (3 Lecture Hours)**

Students will learn legal procedures, rules of evidence, and applications of forensic science in the area of criminal law. Students will also develop skills in report writing and testifying in court.

**Prerequisite:** BIMS 3320.

**BIMS 4341 Health Disparities****3 Semester Credit Hours (3 Lecture Hours)**

This course will examine the social/societal, physical/environmental, biological, and genetic/epigenetic factors that are fundamental in creating disparities in health in America. This course will also focus on the formulation and implementation of public policy objectives to reduce and ultimately eliminate health disparities. Students may not take both this course and BIMS 4350 Global Health Disparities for credit. Offered fall semester every year.

**Prerequisite:** BIOL 1407.

**BIMS 4350 Global Health Disparities****3 Semester Credit Hours (3 Lecture Hours)**

Provides students with an historical perspective on global health issues and leads to an understanding of current and future concerns. Emphasis is on the global burden of disease and determinants of health as well as health disparities. Provides students with an introduction to the study of health disparities in the United States, examining how health disparities are defined and measured and exploring issues such as how the structure of American society affects who gets sick and who gets care. Case studies expose students to a variety of real-life scenarios and explore a range of issues. This is an intensive writing course. This course is cross-listed with HCAD 4350. Students cannot take this course and BIMS 4331 Health Disparities in the US for credit.

**BIMS 4374 Medical Microbiology****3 Semester Credit Hours (3 Lecture Hours)**

Study of common human pathogenic organisms. Includes bacterial, parasitic, viral and fungal infections with emphasis on pathogenesis and treatment.

**Prerequisite:** BIOL 2421.

**BIMS 4375 Mechanisms of Microbial Pathogenesis****3 Semester Credit Hours (3 Lecture Hours)**

Studies of how microorganisms invade the host and produce pathological symptoms associated with diseases. Emphasis is on the interaction between various host cells and pathogens, especially molecular mechanisms of pathogenesis and host immune responses.

**Prerequisite:** BIOL 2421.

**BIMS 4395 Forensic Science Internship****3 Semester Credit Hours (3 Lecture Hours, 5 Lab Hours)**

This course is designed to bridge the gap between academic instructions and the forensic science industry by providing real world experience in forensic investigations. Students attend lectures on campus, plus spend five hours/week at a crime laboratory. Students will accompany crime scene investigators to actual crime scenes and participate in several hands on forensic exercises involving mock as well as real investigations. Some activities may result in students spending more than five hours of laboratory or practicum time.

**Prerequisite:** BIMS 3320.

**Co-requisite:** SMTE 0092.

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

Research in areas of current interest. Written report required.

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

**Co-requisite:** SMTE 0092.

**BIMS 4406 Immunology****4 Semester Credit Hours (4 Lecture 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. Cross listed with BIOL 4406.

**Prerequisite:** BIOL 2421.

**Co-requisite:** SMTE 0092.

**BIMS 4410 Histology****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The study of cells and tissues, especially the manner in which they are organized to form organs and systems. Laboratories involve intensive use of the microscope to identify cells, tissues and organs.

**Prerequisite:** BIOL 2402 or 3425.

**Co-requisite:** SMTE 0092.

**BIMS 4428 Medicolegal Death Investigations****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

This course is designed to provide an introduction to the essential procedures of forensic death investigation. Students are instructed in the process of investigating all aspects of a death case falling under the jurisdiction of medical examiners in Texas. The importance of scene management and documentation, case file management, review of physical and psychological evidence, autopsy procedures, and consultation with other forensic science experts leading to the correct classification of cause and manner of death are emphasized. Course may be repeated only once with permission of instructor.

**BIMS 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. Cross listed with BIMS 5439, BIOL 4439, and BIOL 5439.

**Prerequisite:** BIOL 2401.

**Co-requisite:** SMTE 0092.

**BIMS 4590 Selected Topics****1-5 Semester Credit Hours (1-5 Lecture Hours)**

Variable content. May be repeated for credit.

**Chemistry Courses****CHEM 1305 Introductory Chemistry****3 Semester Credit Hours (3 Lecture Hours)**

A one-semester principles course for students in non-science related majors covering the major concepts of chemistry (atomic structure, bonding, stoichiometry, elementary thermodynamics) and the role of chemistry in contemporary society (polymers, energy, pollution, etc.). Will not substitute for CHEM 1411.

**TCCNS:** CHEM 1305

**CHEM 1411 General Chemistry I****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The foundation course in chemistry. Stoichiometry, chemical equilibria, atomic structure, chemical bonding, periodic properties, thermodynamics, chemical kinetics, and descriptive chemistry of the elements. Laboratory involves development of basic skills. This course counts toward the natural science component of the University Core Curriculum. Either CHEM 1305 - Introductory Chemistry or CHEM 1411, but not both, may be applied towards the core requirement. This course is offered in Fall, Spring and typically during both Summer sessions .

**Co-requisite:** SMTE 0093.

**TCCNS:** CHEM 1411

**CHEM 1412 General Chemistry II****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The continuation of CHEM 1411 - General Chemistry I\*, the foundation course in chemistry with emphasis on quantitative aspects. Laboratory involves development of basic skills. This course counts toward the natural science component of the University Core Curriculum.

**Prerequisite:** CHEM 1411 and MATH 1314.

**Co-requisite:** SMTE 0093.

**TCCNS:** CHEM 1412

**CHEM 2490 Special Topics****4 Semester Credit Hours (1-4 Lecture Hours, 3 Lab Hours)**

May be repeated for credit. Subject materials variable. Offered on sufficient demand.

**CHEM 3411 Organic Chemistry I****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The structure, nomenclature, synthesis, reactions, and reaction mechanisms of the principal classes of organic compounds. Stereochemistry and spectroscopy of organic compounds. Laboratory involves separation and synthetic techniques and development of basic skills. This course is offered in Fall, Spring and typically during the Summer I session.

**Prerequisite:** CHEM 1411.

**Co-requisite:** SMTE 0093.

**CHEM 3412 Organic Chemistry II****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 3411 . The course concludes with a survey of the structures of biomolecules. Laboratory involves spectroscopy and qualitative analysis techniques. This course is offered in Fall, Spring and typically during the Summer II session.

**Prerequisite:** CHEM 3411.

**Co-requisite:** SMTE 0093.

**CHEM 3417 Quantitative Analysis****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A course in quantitative analysis, which includes chemical statistics and the use of acid-base, complexation, precipitation, and redox reactions to perform analyses and separations. Laboratory includes standard volumetric and gravimetric methods and development of basic quantitative techniques. This course is typically offered in Spring.

**Prerequisite:** CHEM 1412.

**Co-requisite:** SMTE 0093.

**CHEM 3418 Instrumental Analysis****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

An introduction to instrumental methods of analysis: spectroscopy, chromatography, and electrochemical methods. Laboratory involves use of instrumentation in chemical analysis. This course is typically offered in Fall and Spring.

**Prerequisite:** CHEM 1412.

**Co-requisite:** SMTE 0093.

**CHEM 4085 Major Field Test in Chemistry****0 Semester Credit Hours**

The Major Field Test (MFT) in Chemistry is a national examination given in the Fall and Spring semesters only. It is a graduation requirement for all Chemistry students. Students enroll in this course during the semester that they plan to take the MFT. There is no cost to the student for either this course or for the MFT.

**CHEM 4292 Senior Chemistry Seminar****2 Semester Credit Hours (2 Lecture Hours)**

Presentation and discussion of selected topics in chemistry. Includes literature searches and reviews, paper presentations, survey of professional opportunities and requirements, career guidance and job searching skills.

**CHEM 4309 Advanced Instrumental Analysis****3 Semester Credit Hours (3 Lecture Hours)**

An advanced course in analytical chemistry covering the underlying theories of instrumental methods. This course is typically offered on an irregular basis.

**Prerequisite:** (CHEM 3411, 3412 and 3418).

**CHEM 4320 Drugs, Toxins and Natural Products Chemistry****3 Semester Credit Hours (3 Lecture Hours)**

The chemistry and biological activity of pharmaceuticals, toxins and selected natural products. Examines how chemical structure relates to biological activity. Also examines action of antibiotics, chemotherapy agents, analgesics, steroids, and compounds targeting the central and peripheral nervous system. This course is typically offered in Fall and Spring.

**Prerequisite:** CHEM 4401.

**CHEM 4341 Advanced Organic Chemistry****3 Semester Credit Hours (3 Lecture Hours)**

This three-credit hour course will entail detailed description of structure, synthesis, and reactions and mechanisms in organic chemistry including important named reactions. This course will also introduce them to the art of writing reaction mechanisms and retrosynthetic analysis. Moreover, they will be learning about separation, purification and characterization of organic compounds followed by scientific abstract writing. Designed only for science major. There is NO laboratory associated with the course.

**Prerequisite:** CHEM 3412.

**CHEM 4344 Chemical Oceanography****3 Semester Credit Hours (3 Lecture Hours)**

The study of the oceans and seas as a chemical system, including interactions with both the biota and the solid earth. This course is typically offered in Spring.

**Prerequisite:** CHEM 1412.

**CHEM 4350 Polymer Chemistry****3 Semester Credit Hours (3 Lecture Hours)**

An advanced lecture course in organic chemistry. Characterization of polymers. Polymerization mechanisms. Current research directions such as biomedical applications and electroactive polymers. This course is offered on an irregular basis.

**Prerequisite:** CHEM 3412.

**CHEM 4360 Molecular Spectroscopy****3 Semester Credit Hours (3 Lecture Hours)**

Spectroscopy and Structure of Organic Compounds is a three-credit that introduce you to concepts used in the identification of organic compounds with methods based on NMR, mass spectrometry, UV and IR.

**Prerequisite:** CHEM 3412.

**CHEM 4401 Biochemistry I****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The structure and function of carbohydrates, lipids, proteins, and nucleic acids. An introduction to enzyme kinetics, cell membrane structure and biochemical signaling. Laboratory exercises demonstrate the basic principles and techniques used in Biochemistry. This course is typically offered in Fall, Spring and Summer.

**Prerequisite:** CHEM 3412 and (BIOL 1406 and 1407).

**Co-requisite:** SMTE 0093.

**CHEM 4402 Biochemistry II****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 4401. Biochemical energetics, including glycolysis, fatty acid oxidation, amino acid oxidation, citric acid cycle, oxidative phosphorylation, photophosphorylation and photosynthesis. Carbohydrate, fatty acid and amino acid biosynthesis. Laboratory is a continuation of biochemical techniques. This course is typically offered in Fall and Spring.

**Prerequisite:** CHEM 4401.

**Co-requisite:** SMTE 0093.

**CHEM 4407 Advanced Inorganic Chemistry****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A survey of inorganic chemistry. Theories of atomic structure, covalent bonding, ionic solids, metallic solids, and coordination compounds. Modern acid-base concepts. Laboratory involves the synthesis of inorganic compounds.

**Prerequisite:** CHEM 3412.

**Co-requisite:** SMTE 0093.

**CHEM 4420 Physical Biochemistry****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A fundamental approach to the study of physical and chemical phenomena, including the study of thermodynamics, gases and phase equilibria. This course is typically offered on an irregular basis.

**Prerequisite:** CHEM 1412 and (PHYS 1402 or 2426) and MATH 2414.

**Co-requisite:** SMTE 0093.

**CHEM 4423 Physical Chemistry I****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A fundamental approach to the study of physical and chemical phenomena, including the study of thermodynamics, gases and phase equilibria. This course is typically offered in Fall.

**Prerequisite:** CHEM 1412 and (PHYS 1402 or 2426) and MATH 2414.

**Co-requisite:** SMTE 0093.

**CHEM 4424 Physical Chemistry II****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 4423, including the study of chemical kinetics, electrochemistry, molecular structure, and quantum mechanics. This course is typically offered in Spring.

**Prerequisite:** CHEM 4423.

**Co-requisite:** SMTE 0093.

**CHEM 4443 Environmental Chemistry****4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A study of the impact of chemistry on the environment, including topics of air pollution, water pollution, and beneficial chemical modifications of the environment. Laboratory devoted to field techniques of sampling, sample preservation, and analytical techniques applied to the environment. This course is typically offered in Spring.

**Prerequisite:** CHEM 1412 and 3411.

**Co-requisite:** SMTE 0093.

**CHEM 4490 Special Topics****4 Semester Credit Hours (1 Lecture Hour, 1 Lab Hour)**

May be repeated for credit. Subject materials variable.

**CHEM 4696 Directed Independent Study****1-6 Semester Credit Hours**

Requires a formal proposal of study to be completed in advance of registration, to be approved by the supervising faculty, the chairperson and the dean of the College.