

Biology

School

School of Science, Engineering and Technology (<http://www.stmarytx.edu/set/>)

School Dean

Teresa Beam, Ph.D. (tbeam@stmarytx.edu)

Department

Biological Sciences (<https://www.stmarytx.edu/academics/department/biology/>)

Department Chair

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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.S. degree are automatically working on a minor in chemistry.

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 or five advanced biology electives. 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 and mathematics that satisfy professional school entrance requirements.

Health Profession Partnerships

- Dental Early Admission Program (DEAP)
- Joint Admission Medical Program (JAMP)
- Lake Erie College of Osteopathic Medicine (LECOM)
- Accelerated Master of Public Health Program
- Father Jim Tobin Pre-Medical Scholars Program
- Baylor College of Medicine Early Acceptance Program
- Pre-Pharmacy Early Commit Program

Majors in Biology

- B.A. in Biology (<https://catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/biology/biology-ba/>)
- B.A. in Biology with Teacher Certification (<https://catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/biology/biology-ba-teacher-certification/>)
- B.S. in Biology (<https://catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/biology/biology-bs/>)

Minor in Biology

- Biology (<https://catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/biology/biology-minor/>)

All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.

BL 1301. General Biology for Non-Majors. 3 Semester Hours.

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 BL 1302. (Lecture 2 hours, Lab 3 hours.) Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>.

BL 1302. General Biology for Non-Majors II. 3 Semester Hours.

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 BL 1302. (Lecture 2 hours, Lab 3 hours.) Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>.

BL 1401. General Biology for Majors I. 4 Semester Hours.

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. (Fall/Spring/Summer) Successful completion required for enrollment in BL 1402. (Lecture 3 hours, Lab 4 hours.) This is a writing intensive course.

BL 1402. General Biology for Majors II. 4 Semester Hours.

Second 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. (Fall/ Spring/Summer) Successful completion required for enrollment in BL 2330, BL 2332, and BL 2233L. Prerequisite: BL 1401. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) This is a writing intensive course.(Lecture 3 hours, Lab 4 hours.).

BL 1411. Human Anatomy & Physiology I. 4 Semester Hours.

This is the first part of a two-course sequence. This course provides a study of the structure and function of the human body including cells, tissues and organs of the following systems: integumentary, skeletal, muscular, nervous, special senses, and endocrine. Emphasis is on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis. This course is intended for Nursing and Exercise & Sport Science majors. Prerequisites: Must be classified as EXSS or Nursing major. (Lecture 3 hours; Lab 2.5 hours) (Fall only).

BL 1412. Human Anatomy and Physio II. 4 Semester Hours.

This is the second part of a two-course sequence. It is a study of the structure and function of the human body including the following systems: endocrine, cardiovascular, immune, lymphatic, respiratory, digestive (including nutrition), urinary (including fluid and electrolyte balance), and reproductive (including human development and genetics). Emphasis is on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis. This course is intended for Nursing and Exercise & Sport Science majors. Prerequisites: BL1411 with a "C" or better (Lecture 3 hours; Lab 4 hours).

BL 2110. Sophomore Biology Seminar. 1 Semester Hour.

This seminar is aimed at providing students with skills and strategies to be successful during the sophomore year (and beyond) as a biology (or related) major. Students will develop problem solving skills, critical thinking, time management, study skills, and other skills essential to success in the major. In addition, students will have a formal opportunity to explore careers in the biological sciences in areas such as the health professions, industry, and academia. Enrollment restricted to second year biology, biology with teacher certification, combined sciences, forensic science biology option, and bioinformatics majors. This course is offered pass/fail. Prerequisite: successful completion of FYE1301. (Fall only).

BL 2233. Cell & Molecular Methods. 2 Semester Hours.

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. (Fall/Spring) Prerequisites: Concurrent registration in BL 2330 or BL 2332. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) (Lab 4 hours).

BL 2311. Food & Nutrition. 3 Semester Hours.

Designed for non-biology majors, to fulfill the natural science requirement. Cannot be applied to Biology major or minor requirement. (Fall/Spring) 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. (Lecture 3 hours.).

BL 2330. Genetic Principles. 3 Semester Hours.

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. (Fall/Spring/Summer) Prerequisites: BL 1401, BL 1402, CH 1401, & CH 1402. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) (Lecture 3 hours; problem-solving session 1 hour).

BL 2332. Cell Biology. 3 Semester Hours.

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. (Fall/ Spring/Summer)Prerequisites: BL 1401, BL 1402, CH 1401, & CH 1402. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) (Lecture 3 hours; problem-solving session 1 hour).

BL 2420. Microbiology for Health Professions. 4 Semester Hours.

Introduces the core concepts and basic principles regarding the interaction of microorganisms, and viruses, with humans and the environment. The various types of microorganisms, and their distinctive cellular structures and mechanisms, are presented. Defining characteristics of acellular infectious agents (e.g., viruses and prions) are also discussed. An emphasis on transmission mechanisms and virulence factors of infectious agents is emphasized, as is the human immunological response (innate and adaptive). Microbial growth requirements and physical and chemical mechanisms for controlling growth are explored. This course is suitable for students applying to Nursing programs and allied health professions. Prerequisites: BL1412 with a "C" or better (Lecture 3 hours; Lab 4 hours).

BL 3000. MCAT Preparation. 0 Semester Hours.

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. (Fall only) This is a non-credit course which means that it will not be applied toward any existing degree requirements and will be assigned a grade of pass/no pass. Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>.

BL 3002. DAT Preparation. 0 Semester Hours.

This is an intensive and comprehensive DAT preparation course provided in conjunction with Kaplan. This course will provide diagnostic testing, preparation for all areas of the DAT exam, and full-length practice DAT exams as part of the course. This is a non-credit course which means that it will not be applied toward any existing degree requirements and will be assigned a grade of pass/no pass. (Fall only) Prerequisites: Must have completed between 60-90 semester hours and must obtain Pre-Health Professions advisor and Department Chair approval to register. Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>.

BL 3110. Junior Biology Seminar. 1 Semester Hour.

This seminar is aimed at preparing students for a particular career path in the biological sciences. Students aspiring to go to graduate or health professional school will develop a plan for preparing for the relevant entrance exam, will receive guidance about seeking research and clinical experiences, and will receive guidance about submitting applications to their respective post-graduate program. Students planning to go into industry (e.g., bioinformatics or forensic science) will begin searching for an internship, will become familiar with Handshake, work on their resumes, and practice interviewing. Enrollment restricted to third year biology, combined sciences, forensic science biology option, and bioinformatics majors. This course is offered pass/fail. Prerequisite: successful completion of BL2110. (Fall only).

BL 3125. Seminars in Biological Science. 1 Semester Hour.

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. (Fall/Spring) Prerequisites: BL 2330, BL 2332, & BL 2233L or permission of the MARC Program Director. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors).

BL 3130. Scientific Methodology & Analysis. 1 Semester Hour.

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. (Fall/Spring) Prerequisites: BL 2330, BL 2332, & BL 2233L or permission of MARC Program Director. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.)

BL 3300. Special Topics in Biology. 3 Semester Hours.

Topics vary from semester to semester. May be retaken for additional credit when a different topic is offered. Prerequisites: BL 1401 and BL 1402, BL2330, BL 2332, and BL2233 (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.)

BL 3310. Introduction to Bioinformatics. 3 Semester Hours.

The objective of the course is to teach hands-on techniques that can help with solving biological problems. Students will learn to efficiently use multiple genomics and bioinformatics tools, that are freely available, for the analysis of DNA, RNA, and protein sequences and structure. Students will learn how to access biological data from databases, work in genome browsers, and analyze genomic regions. No programming skills are necessary for this course. This interdisciplinary course is helpful for students in the department of Biology, Computer Science, Mathematics, and Chemistry who aspire to go to either graduate school or medical school, or plan to work in the Bioinformatics industry that has experienced exponential growth within the last decade.

BL 3330. Preceptorship in the Health Professions. 3 Semester Hours.

This course will pair pre-medical/pre-dental students with practicing physicians/dentists in a mentor/mentee relationship. Students will shadow in a medical/dental practice as well as complete academic coursework relating to practice such as readings, reflections, assessments, workshops, seminar discussions, and networking. (Fall) Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>.

BL 3380. Forensic Pharmacology. 3 Semester Hours.

This course will present the basic pharmacokinetics of forensically relevant drugs, such as opioids, hallucinogens, stimulants, depressants, and cannabinoids. Students will discuss how these drugs influence behavior, illness, injury, and death as revealed by crime scene and laboratory analyses. In parallel, appropriate biological and chemical instrumentation to perform pharmacological investigations will be presented. High-profile medico-legal cases in forensic pharmacology and the legislation governing the development, distribution, and use of certain drugs will also be discussed. Prerequisites: BL 1401, BL1402, CH 1401, CH 1402, CJ 1301 OR permission of instructor. (Spring Only Even Year). (All courses serving as prerequisites in the School of Science, Engineering, and Technology must be completed with a "C" or better to advance to the next sequenced course.) (Lecture 3 hours).

BL 3400. Special Topics in Biology. 4 Semester Hours.

Topics vary from semester to semester. May be retaken for additional credit when a different topic is offered. Prerequisites: BL 1401 and BL 1402, BL 2330, BL 2332, and BL 2233. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours, Lab 4 hours).

BL 3401. Forensic Microscopy. 4 Semester Hours.

Microscopy enables the detection, examination, and analysis of diverse forensic evidence during criminal investigations, and proficiency with various types of microscopy is expected of forensic science practitioners. Conceptually, this course will present the dynamic role of microscopy in a medico-legal context, the optics and mechanics governing forensic microscopy, and the obligation of forensic science practitioners to perform these analyses ethically and with professional competence. Students will also critique and discuss primary research articles in the field of forensic microscopy. Practically, students will use stereo-, compound light, polarizing light, and fluorescence microscopy to analyze physical, biological, and chemical evidence as appropriate. Emerging instrumental microscopy techniques will also be discussed. Prerequisites: BL 1401, BL1402, CH 1401, CH 1402, and CR 3335 OR permission of instructor. (Spring) Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>.

BL 3410. Biostatistics for Life Science. 4 Semester Hours.

This course will provide the background and application of statistical tools for analyzing different types of data frequently encountered by life scientists. The emphasis will be on the applications of various statistical methodology on biological data, using R programming language. This will include contingency table analysis, linear regression and ANOVA, maximum likelihood method and application of statistical tests like t-test, chi-square test and survival analysis. Prerequisites: BL 1401, BL 1402, OR permission of the instructor.

BL 3420. Anatomy. 4 Semester Hours.**BL 3424. Comparative Anatomy. 4 Semester Hours.**

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). (Fall only even year) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 3430. General Physiology. 4 Semester Hours.

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. (Fall/Spring) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 3434. Comparative Physiology. 4 Semester Hours.

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 activities will enhance skills in experimental design and biostatistics, and teach fundamental techniques in respirometry, thermobiology, ecophysiology, bioenergetics, and animal behavior. Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours, Lab 4 hours).

BL 3436. Neurophysiology. 4 Semester Hours.

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. (Spring Only Odd Year) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 3440. Toxicology. 4 Semester Hours.

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. (Fall, Even Years) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) (Lecture 3 hours; Lab 4 hours).

BL 3442. Forensic Osteology. 4 Semester Hours.

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. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) (Lecture 3 hours; Lab 4 hours) (Spring Only, Odd Years).

BL 3444. Histology. 4 Semester Hours.

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. (Spring Only) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a C or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 3464. Evolutionary Biology. 4 Semester Hours.

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. (Spring Only Even Year) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 3481. Microbiology. 4 Semester Hours.

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. (Fall/ Spring) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 3484. Immunology & Infection. 4 Semester Hours.

This course will explore the cellular and molecular mechanisms employed by the mammalian immune system to protect the host from infection by microbial pathogens; we will emphasize the struggle between host defenses and virulence mechanisms of pathogens using select bacteria, protozoa and viruses as examples. This extensive introduction to modern immunology will include the study of the host's innate defenses, antigen capture and presentation, antibody generation and function, cell mediated immunity, discrimination of self from non-self, and advances in vaccine development. Integrating this with the study of microbial virulence factors and mechanisms of immune evasion, especially, will contribute to a more complete understanding of the interaction between microbe and host. Immunology and microbial pathogenesis are two of the most important areas of biological research and medicine and will enable students to expand upon their previous training in cellular and molecular biology. (Spring) Prerequisites: BL 2330, BL 2332 & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours.).

BL 3490. Developmental Biology. 4 Semester Hours.

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. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours) (Fall only Odd Year).

BL 4110. Senior Biology Seminar. 1 Semester Hour.

This seminar is aimed at further preparing students for a particular career path in the biological sciences. Students aspiring to go to graduate or health professional school will receive guidance about submitting applications to their respective post-graduate program. Students planning to go into industry (e.g., bioinformatics or forensic science) will begin searching and preparing to apply for jobs after graduation. Students will develop career development skills such as resume writing, writing a personal statement, and interview skills, and will participate in journal clubs to hone skills in reading and interpreting primary scientific literature. Enrollment restricted to fourth year biology, forensic science biology option, and bioinformatics majors. This course is offered pass/fail. Prerequisite: successful completion of BL3110. (Fall only).

BL 4410. Forensic Toxicology. 4 Semester Hours.

This course will discuss the complex operations of modern forensic toxicology laboratories. It will also discuss the fundamentals of how the human body affects consumed drugs as well as how drugs affect the human body, especially as it relates to behavior and death. Emphasis will be placed on commonly observed forensically relevant drugs, such as ethanol, opioids, cannabinoids, hallucinogens, designers as well as central nervous system (CNS) stimulants and depressants. In parallel, relevant biological and chemical methodologies will be discussed and then used to perform toxicological investigations. Relevant medicolegal cases will also be discussed. Prerequisites: BL 1401, BL 1402, CH 1401, CH 1402, CR 3335 OR by permission of instructor. Additional fee associated with this course. See fee schedule for details at <https://www.stmarytx.edu/admission/financial-aid/tuition/>. (Spring even years).

BL 4411. Genes, Genomes and Genomics. 4 Semester Hours.

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"). Students will be proficient in technical skills relating to DNA sequencing utilizing computer-aided analysis of sequence data and understanding gene expression. Prerequisites: BL 2330 (Genetic Principles), BL 2332 (Cell Biology), & BL 2233L (Cell & Molecular Methods). (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.) (Lecture 3 hours; Lab 4 hours).

BL 4420. Forensic Biotechnology. 4 Semester Hours.

This course will cover the use of biotechnology for forensic applications. We will study the major techniques, methods and instruments used in the analysis of biological evidence commonly encountered at crime scenes. Material will cover the underlying molecular biology techniques used in blood analysis, blood typing, DNA fingerprinting, genetic testing and advanced sequencing technologies. We will also focus on the personal, societal and ethical concerns that have and are expected to arise with the increased use of personal genomic information. The techniques covered will include those commonly used in forensic laboratories such as conducting presumptive tests for fluids, DNA extraction, DNA isolation, quantification of DNA, polymerase chain reactions (PCR), DNA sequencing, and analysis of STR profiling, mtDNA and others. Additionally, we will cover the use of DNA databases for use in forensic investigation. The laboratory will focus on the hands-on use of these techniques as well as an understanding of procedures to minimize contamination, maintain accurate records and troubleshoot. Prerequisites: BL 1401, BL 1402 and CH 1401, CH 1402, and CR 3335 OR permission of the instructor. (Fall).

BL 4440. Mechanisms of Disease. 4 Semester Hours.

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. (Fall Only Even year) Prerequisites: BL 2330, BL 2332, & BL 2233L. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 4451. Biochemistry I. 4 Semester Hours.

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. (Fall Only) Prerequisites: BL 2330, BL 2332, BL 2233L, CH 2411, CH 2412 (All courses serving as prerequisites in the School of Science, Engineering, and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).

BL 4452. Biochemistry II. 4 Semester Hours.

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. (Spring Only) Prerequisites: BL 2330, BL 2332, BL 2233L, CH 2411, CH 2412 (All courses serving as prerequisites in the School of Science, Engineering, and Technology must be completed with a "C" or better in order to advance to the next sequenced course. Note: BL 2332 is not required for Forensic Science Biology Majors) (Lecture 3 hours; Lab 4 hours).