

# BIOLOGY

## Academic Year

2012-2013

## School

School of Science, Engineering and Technology [School Web site](#)

## School Dean

Winston F. Erevelles, Ph.D. [werevelles@stmarytx.edu](mailto:werevelles@stmarytx.edu)

## Department

Biological Sciences

## Department Chair

Timothy Raabe, Ph.D. [traabe@stmarytx.edu](mailto:traabe@stmarytx.edu)

## Description of Program/Major

Students who aspire to the health professions pursue a curriculum devoted almost exclusively to the natural sciences in search of technical expertise. The programs in the Department of Biological Sciences lead to the B.A. or B.S. degree and prepare students for employment or additional studies in professional or graduate school. Students earning a B.A. or B.S. degree also earn a minor in chemistry. The B.S. in Forensic Science (Biology Option) is a rigorous major covering both the science and law aspects of this prominently expanding scientific field. Students completing this degree will be adequately prepared to obtain employment at a Forensic Crime laboratory, to pursue graduate studies in a number of specialties within the field, or to enter a variety of professional schools. The B.A. degree with teacher certification satisfies the requirements for teacher certification by the Texas State Board for Educator Certification.

The study of biological sciences at St. Mary's University includes a broad-based curriculum and extensive scientific training designed to prepare well-rounded health care professionals. Students develop written and oral communication skills, critical thinking and analytical skills, and an understanding and respect for ethical and moral concerns. The first two years of the program are a common set of courses in general biology followed by genetic principles and cell biology. Following completion of the first two years of study, students enroll in a total of four advanced biology electives which can include anatomy, general physiology, microbiology, transmission genetics, comparative anatomy, neurophysiology, comparative physiology, genes & genomes, developmental biology, immunology, medical microbiology or molecular biology. The final year includes a two-semester biochemistry course. All of the biology courses required for the major have a laboratory component that are meant to develop hands-on learning experiences.

Because our students display competence, dedication and compassion, they are readily accepted into graduate programs, the health professions, biomedical research and teaching fields. The program in biological sciences is built upon a rigorous study of biology and includes courses in chemistry, physics

# BIOLOGY

and mathematics that satisfy professional school entrance requirements.

## Health Profession Partnerships

### Dental Early Admission Program (DEAP)

St. Mary's University Department of Biological Sciences has partnered with the University of Texas Health Science Center at San Antonio (UTHSCSA) Dental School to offer a 3+4 program known as the Dental Early Acceptance Program, or DEAP. The DEAP program allows St. Mary's students pursuing dentistry to gain early acceptance into the UTHSCSA Dental School and spend only 3 years at St. Mary's in pursuit of a bachelor's degree.

Students accepted into the DEAP program will follow a 3 year degree plan at St. Mary's which fulfills the prerequisite coursework for the UTHSCSA Dental School as well as degree requirements for a BA in Combined Sciences from St. Mary's. After completing the 3 year degree plan, the student will matriculate into the UTHSCSA Dental School. The BA in Combined Sciences degree will be awarded by St. Mary's after the student successfully completes the 1st year of coursework at the Dental School. The student will earn a Doctor of Dental Science (DDS) degree from the UTHSCSA Dental School after completing the required coursework at the Dental School.

The DEAP is intended for first-time freshmen at St. Mary's who are serious about pursuing dentistry. To be eligible for the DEAP program, the student must:

1. Be a first-time freshman at St. Mary's who has earned at least 12 semester credit hours but not more than 30 semester credit hours at St. Mary's; and
2. Earn at least a 3.4 GPA at St. Mary's.

Applications and supporting documents for the DEAP are submitted through the Pre-Health Professions office at St. Mary's. To apply for the program, the student must complete and submit the following by March 1st of the freshman year:

1. The DEAP application;
2. Official college/university transcripts;
3. Personal statement;
4. Letter of recommendation for the DEAP from the Pre-Health Professions Advisor or the Pre-Dental faculty advisor at St. Mary's.

Although volunteer and shadow hours are not REQUIRED for acceptance into the DEAP program, it is strongly RECOMMENDED that the student engage in these experiences to strengthen his/her application and increase his/her understanding of the field of dentistry.

If accepted into the DEAP program, the student must:

1. Complete the remaining prerequisite courses for dental school;
2. Maintain an overall GPA and science GPA of at least 3.4;

# BIOLOGY

3. Take the DAT exam during the junior year and achieve a minimum score of 18; and
4. Satisfy all requirements of the Texas Medical and Dental Schools Application Service (TMDSAS) application process including a letter of recommendation from the Health Professions Advisory Committee at St. Mary's.

## Facilitated Admissions for South Texas Scholars (FASTS)

St. Mary's University Department of Biological Sciences has partnered with the University of Texas Health Science Center at San Antonio (UTHSCSA) School of Medicine to offer a facilitated admission program into the UTHSCSA School of Medicine. The Facilitated Admissions for South Texas Scholars (FASTS) program allows St. Mary's students pursuing medicine to gain early acceptance into the UTHSCSA School of Medicine and take part in a rigorous summer premedical academy to better prepare them for the MCAT exam and success in medical school.

The FASTS program is intended for first-time freshmen at St. Mary's who are serious about pursuing medicine. To be eligible for the FASTS program, the student must:

1. Be a United States citizen or a permanent resident AND a Texas resident; and
2. Possess the academic abilities and personal qualities that predict success as a medical student and physician.

### Academic Factors:

1. Though there is not a GPA requirement to be eligible to apply for FASTS, competitive applicants will have a St. Mary's GPA of 3.25 or higher.
2. Competitive applicants will have taken both General Biology I and General Chemistry I during their first semester at St. Mary's.
3. High school overall GPA and science GPA will be considered, as well as SAT & ACT scores.

### Personal Factors:

1. Students are encouraged to engage in clinical experiences during high school and the first semester at St. Mary's. These experiences allow the student to gain exposure to the medical field and increase knowledge of clinical procedures and current issues relevant to the industry.
2. Students are encouraged to participate in community service during high school and the first semester at St. Mary's. These experiences demonstrate a commitment to improving the community and a passion for helping those in need - characteristics a good physician will possess.
3. Students should build relationships with faculty members during the first semester at St. Mary's. Science faculty members nominate students for the FASTS program and write letters of recommendation for applicants.
4. Students should take advantage of the services offered at St. Mary's Career Services Center to sharpen their interview skills, and polish their resume and personal statement.

# BIOLOGY

Applications and supporting documents for the FASTS program are submitted through the Pre-Health Professions office at St. Mary's. To apply for the program, the student must complete and submit the following by February 1st of the freshman year:

1. The FASTS program application
2. Official high school transcript & SAT/ACT scores
3. Official college/university transcripts
4. Personal statement
5. Resume
6. Two letters of recommendation  
(details of the personal statement and letters of recommendation are outlined in the program application)

If accepted into the FASTS program, there are conditions the student must meet to remain in the program and be eligible for acceptance into the UTHSCSA medical school:

1. The student must complete a bachelor's degree program at St. Mary's with an overall GPA and science GPA of 3.25 or above. AP coursework will NOT be considered fulfillment of science requirements.
2. In the spring of their junior year, qualified participants who meet the premedical coursework requirements will take the MCAT and those who obtain a ratio of science GPA/MCAT scores of 3.25/28, 3.5/26 or 3.75/24 or better will be eligible for acceptance to medical school following an interview by the admissions committee. In addition, participants cannot have a score of less than 7 on any sub-section of the MCAT.
3. Participants must satisfy all requirements of the Texas Medical and Dental Schools Application Service (TMDSAS) application process including a letter of recommendation from the Health Professions Advisory Committee at St. Mary's, have record of ethical behavior while a pre-medical student, and demonstrate a continuing commitment to study medicine.

## [Joint Admission Medical Program \(JAMP\)](#)

The Joint Admission Medical Program (JAMP) is a special program created by the Texas Legislature to support and encourage highly qualified, economically disadvantaged Texas resident students pursuing a medical education. Funded through the Texas Higher Education Coordinating Board, JAMP is a unique partnership between all eight Texas medical schools and sixty-five public and private four-year undergraduate institutions. St. Mary's is one such private institution. Students accepted into JAMP are assured admission into one of the eight medical schools in Texas provided they meet requirements of the program while completing their undergraduate education. JAMP students also participate in two rigorous summer internships provided by JAMP to prepare for the MCAT exam and success in medical school.

JAMP is intended for students who are serious about pursuing medicine. To be eligible for JAMP, the student must:

# BIOLOGY

1. Be a Texas resident;
2. Enter St. Mary's no later than the first fall semester after graduating high school;
3. Complete 27 semester credit hours during the freshman year at St. Mary's (only 3 of which may be AP hours);
4. Have the ability to participate in two summer internships provided by JAMP;
5. Achieve an overall GPA and science GPA of 3.25 at St. Mary's; and
6. Be Pell grant eligible or have an Estimated Family Contribution (EFC) of up to \$8000 (calculated from the Free Application for Federal Student Aid (FAFSA)).

Students interested in JAMP are encouraged to:

1. Engage in clinical experiences during high school and the freshman year at St. Mary's. These experiences allow the student to gain exposure to the medical field and increase knowledge of clinical procedures and current issues relevant to the industry.
2. Participate in community service during high school and the freshman year at St. Mary's. These experiences demonstrate a commitment to improving the community and a passion for helping those in need - characteristics a good physician will possess.
3. Build relationships with faculty members during the freshman year at St. Mary's. Science faculty members write letters of recommendation for applicants.
4. Take advantage of the services offered at St. Mary's Career Services Center to sharpen their interview skills, and polish their resume and personal statement.

Applications and supporting documents for JAMP are submitted through the Pre-Health Professions office at St. Mary's. To apply for the program, the student must complete and submit the following by October 15th of the sophomore year:

1. The JAMP application (completed online on the JAMP website)
2. Student Aid Report (SAR) (obtained from the FAFSA application)
3. Official high school transcript & SAT/ACT scores
4. Official college/university transcripts
5. Personal statement (uploaded with the JAMP application on the JAMP website)
6. Resume (uploaded with the JAMP application on the JAMP website)
7. Two letters of recommendation accompanied by JAMP Evaluation forms (one from St. Mary's JAMP Faculty Director and one from a St. Mary's faculty)

If accepted into JAMP, there are conditions the student must meet to remain in the program and be eligible for acceptance into a Texas medical school. JAMP Students must:

1. Complete a bachelor's degree program at St. Mary's with an overall GPA and science GPA of 3.25 or above. All medical school prerequisite coursework must be completed at St. Mary's;
2. Take the MCAT exam no later than the Spring semester of the junior year and achieve an overall score of 23 with no sections less than 7;
3. Successfully complete the JAMP summer internships after the sophomore year and junior year;
4. Receive satisfactory evaluations from faculty overseeing summer internships at medical schools;
5. Meet with the JAMP Faculty Director at least once per month each academic year;
6. Provide updated transcripts of college coursework and grades each semester to the St. Mary's JAMP

# BIOLOGY

Faculty Director; and

7. Satisfy all requirements of the Texas Medical and Dental Schools Application Service (TMDSAS) application process including a letter of recommendation from the Health Professions Advisory Committee at St. Mary's, and submit all application materials by July 1st after the junior year.

## **Health Professions Early Acceptance Program (HEAP)**

St. Mary's University Department of Biological Sciences has partnered with the University of Texas Health Science Center at San Antonio (UTHSCSA) School of Health Professions to offer the Health Professions Early Acceptance Program (HEAP) for Physical Therapy, Occupational Therapy, and Physician Assistant Studies. The HEAP allows St. Mary's students pursuing physical therapy, occupational therapy, or physician assistant studies to gain early acceptance into the UTHSCSA School of Health Professions and spend only 3 years at St. Mary's in pursuit of a bachelor's degree.

Students accepted into the HEAP will follow a 3 year degree plan at St. Mary's which fulfills the prerequisite coursework for the health professions program of their choice at UTHSCSA as well as degree requirements for a BA in Combined Sciences from St. Mary's. After completing the 3 year degree plan, the student will matriculate into the UTHSCSA School of Health Professions. The BA in Combined Sciences degree will be awarded by St. Mary's after the student successfully completes the 1st year of coursework in the health professions program at UTHSCSA. The student will earn a professional degree from the UTHSCSA School of Health Professions after completing the required coursework in the health professions program.

The HEAP is intended for first-time freshmen at St. Mary's who are serious about pursuing physical therapy, occupational therapy, or physician assistant studies. Students interested in the HEAP will undergo a review process at St. Mary's after the freshman year which will determine eligibility to apply for the HEAP. To be eligible, the student must:

1. Be a first-time freshman at St. Mary's who has earned at least 26 semester credit hours (but not more than 60), including at least 14 hours in science and math, at St. Mary's;
2. Earn at least a 3.25 GPA at St. Mary's; and
3. Accrue at least 20 hours working, volunteering, shadowing, or observing in a corresponding clinical setting (hours collected during high school are acceptable).

Applications and supporting documents for the HEAP are submitted through the Pre-Health Professions office at St. Mary's. To apply for the program, the student must complete and submit the following by September 1st of the sophomore year:

1. The HEAP application
2. Copies of college/university transcripts
3. Personal statement
4. Resume
5. Two letters of recommendation

# BIOLOGY

(details of the personal statement, resume, and letters of recommendation are outlined in the program application)

If accepted into the HEAP, the student must:

1. Complete the remaining prerequisite courses required by the health professions program;
2. Maintain the GPA required by the health professions program (usually at least a 3.25 or above);
3. Complete any additional requirements for the health professions program such as volunteering or shadowing;
4. Pass a criminal background check that is required of all students in the UTHSCSA School of Health Professions; and
5. Submit an official UTHSCSA application and official college or university transcripts along with an application fee to UTHSCSA prior to matriculating into the health professions program.

## Nursing Early Acceptance Program (NEAP)

St. Mary's University Department of Biological Sciences has partnered with the University of Texas Health Science Center at San Antonio (UTHSCSA) School of Nursing to offer the Nursing Early Acceptance Program (NEAP). The NEAP program is a dual degree program which allows St. Mary's students to gain early acceptance into the UTHSCSA School of Nursing and spend only 3 years at St. Mary's in pursuit of a bachelor's degree.

Students accepted into the NEAP will follow a 3 year degree plan at St. Mary's which fulfills the prerequisite coursework for nursing at UTHSCSA as well as degree requirements for a BA in Combined Sciences from St. Mary's. After completing the 3 year degree plan, the student will matriculate into the UTHSCSA School of Nursing. The BA Combined Sciences degree will be awarded by St. Mary's after the student successfully completes the 1st year of coursework in the nursing program at UTHSCSA. The student will earn a Bachelor of Science in Nursing (BSN) degree from the UTHSCSA School of Nursing after completing the required coursework in the nursing program.

The NEAP is intended for first-time freshmen at St. Mary's who are serious about pursuing nursing. Students interested in the NEAP will undergo a review process at St. Mary's after the freshman year which will determine eligibility to apply for the NEAP. To be eligible, the student must:

1. Be a first-time freshman at St. Mary's who has earned at least 26 semester credit hours (but not more than 60), including at least 14 hours in science and math, at St. Mary's;
2. Earn at least a 3.5 science GPA and a 3.3 overall GPA at St. Mary's; and
3. Demonstrate, in a written personal statement, an understanding of the nursing profession and a desire to pursue the field.

Applications and supporting documents for the NEAP are submitted through the Pre-Health Professions office at St. Mary's. To apply for the program, the student must complete and submit the following by September 1st of the sophomore year:

# BIOLOGY

1. The NEAP application
2. Copies of college/university transcripts
3. Personal statement
4. Resume
5. Two letters of recommendation  
(details of the personal statement, resume, and letters of recommendation are outlined in the program application)

If accepted into the NEAP, the student must:

1. Complete the remaining prerequisite courses required by the UTHSCSA School of Nursing;
2. Maintain a 3.5 science GPA and a 3.3 overall GPA;
3. Achieve a passing score (70%) on the TEAS V standardized exam;
4. Be up-to-date on all immunizations including all Hep A&B series prior to matriculating into the School of Nursing;
5. Receive CPR certification;
6. Submit an official UTHSCSA School of Nursing application and official college or university transcripts along with an application fee during the junior year prior to matriculating into the School of Nursing; and
7. Pass a criminal background check prior to matriculating into the School of Nursing.

## Degree Requirements

### Core Curriculum (SMC)

#### St. Mary's University Core (30 Hours)

*All St. Mary's Core SMC13## "Reflection" courses must be completed before registering for SMC23## "Practice" courses. "Reflection" courses can be taken in any order followed by "Practice" courses in any order.*

SMC 1301	Foundations of Civilization	3
SMC 1311	Foundations of Reflection: Self (Formerly PL 1310)	3
SMC 1312	Foundations of Reflection: Nature	3
SMC 1313	Foundations of Reflection: Others	3
SMC 1314	Foundations of Reflection: God (Formerly TH 2301)	3
SMC 2301	Foundations of Practice: Ethics (Formerly PL 2332)	3
SMC 2302	Foundations of Practice: Civic Engagement and Social Action	3
SMC 2303	Foundations of Practice: Fine Arts and Creative Process (Formerly FA 1101, FA 1102, FA 1103)	3
SMC 2304	Foundations of Practice: Literature	3
SMC 4301	Capstone Seminar: Prospects for Community and Civilization	3



# BIOLOGY

## School Specific Core (SSC)

### School of Science, Engineering, and Technology Specific Core (21 Hours)

Speech	SE 1321 (for international students), SE 1341, SE 2333, SE 3391	3
Composition and Rhetoric (grade of "C" or better)	EN 1311, EN 1313 (for international students)	3
Foreign Languages	Six hours at the sophomore level (2311, 2312) in a Foreign Language previously studied for a minimum of one year; Or, 6 hours of introductory level (1311, 1312) in a Foreign Language not previously studied; Or, 12 hours of CLEP credit for a language previously studied.	6
Social Science	BA 1310, BA 3325, CJ 2300, CJ 3300, EC 2301, EC 2303, PO 1311, PO 1312, PO 1314, PS 1301, PS 3386, SC/CR 1311, SC 3321, HU 3300, HU 3303	3
Theology	Advanced Theology 33XX	3
Fine Arts	AR, DM, MU or Literature: EN 2321, 2322, 2353, 2354, 2355, 2356	3

## Four Year Degree Plan

[Sample 4-year degree plan, Biology \(BA\)](#)

[Sample 4-year degree plan, Biology \(BA\) with Teacher Certification](#)

[Sample 4-year degree plan, Biology \(BS\)](#)

## Department Courses and Descriptions

### General Biology for Non-Majors (3)

BL 1301/2

Designed for non-biology majors to fulfill natural science requirement. Cannot be applied to Biology major or minor requirement. An introduction to the science of biology providing general principles, organization and diversity of life, maintenance and perpetuation of life forms, and interrelationships between living things. Emphasis on human concerns. No prerequisite for BL 1301 or 1302. (Lecture 2 hours, Lab 3 hours.)

### General Biology for Majors I (4)

BL 1401W

First part of a comprehensive and rigorous two semester introduction to modern biological science, providing the foundation for the biology major. Unifying principles, the cell, organization and diversity of life, evolution, ecology, molecular biology, metabolism, general physiology, reproduction, and development. Successful completion required for enrollment in BL 1402. (Lecture 3 hours, Lab 4 hours.)

### General Biology for Majors II (4)

BL 1402W

Second part of a comprehensive and rigorous two semester introduction to modern biological science,

# BIOLOGY

providing the foundation for the biology major. Unifying principles, the cell, organization and diversity of life, evolution, ecology, molecular biology, metabolism, general physiology, reproduction, and development. Successful completion required for enrollment in BL 2330, BL 2332, and BL 2233L.

Prerequisite: BL 1401. (Lecture 3 hours, Lab 4 hours.)

## **Cell & Molecular Methods (2)**

BL 2233

Laboratory projects emphasize experimental approaches to cellular and molecular biology, including growth of bacteria and animal cells, analysis and purification of DNA and protein, light and fluorescence microscopy, digital video microscopy and quantitative image analysis. Other topics include DNA and protein database searches, conducting scientific literature searches and generating hypotheses for original research and scientific report writing. Prerequisites: Concurrent registration in BL 2330 or 2332. (Lab 4 hours)

## **Genetic Principles (3)**

BL 2330

Integrates classic Mendelian principles into a modern molecular genetic perspective. The chromosomal basis of inheritance, gene linkage, chromosome recombination and mapping, DNA structure and function, the genetic code, mutation, gene regulation, transcription, protein synthesis, bacterial and viral genetics, and the methods and uses of genetic engineering in studying genes, are some of the topics developed through a problem-solving approach. Includes one problem-solving session each week. Prerequisites: BL 1401, BL 1402, CH 1401, & CH 1402. (Lecture 3 hours)

## **Cell Biology (3)**

BL 2332

A study of the organization, function, and assembly of eukaryotic cell components, including proteins, membranes, membranous organelles and nuclear organization. Other topics emphasized will be control of gene expression and transcription, protein synthesis, metabolism, endocytosis, signal transduction, cytoskeletal dynamics, cell motility, the cell cycle and apoptosis. Prerequisites: BL 1401, BL 1402, CH 1401, & CH 1402. (Lecture 3 hours; problem-solving session 1 hour)

## **MCAT Preparation (0)**

BL 3000

In a partnership with Kaplan, this course will assist students in their preparation for the entrance exam required by medical schools. The Kaplan MCAT Course begins with a comprehensive work-up that includes a Personal Profile and two Diagnostic Tests. This information is utilized to provide comprehensive feedback that will not only identify the student's academic strengths and weaknesses, but also prescribe a study regimen that is tailored to build up the student's knowledge in weak subject areas, reinforce his knowledge in stronger areas and develop the higher order analytical thinking and problem solving skills necessary for success on the MCAT test.

## **Seminars in Biological Science (1)**

BL 3125

A series of weekly seminars on current research topics in Biological Sciences. Invited speakers are drawn from the scientific research community in San Antonio and across the nation. Students write a review article on a current biomedical research topic. Cannot be used to fulfill Biology minor or major

# BIOLOGY

requirements. Prerequisites: BL 2330, BL 2332, & BL 2233L or permission of the MARC Program Director.

## **Scientific Methodol & Analysis (1)**

BL 3130W

The student is introduced to the processes of analyzing and interpreting scientific literature. Course objectives are: 1) to increase the ability to analyze and interpret scientific articles; 2) to effectively use scientific journals; 3) to improve technical writing skills; 4) to understand various research methods; 4) to improve data analysis; 5) to develop and analyze hypotheses. Topics vary with the semester. Cannot be used to fulfill Biology minor or major requirements. Prerequisites: BL 2330, BL 2332, & BL 2233L or permission of MARC Program Director.

## **Medical Terminology (1)**

BL 3141

A course to teach an understanding of the specialized language of medicine designed for forensics majors and as an elective for future health care professionals. Topics to be covered will include the Latin and Greek origins of modern medical terms, acquisition of a vocabulary of root words and standard prefixes and suffixes, terms of pathophysiology, and development of an understanding of the traditional system of descriptive terms and eponyms. Students will learn to translate medical jargon to plain English and also to convert standard speech to appropriate medical vocabulary. Prerequisites: BL 1401 & 1402 (Lecture 1 hour)

## **Food & Nutrition I (3)**

BL 3311

Designed for non-biology majors, to fulfill the natural science requirement. Cannot be applied to Biology major or minor requirement. Principles of digestion, absorption, and energy; metabolism of essential nutrients and their sources, requirements and functions in human nutrition. Food selection to meet family needs, clinical point of view on nutritional deficiency and related problems. No prerequisite for BL 3311. BL 3311 is prerequisite for BL 3312. (Lecture 3 hours.)

## **Food & Nutrition II (3)**

BL 3312

Designed for non-biology majors, to fulfill the natural science requirement. Cannot be applied to Biology major or minor requirement. Principles of digestion, absorption, and energy; metabolism of essential nutrients and their sources, requirements and functions in human nutrition. Food selection to meet family needs, clinical point of view on nutritional deficiency and related problems. Prerequisite: BL 3311 (Lecture 3 hours).

## **Special Topics in Biology (4)**

BL 3400

Topics vary from semester to semester. May be retaken for additional credit when a different topic is offered. Prerequisites: BL 2330, BL 2332, & BL 2233L (Lecture 3 hours; Lab 4 hours.)

## **Anatomy (4)**

BL 3420W

Fundamentals of mammalian structure and form, illustrated by organ systems. Prerequisites: BL 2330, BL

# BIOLOGY

2332, & BL 2233L. (Lecture 3 hours, Lab 4 hours.)

## **Embryology (4)**

BL 3422

Fundamentals of vertebrate embryological development with emphasis on mammalian and especially human development. This course also includes selected topics in human teratology. Prerequisites: BL 2330, BL 2332, & BL 2233. (Lecture 3 hours, Lab 4 hours.)

## **Comparative Anatomy (4)**

BL 3424

A comparative survey of the anatomy of vertebrates in an evolutionary context. All of the major anatomical systems are examined including the skeletal, muscular, circulatory, respiratory, digestive, neurological, and urogenital systems. A large component of this course is the laboratory section, which is dissection-intensive. Additional lecture topics covered include evolution, phylogenetic systematics, and evolutionary development (evo-devo). Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **General Physiology (4)**

BL 3430W

A study of the fundamental mechanisms which regulate the bodies of all animals. The study includes the normal functions of organs and systems, such as transport, respiratory, digestive, excretory, neural, reproductive and hormonal systems. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Endocrinology (4)**

BL 3432W

A study of the physiological mechanisms of endocrine function. Topics to be covered will include the molecular structure of hormones, cellular mechanisms of production and response to hormones, neuroendocrinology, and the coordination of bodily function via endocrine factors. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Comparative Physiology (4)**

BL 3434W

Study of the evolution and adaptation of physiological systems in all types of animals including vertebrates and invertebrates. Topics will include physiological processes such as: digestion, metabolism, thermoregulation, locomotion, circulation, osmoregulation, excretion, reproduction, and sensory systems. Emphasis will be placed upon the comparative aspects of physiological systems and upon physiological ecology (the study of physiological adaptations to specific environments) and evolutionary physiology (the study of how physiological traits change over time). This is a writing intensive course. Laboratory experiments will regularly involve live animals and are designed to develop critical research skills including, experimental design, biostatistics, graphical analyses, critical-thinking, and effective oral/written communication. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours, Lab 4 hours)

## **Neurophysiology (4)**

BL 3436

# BIOLOGY

This course will investigate the functioning of the nervous system at the cellular and subcellular level. Topics to be discussed in lecture include: glial cell function; ionic mechanisms underlying electrical activity in nerve cells; the physiology of synapses; transduction and integration of sensory information; the analysis of nerve circuits; the specification of neuronal connections; trophic and plastic properties of nerve cells; and the relation of neuronal activity to behavior. The laboratory will incorporate modern neurobiological/neurophysiological techniques including: extracellular recording of action potentials; cell culture of nervous tissue; SDS- PAGE; immunoblotting; immunofluorescence microscopy; and cryo sectioning and staining of nervous tissue. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Toxicology (4)**

BL 3440

This course will examine the general principles underlying the effects of toxic substances on biological systems, including consideration of the history, scope and applications of toxicology, toxicant exposure, the mechanisms of toxic action, the disposition of toxicants, the mechanisms of biotransformation of xenobiotics, toxicokinetics and major types of toxicants. In addition, the effects of toxicants on specific organ systems and the underlying mechanisms will be examined. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Forensic Osteology (4)**

BL 3442

An examination of the human skeleton as it pertains to forensic science. Topics to be covered include introductory skeletal anatomy, pathology and biology of bone, and basic forensic techniques related to skeletal remains. The laboratory section will teach identification of isolated and fragmentary skeletal elements, and recognition of human skeletal elements versus skeletal remains from non-human vertebrates. Techniques for determining approximate age, gender, stature, and identifying different types of trauma to skeletal remains will be taught. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Histology (4)**

BL 3444

This course follows a cellular and differentiative approach aimed at understanding the microstructure and function of various animal tissues, organs and systems. Lectures are complemented by laboratory exercises and laboratory discussion designed to provide students with the skills necessary to study and analyze and correctly identify cells and tissues. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Adv. Nutrition & Metabolism (4)**

BL 3450

This course emphasizes a biochemical and clinical approach to studying nutrient utilization. It is designed to foster quantitative and critical thinking skills by developing an understanding of biochemical pathways; conditions and diseases that result from abnormalities in these pathways; and applications of nutrition knowledge in preventative medicine. Alternative and integrative approaches to disease prevention also are included. Prerequisites: BL 2330, BL 2332, & BL 2233.

## **Transmission Genetics (4)**

# BIOLOGY

BL 3461W

Fundamental principles of Mendelian genetics. Emphasis on genetics research and problem-solving.

Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Evolutionary Biology (4)**

BL 3464W

Evolution is foundational to modern biological thought. Students will begin by examining physical, geological and biological evidence for the process of evolution and the historical foundations of evolutionary theory. They will continue to develop their understanding of the mechanisms of evolution using population genetics as a means to objectively observe evolutionary change. Students will then explore topics such as speciation, mass extinction, adaptive radiation, molecular evolution, systematics, disease, conservation biology and evo- devo. The laboratory will include hands-on experimental activities, computer simulations and discussion of primary literature. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Immunology (4)**

BL 3472

The course will provide students with a strong foundation in the theory and techniques of modern immunology. The main emphasis of the course will be the role of the human immune system in defense against microbial pathogens. Some of the areas to be studied in-depth include innate immunity, cellular interactions in the immune responses, antigen capture and presentation, antibodies and humoral immunity, cell mediated immunity, self and non-self discrimination, immunization and immune disorders. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Microbiology (4)**

BL 3481

Students should obtain a strong understanding of modern microbiology and the techniques used to identify and safely study microorganisms (primarily bacteria). Some of the areas to be studied include the history of microbiology, structure and function of prokaryotic and eukaryotic microbes, evolution and taxonomy of microbes, metabolism, microbial growth and factors controlling growth, microbial genetics, and immunology. Other topics include the central role microbes play in human health, biotechnology and Earth's ecology. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Developmental Biology (4)**

BL 3490W

Building a multicellular organism from a single, genetically unique cell involves reading and interpreting the genetic "blueprint" as well as the coordination of many complex events. Students will study the mechanisms that underlie the processes of fertilization, pattern formation, morphogenesis, organogenesis and cellular differentiation at the molecular, cellular and organismal levels, with a particular emphasis on animals. The evolution of these developmental mechanisms will be discussed and will serve as a unifying theme in the course. The experimental basis for current models of development will be highlighted in both the lecture and laboratory experiences. The weekly laboratory will incorporate both descriptive and experimental techniques, as well as discussion of primary literature. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Molecular Biology (4)**

# BIOLOGY

BL 3495W

Molecular Genetics of Prokaryotes. Topics can include: structure of the macro molecules protein and DNA, replication of DNA , protein synthesis (transcription and translation), gene pair, mutagenesis, regulation of geneaction, bacteriophages, plasmids, transposable elements, recombinant DNA techniques and genetic engineering. Emphasis on problem solving and research. Prerequisites: BL 2330, BL 2332, BL 2233L, CH 3411 and completion of or concurrent registration in CH3412. (Lecture 3 hours; Lab 4 hours.)

## **Mechanisms of Disease (4)**

BL 4440W

This course will examine the biochemical, molecular, and cellular basis of common, economically, and socially important human diseases. A mechanistic approach will allow for an understanding of how the disease develops and manifests itself, as well as an understanding of treatment approaches and current biomedical research. Topics to be covered include: genetic/inherited diseases, metabolic diseases, immunological disorders, infectious diseases, cancer, cardiovascular disease, obesity, diabetes, and aging. In the laboratory, students will gain an understanding of how modern methodologies, that are based on basic biochemical, molecular, and cellular principles, are used for the detection, treatment, and research of disease. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Biochemistry I (4)**

BL 4451

Study of the processes of life at the molecular level. The physiochemical properties of the biologically important molecules and macromolecules is presented with the goal of understanding their structure vs. biological activity relationships. Major topics include the structures of metabolites, macromolecules, bioenergetics, molecular interactions and reactivities, and an introduction to catalysis by enzymes. Prerequisites: BL 2330, BL 2332, BL 2233L, CH 3411, CH 3412 (lecture 3 hours; Lab 4 hours).

## **Biochemistry II (4)**

BL 4452

Study of the processes of life at the molecular level. The physiochemical properties of the biologically important molecules and macromolecules is presented with the goal of understanding their structure vs. biological activity relationships. Major topics include bioenergetics, protein dynamics, enzyme mechanisms and their regulation, metabolism, and the integration and regulation of metabolic processes between pathways and between tissues. Prerequisites: BL 2330, BL 2332, BL 2233L, CH 3411, CH 3412 (lecture 3 hours; Lab 4 hours).

## **Medical Microbiology (4)**

BL 4481

A study of microbial pathogenesis focusing on selected medically important microorganisms (bacteria and protozoa) and viruses. Special emphasis will be placed on developing a modern understanding of host-microbe interaction and contemporary public health concerns. Areas to be studied include strategies microorganisms use to evade host immunological defenses and cause damage to the host. In the laboratory, students will employ biochemical, immunological and molecular methods in the identification of microorganisms. Prerequisites: BL 2330, BL 2332, BL 2233L, & BL 3481. (Lecture 3 hours; Lab 4 hours)

# BIOLOGY

## **Genes and Genomes (4)**

BL 4497W

This course will provide students with a strong background in the theory and techniques of modern molecular genetics-a field that impacts virtually all areas of biology and medicine. An emphasis will be placed on understanding the evidence for critical concepts, including gene regulation, genetic engineering of organisms (recombinant DNA), genomics, advances in molecular medicine and DNA forensic science ("DNA fingerprinting"). Technical skills will be developed by utilizing modern techniques, including gel electrophoresis, restriction enzymes, PCR, DNA cloning, gene expression, recombinant protein purification and DNA sequencing utilizing computer-aided analysis of sequence data. Prerequisites: BL 2330, BL 2332, & BL 2233L. (Lecture 3 hours; Lab 4 hours)

## **Department Faculty**

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