

injuries associated with the physically active, utilization of diagnostic tools and an overall understanding of protective equipment. *Prerequisite: Admission to clinical component of athletic training curriculum.*

ATEP 350. Measurements and Testing in Athletic Training. 2 credits. Offered fall.

The purpose of this course is to introduce and develop proficiency with measurement techniques frequently used in athletic training. Students will learn clinical evaluation techniques such as manual muscle testing, goniometry, volumetric measurements and girth measurements. How these measures are used in research will also be presented. *Prerequisite: Admission to clinical component of athletic training curriculum.*

ATEP 355. Infectious Disease Control. 1 credit. Offered spring. Discussion includes theories of origins, statistics and characteristics of the causative pathogen, incubation, illness patterns, transmission, prevention and treatment of infectious and noninfectious disease. Emphasis is placed on STDs, HIV, Hepatitis and OSHA regulations. *Prerequisite: Admission to clinical component of athletic training curriculum.*

ATEP 376. Pharmacology for Athletic Trainers. 2 credits. Offered fall. This course is designed for students to understand knowledge, skills and values that an entry-level certified athletic trainer must possess in pharmacological applications, including awareness of the indications, contraindications, precautions and interactions of medications, and the governing regulations relevant to physically active individuals. *Prerequisite: Admission to clinical component of athletic training curriculum.*

ATEP 377. General Medicine in Athletic Training. 2 credits. Offered spring. This course is designed for students to understand knowledge, skills and values that an entry-level certified athletic trainer must possess in order to recognize, treat and refer when dealing with general medical conditions and disabilities related to athletes or others involved in physical activity. *Prerequisite: Admission to clinical component of athletic training curriculum.*

ATEP 392. Level II Practicum in Athletic Training. 3 credits. Offered fall. This course focuses on clinical performance and application of didactic knowledge. Clinical rotations, clinical competencies, inservices, case studies and professional journals are included in course content. Sport specific activities and clinical applications involving palpation and wound care are key components of this course. August preseason orientation and clinical participation required. *Prerequisite: Admission to clinical component of athletic training curriculum.*

ATEP 393. Level III Practicum in Athletic Training. 2 credits. Offered spring. This course focuses on clinical performance and application of didactic knowledge. Clinical rotations, clinical competencies, inservices, case studies and professional journal are included in course content. Sport specific activities and clinical applications involving manual muscle testing and equipment fitting are key components of this course. *Prerequisite: ATEP 392.*

ATEP 405. Rehabilitation in Athletic Training: Upper Extremity. 3 credits. Offered fall.

This course explains the rehabilitation process of upper-extremity muscular and joint injuries related to athletic activities. Additional topics include prevention of athletic injuries and aquatic rehabilitation. *Prerequisite: ATEP 305.*

ATEP 406. Organization and Administration in Athletic Training. 3 credits. Offered spring.

This course is an overview of managerial issues including legal concerns, OSHA guidelines, budgeting/purchasing and staffing. In addition, this course provides a variety of experiences culminating in the knowledge and skills needed to meet entry-level competencies set by the National Athletic Trainers' Association. *Prerequisite: Permission of the instructor.*

ATEP 494. Level IV Practicum in Athletic Training. 2-3 credits. Offered fall. This course focuses on clinical performance and application of didactic knowledge. Clinical rotations, clinical competencies, inservices, case studies, and professional journal are included in course content. Sport specific activities and clinical applications involving orthopedic testing and emergency internal abdominal/chest evaluation are key components. *Prerequisite: ATEP 393.*

ATEP 495. Level V Practicum in Athletic Training. 2 credits. Offered spring. This course focuses on clinical performance and application of didactic knowledge. Clinical rotations, clinical competencies, inservices, case studies and professional journal are included in course content. Sport specific activities and clinical applications involving cranial nerve assessment and neurological evaluation are key components of this course. *Prerequisite: ATEP 494.*

Biology

Department of Biology

GBIO 103. Contemporary Biology (3, 0). 3 credits.

An in-depth exploration of selected biological concepts connected to current, relevant topics and emphasizing an understanding of science as a way of obtaining knowledge. Not available for major or minor credit in biology or biotechnology. *Formerly GSCI 103.* Students may not receive credit for both GSCI 103 and GBIO 103.

***BIO 114. Organisms (3, 3).** 4 credits. Offered fall and spring.

An exploration of how diverse life forms carry out fundamental processes that sustain life, including acquiring and using essential molecules, growing and reproducing, responding to environmental stimuli, and maintaining a stable internal environment. Labs will introduce students to the scientific method in a series of investigative lab and field experiences.

BIO 124. Ecology and Evolution (3, 3). 4 credits. Offered fall, spring and summer. In this course students will learn about variation within populations, the mechanisms of evolution, phylogeny and classification, population and community ecology, animal behavior and ecosystems dynamics. Labs will include investigations in laboratory and field settings. *Prerequisite: Grade of "C-" or better in BIO 114.*

BIO 201. Trelawny Learning Community Seminar (3, 0). 3 credits. Offered fall.

An introduction to the biology major for first year students living in the Trelawny Learning Community. Topics will include research opportunities, careers, case studies and current topics. Faculty and upper class students from the department will interact with this course to provide different perspectives about the biology major. *Prerequisite: Membership in the Trelawny Learning Community.*

BIO 203/ISAT 165. Viral Discovery (0, 3). 1 credit. Offered fall.

This course is an exploratory laboratory experience, designed for incoming freshmen. In the course, the students will learn about the life cycle and ecology of viruses infecting bacteria. Soil samples will be collected, and techniques for isolation and purification of the viruses will be performed by the students. Isolated viruses will be visualized using electron microscopy. The genomic material will be isolated and prepared for nucleic acid sequencing.

BIO 204/ISAT 166. Viral Genome and Bioinformatics (0,4). 2 credits. Offered spring.

This is a computer-based laboratory experience, designed for those students completing the Viral Discovery course. Students will learn how to identify genes in a viral genome, compare the predicted proteins with known proteins in databases, describe the contents of the genome and note all the relevant information for publication. Students will also research the ecology of soil and the role played by bacteriophages in ecology and evolution. *Prerequisites: BIO 203 or ISAT 165.*

BIO 214. Cell and Molecular Biology (3, 3). 4 credits. Offered fall and spring.

Students will explore the physiology, metabolism and reproductive biology of prokaryotic and eukaryotic cells. Topics will include the structure and function of macromolecules, theoretical and mechanistic aspects of metabolism, bioenergetics and signal transduction. Labs will include investigations that introduce students to various biochemical techniques. Credit may not be earned in both BIO 214 and BIO 220. *Prerequisites: Grades of "C-" or better in BIO 114 and either CHEM 131, CHEM 120 or permission of the instructor.*

BIO 220. Cell Biology. (3, 0) 3 credits. Offered periodically.

A comparative and theoretical coverage of basic aspects of cell structure and function common to most biological systems, including integration of cell theory, metabolism and gene action. Credit may not be earned in both BIO 220 and CHEM 222. *Prerequisite: CHEM 132, CHEM 120 or equivalent. Credit may not be earned in both BIO 220 and BIO 214.*

BIO 224. Genetics and Development (3, 3). 4 credits. Offered fall and spring.

The final course in the introductory series will explore how genetic information is utilized throughout the lifetime of the organism. Labs will make use of common model organisms highlighting the growing base of knowledge on the genetics and molecular biology of developmental processes. Credit may not be earned in both BIO 224 and BIO 230. *Prerequisites: Grade of "C-" or better in BIO 214.*

BIO 230. Genetics (3, 3). 4 credits. Offered periodically.

A study of the major principles of biological inheritance through lectures, readings, experimentation and discussions. Credit may not be earned in both BIO 230 and BIO 224. *Prerequisites: BIO 120 and BIO 130.*

***BIO 270. Human Physiology (3, 2).** 4 credits. *Offered fall, spring and summer.*

An introduction to basic physiological principles using humans as the primary organism. Physiological adaptations will be examined at the molecular through organismal levels. Intended for students in health-related fields and Cluster 3 of the General Education program. Not available for biology or biotechnology major credit. *Prerequisites or corequisites: CHEM 120 or CHEM 131 or equivalent, and MATH 220 or equivalent.*

BIO 280. Allied Health Microbiology (2, 4). 4 credits. *Offered fall, spring and summer.*

An introduction to the biology and significance of microorganisms. Emphasis will be placed on human- and health-related aspects of microbiology. Credit may not be earned in both BIO 280 and BIO 380. Not available for biology or biotechnology major credit. *Prerequisite: CHEM 120, GSCI 101, GBIO103 or equivalent.*

BIO 290. Human Anatomy (3, 3). 4 credits. *Offered fall, spring and summer.*

A study of the basic body plan is reinforced by studies of dissected human cadavers and computer simulations. Emphasis is on the major body structures and systems.

BIO 301. Introductory Neuroscience. 3 credits. *Offered fall.*

This course will examine molecular control of neuronal function. Topics include the structure and function of neuronal excitability, chemical and contact-mediated neuronal communication, developing and regenerating nervous systems, sensation and perception, learning and memory formation, repair from neuronal damage, and the neuronal pathways of sensation and motor control. In the context of these subjects, we will review the neuronal alterations that cause some common brain diseases. *Prerequisite: CHEM 131, AND BIO 214 OR ISAT 351.*

BIO 305. Ornithology (1, 4). 3 credits. *Offered spring.*

Introduction to avian biology with exercises in field identification. *Prerequisite: BIO 124 or permission of instructor.*

BIO 310. General Entomology (2, 4). 4 credits. *Offered periodically.*

A laboratory and field study of insects. Morphology, physiology and behavioral aspects will be emphasized. Collection, identification and preservation of local insects by standard procedures will be part of the course. *Prerequisite: BIO 124 or permission of instructor.*

BIO 312. Animal Welfare (3, 0). 3 credits. *Offered spring.*

An examination of the biological basis of animal welfare. Topics include the evolution of domestic animals, physiological and behavioral measurements of stress, welfare assessment and pain perception. Case studies examine the use of animals for companionship, food, medical research and entertainment. *Prerequisite: BIO 124 or permission of the instructor.*

BIO 316. Principles of Animal Development (3, 3). 4 credits. *Offered fall.*

An introduction to the fundamental processes and mechanisms of animal development. The cellular and molecular bases of embryonic processes ranging from fertilization through organogenesis and of postembryonic processes including metamorphosis, regeneration, senescence and reproduction are explored in the primary vertebrate models (fish, frog, chick, mouse, human) and selected invertebrates. *Prerequisite: BIO 224.*

BIO 320. Comparative Anatomy of Vertebrates (2, 4). 4 credits. *Offered spring.*

A study of the evolution of vertebrate organ systems that integrates structure, function and development. *Prerequisite: BIO 124, BIO 290 or equivalent.*

BIO 330. Scanning Electron Microscopy (0, 3). 3 credits. *Offered periodically.*

This course will include the theory and application of scanning electron microscopy and energy dispersive spectrometry. Students will learn to prepare, view and analyze specimens. An individual research project will be required of each student. *Prerequisite: CHEM 132.*

BIO 340. Morphology and Anatomy of Vascular Plants (2, 4). 4 credits.

Offered fall even years.

A detailed study of the comparative morphology and anatomy of tracheophytes. *Prerequisite: BIO 124.*

BIO/MATH 342. Mathematical Models in Biology. 3 credits. *Offered spring.*

Introduction to dynamical models (discrete and continuous time) applied to biology. Tools of mathematical analysis from linear and nonlinear dynamics will be taught, including stability analysis of equilibria, as well as appropriate use of software packages. Emphasis will be on model development and interpretation in the context of applications, including effective written and oral presentation. *Prerequisites: MATH 232 or MATH 235 or equivalent.*

BIO 345. Animal Field Biology. 3 credits. *Offered summer.*

The course is designed to use the nutritional and energetic relationships between plants and animals to lead into the evolutionary relationship of

members of the different animal phyla. Field study and lab specimens will be used to develop understanding of the ecological relationships of humans and local animals, insects, and plants. *Prerequisites: BIO 114 or the equivalent.*

BIO/GEOL 350. Invertebrate Paleontology (3, 2). 4 credits. *Offered periodically.*

The history of nonvertebrate life from its origin, through evolving biogeochemical cycles, origin of eukaryotes and multicellularity, evolutionary records of all major groups and theoretical issues such as major group origins, adaptive radiation patterns, extinctions, functional adaptations and paleoecology. *Prerequisite: GEOL 230, BIO 114 or permission of the instructor.*

BIO 353. Basic Ecology (3, 3). 4 credits. *Offered fall.*

Ecological principles are presented in a context which will aid pre-college teachers to understand the background science of the subject and apply it to instruction. *Prerequisites: Course is open only to IDLS majors and biology or biotechnology majors enrolled in the secondary education licensure pre-professional program. GSCI 166 or equivalent.*

BIO 360. Plant Biology (3, 0). 3 credits. *Offered spring.*

An introduction to the biology of plants including evolution, diversity, form and function, ecology, and biotechnology. *Prerequisites: BIO 124 and BIO 214.*

BIO/CHEM 361. Biochemistry I (3, 0). 3 credits. *Offered fall.*

An introduction to the molecules and chemical reactions of living systems. Structure and function of important classes of biomolecules are explored and the relationship of structure to function is stressed. Basic metabolic sequences are discussed. *Prerequisites: CHEM 342 and permission of instructor.*

BIO 364. Human Uses of Plants (3, 0). 3 credits. *Offered fall.*

A survey of past, present and future uses of plants with emphasis on economically important plant families. Issues of cultivated plant origins, biodiversity and germplasm preservation are considered. *Prerequisite: BIO 124 or permission of the instructor.*

BIO 365. Laboratory in Human Uses of Plants (0, 3). 1 credit. *Offered fall.*

An investigative examination of plants and their constituents with an emphasis on their physiological ecology, adaptations and economic utilization by humans. *Prerequisite or corequisite: BIO 364.*

BIO 366. Plants and Environment (3, 3). 4 credits. *Offered spring.*

Students will engage in a systematic investigation of plant structure and function. Ecological roles of plants and resource utilization by humans will be explored. *Prerequisites: Course is open only to IDLS majors and biology or biotechnology majors enrolled in the secondary education licensure pre-professional program. GSCI 166E or equivalent.*

BIO 370. Animal Physiology (3, 3). 4 credits. *Offered fall and spring.*

Design and function of cellular and organ physiology will be explored in both non-human and human animals. Class activities will emphasize problem-solving, and collaborative and independent learning. The laboratories will utilize computer simulations and animal/human experiments to examine principles of both physiology and scientific investigation. *Prerequisites: BIO 214 and CHEM 132 or permission of the instructor. One semester each of calculus and statistics are recommended.*

BIO 380. General Microbiology (2, 4). 4 credits. *Offered fall and spring.*

A study of the structure and function of microorganisms and their relationship to humans and to the environment. Credit may not be earned in both BIO 280 and BIO 380. *Prerequisite: BIO 214 or permission of the instructor.*

BIO 386. Field Botany (3, 3). 4 credits. *Offered spring odd years.*

An in-depth survey of vascular plants in the field with emphasis on identification, diversity of form and function, and ecology. Laboratory topics will include techniques for sampling plant communities, identifying local flora and preserving botanical materials. *Prerequisite: BIO 124.*

BIO/PSYC 395. Comparative Animal Behavior (3, 0). 3 credits.

This course covers aspects of the development, function and evolution of the behavior of nonhuman animals. Topics include intraspecies communication, feeding, aggression, territoriality, reproductive behavior and social behavior. *Prerequisite: Psychology majors: PSYC 211 or PSYC 213; biology or biotechnology majors: BIO 114 and 124 and one of the following ("C-" or better): MATH 205, 220, 231, 235, 285, 318.*

BIO 403. Animal Communication. 3 credits. *Offered summer.*

In this integrated lecture and lab course, students will develop an understanding of how and why animals communicate. This course will explore animal communication from diverse perspectives, including the physical nature, design features, and evolution of signals, and will do so through in-depth examination of examples of communication systems. *Prerequisites: BIO 124 and MATH 220, MATH 285 or MATH 318 or Permission of the instructor.*

BIO 404. Evolutionary Analysis (3, 0). 3 credits. *Offered fall.*

An examination of the place of theoretical thought in biology. The concepts of phylogenetic relationships and the mechanisms of organic change as expressed through the principles of organic evolution will be stressed. *Prerequisite:* BIO 224 or permission of the instructor.

BIO/GEOL 405. Vertebrate Paleontology (3, 1). 3 credits. *Offered periodically.*

A study of the origin and evolution of the vertebrates. Emphasis will be on understanding how the processes of Earth evolution and biological evolution have interacted through time to produce a coherent picture of vertebrate history. *Prerequisite:* GEOL 230, BIO 124 or permission of instructor.

BIO 409. Marine and Freshwater Invertebrates (3, 0). 3 credits.

Offered fall.

This is a course on animal diversity, the goal of which is to provide an understanding and appreciation of diverse ways animals function, reproduce and interact with their environment. Invertebrate groups will be surveyed. How evolution has resulted in the great richness and diversity of life on earth today will be explored using the principles of adaptation and phylogenetic analysis. *Prerequisite:* BIO 124 or equivalent.

BIO 410. Advanced Human Anatomy (1, 6). 3 credits. *Offered spring.*

An advanced study of topics in human anatomy using dissection techniques. *Prerequisites:* BIO 290 and/or BIO 320 and permission of instructor.

BIO 414. Clinical Anatomy for Occupational Therapists. 4 credits.

Offered fall.

This course offers an in-depth study of the structure of the musculoskeletal and peripheral nervous systems of the human body. Specific structural and neural pathologies will be examined in regards to impact on occupational performance. Laboratory experiences involving cadaver dissection, skeletal material, models and audiovisual technology will be utilized. *Prerequisite:* Admission to the Occupational Therapy program.

BIO 416. Human Embryology (3, 3). 4 credits. *Offered spring.*

An introduction to human development. Topics include the molecular and cellular process of gametogenesis, fertilization, gastrulation and organogenesis, as well as the macroscopic changes that occur from conception to birth. This course will provide a basis for understanding congenital malformations, cloning and stem cell research. *Prerequisites:* BIO 224 or BIO 290.

BIO 420. Medical Parasitology (3, 0). 3 credits. *Offered fall.*

The study and medical implications of parasites that infect humans. Class activities will emphasize parasite morphology, modes of transmission, mechanisms of host entry and infection, niche selection, life cycles, pathogenesis, diagnosis, and treatment and control. *Prerequisite:* BIO 214 or permission of instructor.

BIO 421. Medical Parasitology Lab (0, 3). 1 credit. *Offered fall.*

This course will introduce students to the techniques and procedures currently used in clinical and research parasitology. Laboratory exercises will focus on diagnostic methods and the use of animal models that illustrate parasitic life cycles, including their infectious stages and modes of transmission. *Corequisite or prerequisite:* BIO 420.

BIO 426. Topics in Biology. 1-4 credits. *Offered periodically.*

Studies in specified areas of biology. May be repeated for credit when course content changes. *Prerequisite:* See e-campus for prerequisites for specific topics.

BIO 427. Topics in Biology with Laboratory. 1-4 credits. *Offered periodically.*

Laboratory studies in special areas of biology to accompany BIO 426 or stand alone. May be repeated for credit when course content changes. *Prerequisite:* See e-campus for prerequisites for specific topics.

BIO 430. Human Genetics (3, 0). 3 credits. *Offered spring and summer.*

Current topics in human genetics with emphasis on species and population variation, medical genetics and genetic applications that affect humans. *Prerequisite:* BIO 224.

BIO 440. Functional Neuroscience for Occupational Therapists.

3 credits. *Offered fall.*

This course will examine functional performance of all aspects of the human nervous system. Specific nervous system conditions will be introduced and their impact on occupational performance, performance components and environmental contexts discussed. *Prerequisites:* Admission to the Occupational Therapy program.

BIO 442. Immunology (3, 0). 3 credits. *Offered spring.*

A study of the molecular and cellular basis of the immune system. Topics include the properties of antigens and immunoglobulins, the development and regulation of humoral and cell-mediated immunity, resistance and

immunization to infectious diseases, allergies, and autoimmune and immunodeficiency disorders. Credit may not be earned in BIO 442 and BIO 542. *Prerequisite:* BIO 214 or permission of instructor.

BIO 443. Immunology Laboratory (0, 4). 1 credit. *Offered spring.*

This course will introduce students to the theory and application of many of the methods currently used in clinical and research immunology. Laboratory exercises will focus on methods for identifying, quantifying and assessing functional activities of immune cells and molecules. Students will gain experience using experimental animals and in animal cell culture techniques. *Corequisite:* BIO 442.

BIO 444. Virology (3, 0). 3 credits. *Offered fall.*

A study of the fundamental aspects of both basic and medical virology. Credit may not be earned in both BIO 444 and BIO 544. *Prerequisites:* BIO 214 and BIO 224 or permission of instructor.

BIO 445. Neurobiology (3, 3). 4 credits. *Offered periodically.*

Molecular, cellular and network mechanisms underlying behavior will be studied using problem-solving, discussion, lecture and critical reading of the primary literature. Similarities and differences between nervous systems and computers will be explored. Laboratories will utilize contemporary electrophysiology and computer simulation to examine the neurobiology of simple animal model systems. *Prerequisite:* BIO 370. *Physics recommended.*

BIO 448. Medical Microbiology (3, 3). 4 credits. *Offered spring.*

This class focuses on microorganisms of medical importance, mainly bacteria and viruses. Lecture follows an organism-by-organism approach. Key topics for each organism include general cell structure, unique structures/functions, epidemiology of the disease that the organism causes, mechanisms of pathogenesis, isolation and identification of the organism, and treatment options. *Prerequisite:* BIO 380.

BIO 450. Evolutionary and Societal Impacts of Developmental

Biology (3, 0). 3 credits. *Offered spring.*

Discussion-based course on topical issues in developmental biology and how they impact animal evolution, bioethics, human identity and environmental science. *Prerequisite:* BIO 224.

BIO 451. Ecological Systems (2, 4). 4 credits. *Offered periodically.*

Ecosystems are examined as basic ecological units which are comprised of communities interacting with their environments and are themselves components of landscape. Credit may not be earned in both BIO 451 and 551. *Prerequisites:* BIO 124 and BIO 214.

BIO 452. Population Ecology (2, 4). 4 credits. *Offered fall.*

Theoretical and applied aspects of distribution and abundance, population regulation, interactions between populations and conservation will be studied in selected organisms, including humans. Credit may not be earned in both BIO 452 and BIO 552. *Prerequisite:* BIO 124.

BIO 453. Microbial Ecology and Evolution (2, 4). 3 credits. *Offered spring.*

The ecology of microorganisms will be covered, including those important in human health and in natural environments. Emphasis will be placed on the study and critique of scientific literature. Credit may not be earned in both BIO 453 and 553. *Prerequisites:* BIO 124, and BIO 280 or BIO 380.

BIO 454. Introduction to Biometrics (3, 1). 4 credits. *Offered spring even years.*

The design of biological experiments and applications of statistical techniques in ecology, cell biology, physiology, behavior, systematics, genetics and evolution. Experiments and data from the biological literature will be emphasized. Statistical software packages will be used. Credit may not be earned in both BIO 454 and BIO 554. *Prerequisite:* MATH 220 or equivalent.

BIO 455. Plant Physiology (3, 3). 4 credits. *Offered spring odd years.*

Function and structure of plants including water relations, mineral nutrition, transport phenomena, metabolism, growth and development, and selected topics in physiological ecology. Credit may not be earned in both BIO 455 and BIO 555. *Prerequisite:* BIO 214. *Prerequisite or corequisite:* CHEM 342.

BIO 456. Landscape Ecology (3, 3). 4 credits. *Offered periodically.*

The functional and descriptive study of the interaction of the mosaic of ecosystems that comprise the landscape prevalent in a region. *Prerequisite:* BIO 124.

BIO 457. Biological Applications of Geographic Information Systems

(2, 4). 4 credits. *Offered fall.*

This course will explore the various ways that geographic information systems (GIS) can be used to answer biological questions. Students will use GIS software to study applications in ecology, conservation biology and environmental biology. No prior GIS experience is required. *Prerequisites:* BIO 124 or permission of the instructor.

BIO 458. Comparative Animal Physiology (2, 4). 4 credits. *Offered periodically.*
An investigation of animal physiological adaptations to biotic and abiotic environmental factors. Laboratory study emphasizes experimental methods utilized to examine adaptive mechanisms. Credit may not be earned in both BIO 458 and BIO 558. *Prerequisite:* BIO 270 or BIO 370.

BIO 459. Freshwater Ecology (2, 4). 4 credits. *Offered fall.*
Functional relationships and productivity of freshwater communities are examined as they are affected by their physical, chemical and biotic environment. Organisms inhabiting lakes, ponds, rivers, streams and estuaries are studied at the population, community and ecosystem levels. Credit may not be earned in both BIO 459 and BIO 559. *Prerequisites:* BIO 124, CHEM 131 and CHEM 132.

BIO 460. Plant Cell and Tissue Culture (2, 4). 4 credits. *Offered spring even years.*
Theory and practice of growing isolated plant cells, tissues and organs. Credit may not be earned in both BIO 460 and BIO 560. *Prerequisites:* BIO 114 and CHEM 132.

BIO 465. Environmental Toxicology (3, 3). 4 credits. *Offered spring.*
The study of types, sources and biological effects of environmental pollutants. Class activities will include discussions of foundational material covering the biological effects of a broad range of pollutants. Labs will focus on the use of simulation models, geographic information systems and other software currently used in environmental toxicology for the analysis of environmental data. Credit may not be earned in both BIO 465 and BIO 565. *Prerequisite:* BIO 224 or equivalent.

BIO 466. Toxicology Seminar (3, 0). 3 credits. *Offered fall.*
Readings and discussions of the primary scientific literature with a focus on the biological effects of toxins at the genetic, cellular, physiological, and ecological level. *Prerequisite:* BIO 224 or equivalent.

BIO 470. Morphology of Nonvascular Plants (2, 4). 4 credits. *Offered fall odd years.*

Comparative morphology, ecology and taxonomy of representative algae, fungi and bryophytes. Credit may not be earned in both BIO 470 and BIO 570. *Prerequisite:* BIO 124.

BIO 472. Human Metabolism (3, 0). 3 credits. *Offered spring.*
This course will focus on the cellular physiological mechanisms responsible for regulation of normal human metabolism and place them in the context of the development of chronic disease processes. *Prerequisites:* CHEM 341 and BIO 214 or permission of the instructor.

BIO 475. Advanced Cell and Molecular Biology (3, 3). 3 credits. *Offered spring.*

This seminar-style course covers topics in advanced cell and molecular biology. Class format will be discussions from assigned review articles, followed by student-led presentations of assigned primary literature. Students write a research grant proposal and give an oral presentation of their proposal in class. *Prerequisite:* BIO 224.

BIO 480. Advanced Molecular Biology (2, 4). 4 credits. *Offered fall.*
Cellular constituents and genetics are emphasized at the molecular level. Credit may not be earned in both BIO 480 and BIO 580. *Prerequisite:* BIO 224. *Prerequisite or corequisite:* CHEM 342.

BIO 481. Genomics (3, 3). 4 credits. *Offered spring.*
An advanced biology course designed for students to learn about the structure and function of genomes, to develop facility in web-based tools and resources, and to appreciate the power and limitations of current resources and knowledge. Focus is on the biological questions that genomics can help to answer. Laboratory exercises will be sequencing and analyzing genomic DNA. *Prerequisite:* BIO 224.

BIO 482. Human Histology (3, 3). 4 credits. *Offered fall.*
Microscopic structure of cells, tissues and major organ systems of the body. Basic anatomical and physiological function is presented to emphasize the histological significance of the examined organ systems. *Prerequisite:* BIO 270, BIO 290 or equivalent.

BIO 486. Systematics of Vascular Plants (2, 4). 4 credits. *Offered spring even years.*
Study of systematic theory and an overview of the classification and evolution of higher plants with particular attention to flowering plant families. Techniques for plant identification and collection and for construction of phylogenies will be taught in lab. *Prerequisite:* BIO 124 or permission of the instructor.

BIO 490. Biomechanics (3, 3). 4 credits. *Offered spring.*
A study of the interactions of organisms with their physical environment. Concepts from fluid and solid mechanics are applied to biological form and function. *Prerequisite:* BIO 114 or permission of the instructor.

BIO 494. Internship in Biology (0-12). 6 credits.
Students participate in research or applied biology outside of this university. A proposal must be approved prior to registration, and a final paper will be completed. *Prerequisites:* Biology or biotechnology major with a minimum of eight biology credit hours and a GPA of 2.5 or greater.

BIO 495. Biotechniques (0, 4). 1 credit.
Emphasis is placed on theory, methodology and the development of manipulative abilities. Students must notify the biology office of their interest the semester before registration. May be repeated for a maximum of two credits when course content changes. *Prerequisites:* GPA of 2.5 or greater.

BIO 496. Research Literature (0, 4). 1 credit.
A systematic review and study of the research literature in a selected field of biology. Proposal for study should be approved by sponsor and department head the semester before registration. May be repeated for a maximum of 2 credits when course content changes. *Prerequisites:* GPA of 2.5 or greater.

BIO 497. Biological Research (0, 4-8). 1-3 credits.
Research in a selected area of biology as arranged with sponsor. Research outline must be approved by sponsor and department head the semester before registration. Course may be repeated. *Prerequisites:* GPA of 2.5 or greater.

BIO 499. Honors in Biology (0, 6). 6 credits.
Three semester course taken as parts A, B and C; 2 credits each.

Biotechnology

College of Science and Mathematics and College of Integrated Science and Technology

BIOT 260. Biotechnology Seminar. 1 credit. *Offered fall.*

An introduction to biotechnology. Topics will include research opportunities, careers and current topics in biotechnology. Not available for biology major or minor credit.

Business Law

College of Business

BLAW 314. Real Estate Law. 3 credits.

A study of the principles of law-governing interests in real estate including acquisition, encumbrance, transfer, rights and obligations of parties, and state and federal regulations thereof. *Prerequisites:* COB 218 and junior standing.

BLAW 470. Financial Products: Regulation and Protection. 3 credits. *Offered once a year.*

An inquiry into the legal environment of the financial marketplace. Topics explored include the role of regulatory agencies, the design of contracts which minimize credit risk and maximize marketability, and methods of protecting the proprietary component of innovative financial products. *Prerequisites:* COB 218 and junior standing.

BLAW 495. Contract Law, Sales and Secured Transactions. 3 credits. *Offered fall and spring.*

A study of the law of contracts, Article Two of the Uniform Commercial Code, product liability, legal liability of accountants, secured transactions and bankruptcy with emphasis on the role these play in professional and personal decision making. The courts, the legislature and the interaction of these two branches of government in responding to a changing society are studied throughout. *Prerequisites:* COB 218 and COB 300.

BLAW 496. The Law of Business Organizations, Negotiable Property Instruments and Property. 3 credits. *Offered once a year.*

A study of Article Three of the Uniform Commercial Code, agency, partnerships, corporations, securities regulations, real property, trusts and decedents estates with emphasis on the role these play in professional and personal decision making. *Prerequisites:* COB 218 and COB 300 or permission of instructor.

BLAW 497. Legal Aspects of International Business. 3 credits. *Offered fall.* Survey of legal implications of international business dealings including foreign direct sales, distributorship arrangements, licensing of technology and legal aspects of the multi-national corporation. The foreign legal environment, relevant conventions and trade regulations, and the transnational reach of regulatory law will be considered. *Prerequisites: COB 218 and senior standing.*

Business and Marketing Education

College of Education

BMED 200. Introduction to Business and Marketing Education. 3 credits. A general survey of business and marketing principles as they relate to preparation for teaching with emphasis on the history of business and marketing in America, the basic forms of business organizations, ownership, finance, management, taxes and wages, and labor relations.

BMED 230. Document Design and Production. 3 credits. Experience in planning, designing and producing documents for the business office with focus on transferability of productivity among the genre of word processing software. *Prerequisite: Keyboard in excess of 40 words per minute with at least 95 percent word accuracy without visual reference to the keyboard.*

BMED 300. Data and Records Management. 3 credits. Develops skills in managing the information of business by organizing data through the creation and use of computer spreadsheets and databases. Includes the management and organization of hard records.

BMED 376. Occupational Experience in Business. 3 credits. Supervised internship providing business office experience for students seeking licensure as business education teachers in middle and secondary schools. A credit/no credit grade will be assigned. *Prerequisite: Permission of the instructor.*

BMED 377. Occupational Experience in Marketing. 3 credits. Supervised internship providing marketing (retail, promotion, entertainment, merchandising, etc.) experience for students seeking licensure as marketing education teachers in middle and secondary schools. A credit/no credit grade will be assigned. *Prerequisite: Permission of the instructor.*

BMED 380. Demonstration Methods for Business and Marketing. 3 credits. Development of an instructional model incorporating demonstrations and supervised walk-throughs in planning and directing the learning of computer-related and other complex business and marketing procedures and processes.

BMED 400. Business and Marketing Communications. 3 credits. Develops skills in communicating effectively through formal and informal business reports, letters and memorandums. Emphasis on realistic problem solving involving collecting, organizing, analyzing, interpreting and presenting data. *Prerequisites: GWRIT 101, GWRIT 102 and BMED 230 or equivalent.*

BMED 430. Desktop Publishing Design and Production. 3 credits. Experience in planning, designing and producing the publications of business and education with focus on transferability of functions among the genre of desktop publishing software.

BMED 490. Independent Study in Business and Marketing Education. 1-3 credits. *Offered fall and spring.* Provides opportunity to complete independent study or research on problems in business and marketing education. *Prerequisite: Permission of the program coordinator.*

Chemistry

Department of Chemistry and Biochemistry

CHEM 100. Chemistry Today. 3 credits. Provides the background necessary to understand how chemistry affects our daily lives. An enriched overview of the fundamental principles of chemistry is followed by applications to topics of current interest. A high school science background is assumed. Not available for major or minor credit in chemistry.

***CHEM 120. Concepts of Chemistry.** 3 credits. *Offered fall and spring.* A one-semester introduction to the fundamental principles, laws and applications of chemistry. Examples relating to the health sciences are emphasized. Not available for major or minor credit in chemistry.

CHEM 120L. Concepts of Chemistry Laboratory. 1 credit. *Offered fall and spring.* A one-semester introduction to laboratory work which illustrates the fundamental principles, laws and applications of chemistry discussed in CHEM 120. Experiments relating to the health sciences are emphasized. *Prerequisite or corequisite: CHEM 120.*

***CHEM 131. General Chemistry I.** 3 credits. *Offered fall and spring.* The first of a two-course general chemistry sequence for science majors. It is designed to introduce students to basic chemical concepts including atomic structure, periodic properties of the elements, nomenclature, basic stoichiometry, theories related to reactivity and bonding, and the behavior of materials. The laboratory and lecture portions of CHEM 131 must be taken concurrently. Chemistry majors take 135L rather than 131L.

CHEM 132. General Chemistry II. 3 credits. *Offered fall and spring.* A course designed to examine the mechanisms by which chemists obtain information about reacting systems. Major concepts covered include: chemical reactivity, chemical equilibrium, electrochemistry, thermodynamics and kinetics. *Prerequisites: Grades of "C-" or higher in CHEM 131 and either CHEM 131L or CHEM 135L. Corequisite: CHEM 132L or 136L (chemistry majors take 136L).*

CHEM 131L*-132L. General Chemistry Laboratories. 1 credit each semester. *Offered fall and spring.* These laboratory courses are designed to complement and supplement the CHEM 131-132 lecture courses. The laboratory and lecture portions must be taken concurrently. Chemistry majors are to take CHEM 135L and 136L. *Prerequisites for CHEM 132L: Grades of "C-" or higher in CHEM 131 and either CHEM 131L or CHEM 135L.*

CHEM 135L. Special General Chemistry Laboratory. 1 credit. *Offered fall.* An enriched laboratory course designed primarily for chemistry majors. *Corequisite: CHEM 131.*

CHEM 136L. Special General Chemistry Laboratory. 2 credits. *Offered spring.* An enriched laboratory course that includes special topics and experiments not presented in the regular CHEM 132 laboratory. *Prerequisites: Grades of "C-" or higher in CHEM 131 and either CHEM 131L or 135L. Corequisite or prerequisite: CHEM 132.*

CHEM 200. Computer Applications in Chemistry. 1 credit. *Offered fall.* Students are given chemically relevant problems that require that they learn to use software that all literate chemists should be familiar with. In addition, students are introduced to a programming language, first by writing macros for spreadsheet, presentation or word processing programs and finally, by using a high level programming language. *Corequisite or prerequisite: CHEM 341.*

CHEM 221. Concepts of Organic Chemistry. 3 credits. *Offered fall.* An introduction to the study of organic compounds with emphasis on the chemistry of functional groups, including methods of preparation and interconversions. The laboratory and lecture portions must be taken concurrently. *Prerequisites: CHEM 132 and 132L.*

CHEM 221L. Concepts of Organic Chemistry Laboratory. 1 credit. *Offered fall.* Laboratory work will include training in the techniques of organic chemistry, preparation of compounds and some organic qualitative analysis. *Prerequisite or corequisite: CHEM 221.*

CHEM 222. Concepts of Biochemistry. 3 credits. *Offered spring.* A survey of the principal constituents of living cells: proteins, carbohydrates, lipids and nucleic acids with emphasis on their synthesis and transformations in vivo. Intermediary metabolism and protein replication will be stressed. The laboratory and lecture portions must be taken concurrently; not available for major credit. Credit may not be earned in both CHEM 222 and BIO 220. *Prerequisites or corequisites: CHEM 221 and CHEM 221L (or CHEM 342 and CHEM 346L).*

CHEM 222L. Concepts of Biochemistry Laboratory. 1 credit. *Offered spring.* The laboratory work will comprise experiments demonstrating some of the pertinent reactions including those of analytical value. *Prerequisite or corequisite: CHEM 222.*

CHEM/PHYS/MATS 275. An Introduction to Materials Science. 3 credits. *Offered fall.*

An introduction to materials science with emphasis on general properties of materials. Topics will include crystal structure, extended and point defects, and mechanical, electrical, thermal and magnetic properties of metals, ceramics, electronic materials, composites and organic materials. *Prerequisites: CHEM 131 and PHYS 150 or PHYS 250 or ISAT 212 or permission of the instructor.*

CHEM 280. An Alternative Lower-Division Chemistry Experience. 1-3 credits. *Offered fall and spring.*

This course will provide a mechanism for offering a nontraditional, lower-division, lecture and/or laboratory course. It will be offered only with the approval of the full-time teaching faculty. No course will be offered more than three times under the 280 designation. Students may repeat CHEM 280 for credit when course content changes.