BIOLOGY (BIOL)

BIOL 104 Survey of General Biology 4 Credit Hours (3,3)
This course is a non-majors biology course that will cover the major units of general biology: (1) cells and energy; (2) genetics; (3) evolution; (4) organismal biology; (5) ecology. Developing a solid understanding of the fundamentals of general biology is vital to being an informed citizen about advances in the medical and food sciences, foundational and new information about the organization of life, and current issues of environmental and ecological concern. Course content is tied to the State of Michigan's benchmarks for training elementary school teachers, but any students interested in the life sciences are encouraged to take this class. The laboratory is designed to illustrate the course content as well as illustrate the principles of inquiry.
Prerequisite(s): MATH088 and READ091 or equivalent test scores
Pre or Corequisite(s): ENGL110

BIOL 105 Function of the Human Body 4 Credit Hours (3,2)
Survey of the functional anatomy and the related physiological processes needed for the understanding of normal human activity. Not open to biological majors or minors.
Pre or Corequisite(s): ENGL110

BIOL 106 Boat Handling and Navigation 3 Credit Hours (2,3)
Topics related to the art of seamanship are covered, including the basics of boating and safety. Piloting and navigation are emphasized with an understanding of weather, waves, and wind, as well as the use of board electronic equipment.
Pre or Corequisite(s): MATH102

BIOL 121 Human Anatomy & Physiology I 4 Credit Hours (3,3)
This is the first half of a two-course sequence. This course covers organization of the human body, basic principles of chemistry, the integumentary system, the skeletal and muscular systems, the nervous system and special senses. Laboratory experiences are designed to complement the lecture topics. This course may not be used as a general education natural science elective nor does this sequence apply toward a major or minor in biological science.
Prerequisite(s): High school chemistry, MATH088 or equivalent satisfactory score on ACT/SAT or Placement Exam
Pre or Corequisite(s): ENGL110

BIOL 122 Human Anatomy & Physiology II 4 Credit Hours (3,3)
The second half of the Human Anatomy and Physiology sequence emphasizes the endocrine system, cardiovascular system, lymphatics and the immune response, respiratory system, digestive system, urinary system and the reproductive system. Laboratory experiences are coordinated with the lecture discussions.
Prerequisite(s): BIOL121

BIOL 131 General Biology: Cells 4 Credit Hours (3,3)
This course is an introduction to the cellular aspects of general biology. This course will provide an overview of cellular biology and serve as a framework for further biological studies. Topics to be covered include basic chemistry of the cell, function of cellular organelles, cellular metabolism including respiration and photosynthesis, the cell cycle, mitosis, meiosis, simple transmission genetics, introduction to molecular and developmental biology. The laboratory introduces the student to inquiry based scientific method.
Prerequisite(s): MATH088 or equivalent scores on the math placement exams
Pre or Corequisite(s): ENGL110

BIOL 132 General Biology: Organisms 4 Credit Hours (3,3)
An introduction to the diversity of life, including the morphology, physiology, reproduction, general habitats and taxonomy of organisms. Adaptation to environment and modern concepts of evolution are stressed as unifying themes throughout the course.
Prerequisite(s): MATH088 or equivalent scores on the math placement exams
Pre or Corequisite(s): ENGL110

BIOL 199 Freshman Seminar 1 Credit Hour (1,0)
A partial focus for this course will be on academic skills and the transition from high school to college. Topics will include time management, use of campus resources, development of critical thinking, and strengthening study skills. At other times students will meet in discipline-based groups in conjunction with BIOL299, BIOL399 and BIOL499. These meetings will include discussion of literature relevant to the discipline and progress reports from upper-class students engaged in scholarly projects.

BIOL 202 Plant Science: Ident/Diversity 3 Credit Hours (2,3)
Identification of plants, with emphasis on local flora; systematics and overview of the biodiversity across plant families, with emphasis on seed plants; ecological, cultural and economic concerns of select plant species.
Prerequisite(s): BIOL132

BIOL 204 General Microbiology 4 Credit Hours (3,3)
This course will deal with the history and scope of microbiology, a study of microbial structure, growth, nutrition, metabolism, genetics, taxonomy and control. A study of mycoplasma, viruses and molds will be incorporated with genetic engineering and recombinant DNA. Labs will emphasize the identification and cultivation of molds and bacteria.
Prerequisite(s): BIOL131 and CHEM115

BIOL 206 Medical Laboratory Practices 2 Credit Hours (2,0)
Covers fundamental principles of medical laboratory science including safety, specimen handling, measurement, common calculations, organization of the medical laboratory, automation, and quality control.
Prerequisite(s): MATH111, CHEM115, BIOL131

BIOL 208 Prin Animal Biology & Health 3 Credit Hours (3,0)
The course provides a comprehensive overview of the biology of animals that are in close association with humans, including food animals, companion animals and zoo animals. The main topics will emphasize fundamental concepts of animal anatomy and physiology, animal nutrition and growth, animal breeding and selection, animal health and management, ecology and behavior, diversity and evolution, as well as applications in care and use of specific animal species and phyla.
Prerequisite(s): BIOL131 and BIOL132

BIOL 220 Genetics 4 Credit Hours (3,3)
This course covers the three major subdivisions of the study of genetics - Mendelian or transmission genetics, molecular biology, and population genetics. Transmission genetics topics will include traditional genetics problems and modes of inheritance; mitosis, meiosis and control of the cell cycle; chromosomal structure and recombination. Molecular topics will include information on DNA structure and replication, transcription, translation, gene cloning, genomics, and current research in DNA technology. Topics in population genetics will include aspects of the Hardy-Weinberg theory. The laboratory will include exercises in both traditional and molecular genetics.
Prerequisite(s): BIOL131 and CHEM115

BIOL 223 Clinical Microbiology 3 Credit Hours (3,0)
A basic course in microbiology dealing with the study of microorganisms and pathogens in humans. A survey of viruses, molds and bacteria. Their morphology and growth characteristics will be discussed along with the physical and chemical means to control pathogenic microorganisms causing human infections. Does not apply towards a major or minor in biology.
Prerequisite(s): CHEM105 or CHEM110 and BIOL122

BIOL 232 Introduction to Aquaponics 4 Credit Hours (3,3)
The course will cover the main topics of aquaponics including an overview of the concept; coupled versus uncoupled systems; microbiology (friendly microbes and pathogens), water chemistry and nitrogen-cycling, plant growth and nutrition, aquatic animal growth and nutrition, automation and system monitoring, sustainable energy options.
Prerequisite(s): BIOL132 or BIOL104 and CHEM115 or CHEM108 and CHEM109

BIOL 235 Int to Protected Horticulture 3 Credit Hours (2,3)
An introduction to growing crop plants in hoophouses, greenhouses or other protective structures. Topics include infrastructure considerations, management of growth conditions and disease/pests specific to growing indoors, variety selection, monitoring and adaptive management, and cost management.
Prerequisite(s): BIOL104 or both BIOL131 and BIOL132

BIOL 243 Vertebrate Anatomy 4 Credit Hours (3,3)
A detailed study of the origin, phylogeny and anatomy of the vertebrates. Laboratories emphasize the thorough dissection of representatives of at least three classes of vertebrates.
Prerequisite(s): BIOL132 and sophomore standing

BIOL 280 Biostatistics 3 Credit Hours (2,2)
A course in the design and analysis of biological experiments. The focus of the course is the development of a systematic method for determining an appropriate statistical technique and the interpretation of results in terms of biological science.
Prerequisite(s): BIOL131, BIOL132, and MATH111 or Calculus

BIOL 290 Ind Study in Discipline 1-4 Credit Hours (1-4,0)
Special studies and/or research in biology for individuals or small seminar groups. Course content to be arranged by student(s) and a supervising professor with approval of department and college dean. Independent study courses may be repeated for a maximum of eight credits. Additional information is available at the School of Natural Science.
Prerequisite(s): Students must have an overall GPA of at least 2.5 and no I grades on their transcript

BIOL 299 Sophomore Seminar 1 Credit Hour (1,0)
Students meet in discipline-based, student-faculty groups in conjunction with BIOL199, BIOL399 and BIOL499. Weekly meetings will include discussion of literature relevant to the discipline and progress reports from upperclass students engaged in scholarly projects. Sophomores will assist with ongoing projects and will be guided by faculty and juniors enrolled in BIOL399 to conduct a comprehensive, annotated literature search in their area of interest.
Prerequisite(s): BIOL199 and ENGL111

BIOL 302 Invertebrate Zoology 3 Credit Hours (2,3)
A study of the invertebrate groups with emphasis on morphology, phylogeny and life cycles.
Prerequisite(s): BIOL132

BIOL 303 General Entomology 3 Credit Hours (2,3)
An introduction to the biology, ecology and systematics of the insects. This course covers fundamentals of insect taxonomy and physiology; and the varied roles insects play in the natural world and in human history and culture.
Prerequisite(s): BIOL132

BIOL 306 Mycology 3 Credit Hours (2,2)
Covers fungal structure, reproduction, and classification, fungal infections and toxicoses of humans and plants, food uses of fungi, fungal identification, and fungal culture. Laboratory covers techniques for fungal culture, identification, and laboratory diagnosis of mycoses.
Prerequisite(s): BIOL132 and BIOL204

BIOL 307 US Food System 3 Credit Hours (3,0)
An overview of how food is produced, sold, bought and used in the US. The class will analyze the ecological, economic, social, cultural, political and ethical implications of the conventional operation of the US food system and investigate emerging alternatives designed to address these issues.
Prerequisite(s): ENGL111, Junior status

BIOL 315 Plant Sciences: Structure/Func 4 Credit Hours (3,3)
Organization of the plant body, photosynthesis, water relations, mineral nutrition, growth and reproduction, plant response to stress, ecological and economic importance of secondary metabolites.
Prerequisite(s): BIOL131, BIOL132, CHEM115

BIOL 330 Animal Physiology 4 Credit Hours (3,3)
The course examines the many ways animal groups solve the problem of maintaining internal homeostasis. Neural control, endocrine systems, gas exchange, energy acquisition and temperature regulation are a few of the topics examined. The lab is closely tied to the lecture material using non-invasive live animal experiments, computer interfaced data gathering and analysis.
Prerequisite(s): BIOL131, BIOL132 and CHEM116

BIOL 332 Embryology 3 Credit Hours (2,2)
A study of pattern formation and morphogenic processes in animals, with an emphasis on vertebrates. The laboratory portion of the course emphasizes descriptive ontogeny of representative vertebrates.
Prerequisite(s): BIOL131 and BIOL132; (BIOL243 is highly recommended)

BIOL 335 Principles of Animal Nutrition 3 Credit Hours (3,0)
A scientific approach to the nutritional role of water, carbohydrates, proteins, lipids, minerals, and vitamins. The course will emphasize comparative aspects of gastrointestinal anatomy and physiology for livestock, wildlife, and fish.
Prerequisite(s): CHEM116

BIOL 337 General Ecology 3 Credit Hours (2,3)
A survey of concepts and applications of plant and animal physiological, morphological, behavioral, population, community, and systems ecology.
Prerequisite(s): BIOL131, BIOL132 and MATH111

BIOL 380 Clin Hematology & Hemostasis 4 Credit Hours (3,3)
A study of the components of blood. Discussions of the formed elements to include normal and malignant states; anemias, leukemias, lymphomas, hemostasis (coagulation) processes and disease states. Laboratories will cover routine and automated blood component measurements. Offered even-numbered spring semesters.
Prerequisite(s): CHEM351
Pre or Corequisite(s): BIOL330

BIOL 385 Public Hlth Stats Epidemiology 3 Credit Hours (3,0)
Principles, purpose and methods of descriptive and analytic epidemiology with emphasis on environmental health.
Prerequisite(s): BIOL280 or PSYC210 or SOCY302 or MATH207

BIOL 389 Internship in: (Discipline) 3,4 Credit Hours
A variable credit practicum course in which the students will perform research and/or gain work experience under the direction of a faculty mentor and a qualified supervisor. Students are expected to spend a minimum of 45 hours in an approved work setting for each credit earned. The course may be repeated once for a maximum of eight credits. Student interns will be required to write weekly updates or journal entries to be submitted to their LSSU faculty mentor for evaluation of what the student has learned. 3-4
Prerequisite(s): 2.50 GPA in major and permission of faculty mentor or department chair

BIOL 399 Planning Research Project 1 Credit Hour (1,0)
A one credit practicum course in which students meet weekly with a faculty mentor to develop a senior research project, complete a formal research proposal, and present the research proposal to peers and faculty. Students and mentors will also meet in larger groups to discuss relevant literature and provide constructive feedback of student projects from BIOL499 and BIOL399.
Prerequisite(s): BIOL280, BIOL299, and COMM101

BIOL 405 Animal Behavior 3 Credit Hours (3,0)
A course designed to examine the proximate mechanisms and the evolutionary development of animal behavior. Important concepts are explained by reference to illustrative studies. An appreciation of the methods and theoretical significance of current research is emphasized. Offered even-numbered fall semesters.
Prerequisite(s): Junior standing and BIOL330 or BIOL337

BIOL 406 Immunohematology 3 Credit Hours (2,3)
Fundamentals of blood banking in the ABO, Rh and other blood group systems; blood component preparation and utilization; transfusion complications; quality control and problem solving. Laboratories include techniques used in immunology/serology; blood grouping; compatibility testing; and antibody identification. Offered even-numbered springs.
Prerequisite(s): BIOL220
Pre or Corequisite(s): BIOL423

BIOL 420 Evolutionary Analysis 3 Credit Hours (3,0)
This course explores the fundamental mechanisms of evolutionary process and speciation, and illustrates the use of evolutionary analysis as a problem-solving tool. Issues of current interest in ecology, conservation, animal behavior, human medicine and a variety of other fields are addressed from the evolutionary perspective to explain biological phenomena and community interactions.
Prerequisite(s): BIOL220

BIOL 421 Adv Cell & Molecular Biology 4 Credit Hours (3,3)
This course will examine cellular structure and function with emphasis on organelle ultrastructure, cell membranes and permeability, cellular interactions, and the molecular foundations of genetic mechanisms and cell energetics.
Prerequisite(s): BIOL220 and CHEM351

BIOL 422 Parasitology 3 Credit Hours (2,2)
A study of the morphology, taxonomy, habitats and life cycles of parasites.
Prerequisite(s): BIOL131 and BIOL132

BIOL 423 Immunology 4 Credit Hours (3,3)
A study of the basic elements of the immune response system and the various ways in which the immune system can fail, leading to immunopathological reactions. Labs will include current diagnostic methodologies.
Prerequisite(s): BIOL131, BIOL132, BIOL204 and CHEM351

BIOL 425 Virology 3 Credit Hours (2,3)
The basic concepts of virology are discussed. Lab will cover some traditional virology methods but will emphasize recent molecular approaches to viral identification.
Prerequisite(s): BIOL204 and BIOL220

BIOL 426 Animal Disease and Zoonoses 3 Credit Hours (3,0)
The course covers the environmental conditions that favor disease outbreaks, and the affects of diseases on the functional dynamics of both terrestrial and aquatic ecosystems, including human public health. Basic concepts of the ecology of infectious diseases and management strategies for functional ecosystems will be discussed.
Prerequisite(s): BIOL337

BIOL 433 Histology and Histopathology 4 Credit Hours (3,3)
A systems approach is used to study the microscopic anatomy of mammalian tissues and organs. Related physiological processes are integrated with the anatomical studies. The course includes an intensive laboratory experience where students will learn to visually identify diseased tissue. They will also learn methods of sample preparation including sectioning and staining for microscopic identification of pathogens.
Prerequisite(s): BIOL330

BIOL 437 Plant Ecology 3 Credit Hours (2,3)
A study of the autecology, population ecology and community ecology of plants, including fundamental theory, field methods and data analysis.
Prerequisite(s): BIOL202, BIOL337 and MATH207

BIOL 450 Lab Apprenticeship: Discipline 1 Credit Hour (0,3)
Students will assist in laboratories, learning instructional techniques, under direction of faculty. Course may be repeated for a maximum of two credits. Students must gain approval of the faculty member in charge of the specific laboratory, and the dean. This is a credit/no credit course.

BIOL 455 Clin Chem Body Fluid Analysis 4 Credit Hours (3,2)
Covers molecular analytes that are measured in blood, urine, and body fluids: the physiologic and pathologic processes that affect the levels of these analytes, correlations of analyte levels with disease, methods and instruments used to measure them, and principles and practices of quality control. Offered fall of even-numbered years. It is highly recommended that students take BIOL330, Animal Physiology, before taking BIOL455.
Prerequisite(s): MATH207, CHEM332
Pre or Corequisite(s): CHEM351

BIOL 460 Clinical Internship 3,9 Credit Hours
A six-month internship experience in a clinical laboratory. This course is open only to students in the Medical Laboratory Science Major, Clinical Concentration. Students will be placed at one of LSSU's affiliate clinical sites. There they will perform routine analyses of clinical specimens under the supervision of clinical site personnel. Students will be trained in chemical, hematological, microbiological, coagulation, and blood bank analyses. Variable credits, 3 or 9; must be repeated once for a maximum of 12 credits. 3 or 9
Prerequisite(s): BIOL380, BIOL406, BIOL423, BIOL455, BIOL480 and Permission of Course Director

BIOL 480 Adv Clinical Microbiology 4 Credit Hours (3,3)
An advanced course in clinical microbiology concerning the role of bacteria, viruses, and fungi as the cause of various human infections. Standard modern clinical laboratory methodology will be covered. Offered odd-numbered spring semesters.
Prerequisite(s): BIOL204

BIOL 490 Ind Study in (Discipline) 1-4 Credit Hours (1-4,0)
Special studies and/or research in biology for individuals or small seminar groups. Course content to be arranged by student(s) and a supervising professor with approval of department and college dean. Independent study courses may be repeated for a maximum of eight credits. Additional information is available at the School of Natural Science.
Prerequisite(s): Students must have junior or senior standing, have an overall GPA of at least 2.5, and no I grades on their transcript

BIOL 495 Senior Project 2 Credit Hours (0,6)
A practicum under the guidance of a faculty member. The student will conduct a scholarly project based on the proposal submitted by the student in BIOL399 (or an appropriate substitute).
Prerequisite(s): BIOL399

BIOL 499 Senior Symposium 1 Credit Hour
A one credit practicum course in which students meet weekly with a faculty mentor to complete the formal senior thesis paper, and prepare both oral and poster presentations for the senior symposia. Students and mentors will also meet in larger groups to discuss relevant literature and provide constructive feedback of student projects from BIOL499 and BIOL399. 1
Prerequisite(s): BIOL280, BIOL299 and COMM101