

**3440. Data Collection and Analysis.** 4 hours. (3;1) Methods of observing and measuring behavior and for analyzing behavioral data. Topics include dimensional properties of behavior, techniques of direct observation, methods of summarizing data, preparing graphs and analyzing graphed data. Introduces single-subject experimental designs including reversal, multiple baseline and multiple treatment designs. Prerequisite(s): BEHV 2300 or 3150, and 2700.

**3550. Behavior Change Techniques.** 4 hours. (3;1) Designing and implementing behavior change techniques. Topics include shaping, discrimination training, instructional and imitation training, and differential reinforcement. Behavior change techniques will be applied in such settings as classrooms, institutions, workshops and group homes and their effectiveness evaluated. Prerequisite(s): BEHV 2700.

**3660. Survey of Applied Behavior Analysis Literature.** 3 hours. Comprehensive survey of recent literature in multiple areas of application. Topics include applications in classroom behavior, skill acquisition, developmental disabilities, rehabilitation, interpersonal behavior, autism, community behaviors, family interactions, organizational behavior management and others. Prerequisite(s): BEHV 2300 or 3150.

**3770. Building Skills with Behavior Technology.** 4 hours. (3;1) Acquisition of complex repertoires for persons with developmental disabilities. Topics include selection of target behaviors, planning intervention procedures, evaluating results and ensuring maintenance of skills. Ethical and aesthetic considerations. Prerequisite(s): BEHV 3440 or consent of instructor.

**4000. Applied Behavior Analysis and Autism II: Program Development.** 4 hours. (3;1) Describes curricular, research and development issues involved in the scientist-practitioner model of applied behavior analysis interventions for young children with autism. Students design data collection systems, identify variables affecting behavior, and evaluate program efficacy. Students conduct upper-level program design and implementation, and complete extensive practical training. Prerequisite(s): BEHV 3000.

**4010. Functional Analysis and Problem Behavior.** 4 hours. (3;1) Introduction to function-based treatment approaches for problem behavior. Topics include anecdotal assessment, descriptive assessment, experimental analysis and various courses of treatment derived from functional assessment, with emphasis on the importance of consistency between procedures and the functional properties of problem behavior. Prerequisite(s): BEHV 3440 or consent of instructor.

**4310. Behavior Principles and Self-Management.** 3 hours. Uses behavior principles to understand and deal with problems in self-management. Self-assessment of goals, options and necessary trade-offs is followed by a behavior analysis of the nature of the self-management problem. Each student applies behavioral principles to develop and implement an individual self-management plan to reach a particular short-term goal. Prerequisite(s): BEHV 2300 or 3150.

**4400. Organizational Behavior Management.** 3 hours. Describes theory and techniques of applying behavior analysis principles to solve performance problems and design more effective workplaces. Focuses on pinpointing critical work behaviors, measuring work performance, analyzing the contingencies responsible for the performance, implementing and evaluating intervention programs involving stimulus control, feedback and reinforcement

systems to improve employee performance. Discusses organizational behavior management as a philosophy and as a tool for improving job performance in any organization.

**4750. Capstone Course in Applied Behavior Analysis.** 3 hours. Integrates and extends basic behavioral principles and behavior change procedures to address professional issues including behavioral assessment and goal development, selection of appropriate behavior change procedures, ethical and legal responsibilities, and technology transfer. Prepares students for professional certification in applied behavior analysis. Prerequisite(s): senior status and a minimum of 18 hours in behavior analysis.

**4800. Topics in Behavioral Applications.** 3 hours. Focus is on the complex relations between behavior and the environment in specific kinds of settings. Topics include applications in institutional settings and work environments in public and private sectors, business and industry. May be repeated for credit as topics vary. Prerequisite(s): BEHV 2300 or 3150.

**4900. Special Problems.** 1–3 hours. Prerequisite(s): consent of instructor.

**4951. Honors College Capstone Thesis.** 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

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## Bilingual and English as a Second Language

see Teacher Education and Administration

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## Biochemistry

see Biological Sciences

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## Biological Sciences

### Biochemistry, BIOC

**2900-2910. Introduction to Biochemical Research.** 1–3 hours each. Individualized laboratory instruction. Students may begin training on laboratory research techniques. Prerequisite(s): CHEM 1430 (may be taken concurrently) and consent of instructor. For elective credit only; may not be substituted for required chemistry courses.

**3621. Elementary Biochemistry.** 3 hours. Chemistry of biomolecules; amino acids, proteins, enzymes, carbohydrates, lipids, nucleotides, nucleic acids, vitamins and coenzymes; metabolism of biomolecules, generation and utilization of energy. Prerequisite(s): one term/semester of organic chemistry. Counts toward chemistry minor for biology majors when taken concurrently with BIOC 3622. For students needing one term/semester biochemistry course; admission to the biology/biochemistry major, or consent of department. May not be used in the degree if credit is earned in BIOC 4540 or 4550.

**3622. Elementary Biochemistry Laboratory.** 1 hour. (0;4) Laboratory techniques for BIOC 3621. Prerequisite(s): concurrent enrollment in BIOC 3621. May not be used in the degree if credit is earned in BIOC 4560.

**4540. Biochemistry I.** 3 hours. Chemistry and biochemistry of carbohydrates, lipids, amino acids and proteins, and nucleic acids; biochemical energetics, enzyme catalysis, vitamins and coenzymes, and their interrelationships in energy-producing cycles and pathways. Prerequisite(s): CHEM 2380 and admission to the biology/biochemistry major, or consent of department. May not be used in the degree if credit is earned for BIOC 3621. May not be repeated at the graduate level as BIOC 5540.

**4550. Biochemistry II.** 3 hours. Continuation of 4540. Metabolic pathways in biosynthesis and degradation of lipids, nucleic acids, proteins and carbohydrates; photosynthesis, nitrogen cycle, and metabolic regulation. Prerequisite(s): BIOC 4540 or consent of department. May not be repeated at the graduate level as BIOC 5550.

**4560. Biochemistry Laboratory.** 2 hours. (1;3) Analysis and characterization of amino acids, peptides, enzymes, lipids, nucleic acids, carbohydrates, and metabolic pathways and processes. Techniques include a variety of chromatographic methods, electrophoresis, UV-vis spectroscopy and radiochemistry. Prerequisite(s): BIOC 4540 (may be taken concurrently). May not be used in the degree if credit is earned for BIOC 3622. May not be repeated at the graduate level as BIOC 5560.

**4570. Biochemistry and Molecular Biology of the Gene.** 3 hours. Mechanisms and regulation of genetic expression, chromosome replication, mutagenesis and DNA repair, and gene cloning in prokaryotic and eukaryotic systems. May not be used to satisfy minor requirements in chemistry. Prerequisite(s): at least one of the following: BIOL 3510/3520, 3451/3452 or BIOC 4540. (Same as BIOL 4570.)

**4580. Molecular Biology and Biotechnology Laboratory.** 2 hours. (0;5;0) Experiments in recombinant DNA techniques, gene regulation and other areas of molecular biology. May not be used to satisfy major or minor requirements in chemistry. Prerequisite(s): BIOC 4570 (may be taken concurrently) or BIOL 4770 (may be taken concurrently), or consent of department. (Same as BIOL 4580.) May not be repeated at the graduate level as BIOC or BIOL 5580.

**4900-4910. Special Problems.** 1–3 hours each. Prerequisite(s): CHEM 3220 or equivalent, and consent of directing professor.

**4930. Special Problems.** Individual study without laboratory. Prerequisite(s): junior or senior standing and approval of supervising faculty member and/or consent of department.

**4940. Honors Research in Biochemistry.** 3 hours. Advanced original independent research supervised by a faculty member in the biological sciences. For students interested in pursuing careers in research or medicine. Prerequisite(s): 3.25 GPA or better in the sciences, at least 12 hours of biology and 16 hours of biochemistry/chemistry, junior or senior standing and departmental approval.

**4950. Honors Thesis in Biochemistry.** 3 hours. A continuation of BIOC 4940 involving advanced original independent research culminating in a written report supervised by a faculty member in the biological sciences. The results are written in standard thesis format and

presented orally. For students interested in pursuing careers in research or medicine. Prerequisite(s): BIOC 4940 and departmental approval.

**4951. Honors College Capstone Thesis.** 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

### **Biological Sciences, BIOL**

**1024. Biological Principles of Women's Health.** 3 hours. Fundamental principles of modern biology discussed within the context of women's health. Provides a foundation in biological principles with specific emphasis on topics that address the understanding of women's physiology. Topics include human genetics, metabolism, reproduction, neural organization and sexuality. This is an introductory course; however, successful completion of an introductory course in biology at either the high school or college level will be helpful. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.* (Same as WMST 2620.)

**1082. Biology for Educators.** 3 hours. (3;3) Develop a meaningful and functional command of key biological concepts, an understanding of the interrelationships among all living things, and a correlation between what pre-service teachers are required to learn and what they are required to teach. Includes laboratory. A general biology course with laboratory designated for elementary and middle school education majors seeking teacher certification. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.* Note: this course may not be used to satisfy the laboratory science requirement for majors in the College of Arts and Sciences.

**1112 (BIOL 1413). Contemporary Biology.** 3 hours. (3;3) Study of major theories and principles of biology pertaining to cell and molecular biology, form and function of tissue and organ systems, and principles of ecology as they relate to animal and plant diversity and evolution; ethical and social issues relating to humans as components of living systems. Includes laboratory. May not be counted toward a major or minor in biology. *May be used to satisfy a portion of the Natural Sciences requirements of the University Core Curriculum.*

**1122 (BIOL 1411). Plant Biology.** 3 hours. (3;3) Plant structure and function; plant genetics, reproduction and development; role in ecosystems, agriculture and industry; food resources and human population. Includes laboratory. May not be counted toward a major or minor in biology. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1132 (BIOL 2406). Environmental Science.** 3 hours. (3;2) Interdisciplinary approach to understanding basic concepts in environmental science including critical scientific thought, biodiversity, resource management, pollution, global climate change, resource consumption and population growth. Emphasis on how these concepts affect and are affected by human society. Includes laboratory. May not be counted toward a major or minor in biology. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1710 (BIOL 1306). Principles of Biology I.** 3 hours. (3;0;1) An integrated approach to cell and molecular biology with an emphasis on biological chemistry, cell structure and function, Mendelian and molecular genetics, evolutionary biology, and classification of microorganisms, plants and animals. Required for biology major. Course should be taken concurrently with BIOL 1730. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1711. Honors Principles of Biology I.** 3 hours. (3;0;1) An integrated approach to cell and molecular biology with an emphasis on biological chemistry, cell structure and function, Mendelian and molecular genetics, evolutionary biology, and classification of microorganisms, plants and animals. Course should be taken concurrently with BIOL 1733. Prerequisite(s): high school pre-AP/AP biology and chemistry are highly recommended. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1720 (BIOL 1307). Principles of Biology II.** 3 hours. (3;0;1) An integrated approach to the anatomical, physiological and functional aspects of nutrition, gas exchange, transport, reproduction, development, regulation, response and ecology of microorganisms, plants and animals. Required of all biology majors. Course should be taken concurrently with BIOL 1740. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1722. Honors Principles of Biology II.** 3 hours. (3;0;1) An integrated approach to the anatomical, physiological and functional aspects of nutrition, gas exchange, transport, reproduction, development, regulation, response and ecology of microorganisms, plants and animals. Course should be taken concurrently with BIOL 1744. Prerequisite(s): high school pre-AP/AP biology and chemistry are highly recommended. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1730 (BIOL 1106). Principles of Biology I Laboratory.** 1 hour. (0;3) Laboratory techniques for BIOL 1710. Prerequisite(s): BIOL 1710 or 1711, should be taken concurrently. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1733. Honors Principles of Biology I Laboratory.** 1 hour. (0;3) Laboratory techniques for BIOL 1711. Prerequisite(s): BIOL 1711 should be taken concurrently. High school pre-AP/AP biology and chemistry are highly recommended. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1740 (BIOL 1107). Principles of Biology II Laboratory.** 1 hour. (0;3) Laboratory techniques for BIOL 1720. Prerequisite(s): BIOL 1710/1730 or 1711/1733; BIOL 1720 (may be taken concurrently) or BIOL 1722 (may be taken concurrently). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1744. Honors Principles of Biology II Laboratory.** 1 hour. (0;3) Laboratory techniques for BIOL 1722. Prerequisite(s): BIOL 1711/1733; BIOL 1722 (may be taken concurrently). High school pre-AP/AP biology and chemistry are highly recommended. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**2041 (BIOL 2321). Microbiology.** 3 hours. Survey of the microbial world; classification, ecology, morphology and physiology of eukaryotic and prokaryotic microorganisms. Corequisite(s): BIOL 2042. Prerequisite(s): BIOL 1710/1730; and CHEM 1420 (may be taken concurrently).

**2042 (BIOL 2121). Microbiology Laboratory.** 1 hour. (0;4) Laboratory techniques in general microbiology. Survey of microorganisms including bacteria, fungi, protozoa, and algae. Culture, staining and identification of bacteria. Corequisite(s): BIOL 2041. Prerequisite(s): CHEM 1420 (may be taken concurrently).

**2140. Principles of Ecology.** 3 hours. Ecological and evolutionary approach to understanding distribution, abundance, dispersion and form-function diversity of organisms. Focus on organisms, their physiological and life history adaptations, and populations. Prerequisite(s): BIOL 1710/1730 and 1720/1740 or equivalent.

**2241. Biology of Higher Plants.** 3 hours. Introduction to basic principles of form, function, ecology and evolution of plants, as well as modern topics related to plant adaptation in changing environments and the exploitation of plants by humans for improved quality of life in developing and developed countries. Prerequisite(s): BIOL 1710/1730 and 1720/1740 or equivalent.

**2301 (BIOL 2301). Human Anatomy and Physiology I.** 3 hours. Functional anatomy and physiology of the human body including biological chemistry, cell morphology, membrane and tissue physiology, musculoskeletal system and the nervous system. For kinesiology, dance majors and allied health students. Corequisite(s): BIOL 2311. *May be used to satisfy a portion of the Natural Sciences requirements of the University Core Curriculum.*

**2302 (BIOL 2302). Human Anatomy and Physiology II.** 3 hours. Functional anatomy and physiology of the human body including the endocrine, digestive, respiratory, cardiovascular, urinary and reproductive systems. For kinesiology, dance majors and allied health students. Corequisite(s): BIOL 2312. Prerequisite(s): BIOL 2301/2311. *May be used to satisfy a portion of the Natural Sciences requirements of the University Core Curriculum.*

**2311 (BIOL 2101). Human Anatomy and Physiology I Laboratory.** 1 hour. (0;3) Laboratory studies examining the functional anatomy and physiology of the human body including cell morphology, tissue histology, musculoskeletal anatomy and nervous system anatomy. For kinesiology, dance majors and allied health students. Corequisite(s): BIOL 2301. *May be used to satisfy a portion of the Natural Sciences requirements of the University Core Curriculum.*

**2312 (BIOL 2102). Human Anatomy and Physiology II Laboratory.** 1 hour. (0;3) Laboratory studies examining the functional anatomy and physiology of the human body including the endocrine, digestive, respiratory, cardiovascular, urinary and reproductive systems. For kinesiology, dance majors and allied health students. Corequisite(s): BIOL 2302. *May be used to satisfy a portion of the Natural Sciences requirements of the University Core Curriculum.*

**2381 (BIOL 2320). Applied Microbiology.** 3 hours. Introduction to microbiological concepts as applied to human activities with an emphasis on the microbiology of food. Survey of bacteria, viruses, fungi, and metazoa and their respective roles in the environment, disease, food production, and food spoilage. Control of microorganisms, food safety and regulations. Prerequisite(s): should be taken concurrently with BIOL 2382. May not be counted toward a major or minor in biology. For hospitality management and other non-science majors. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**2382 (BIOL 2120). Applied Microbiology Laboratory.** 1 hour. (0;3) Laboratory techniques for BIOL 2381. Prerequisite(s): BIOL 2381 (may be taken concurrently). May not be counted toward a major or minor in biology. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**2700. Human Evolution and Physical Anthropology.** 4 hours. (3;2) Study of human biological evolution from primate beginnings to the present era. Emphasis is placed upon anatomical and physiological variations and their adaptive significance. (Same as ANTH 2700.)

**2900-2910. Special Problems.** 1–3 hours each. Individual readings and laboratory research projects in the biological sciences.

**3000. Comparative Anatomy of Vertebrates.** 4 hours. (3;6) Development, anatomy and phylogenetic relationships of vertebrate organ systems. Laboratory studies of representative vertebrate animals. Prerequisite(s): 12 hours of biological sciences.

**3030. Careers in the Life Sciences.** 1 hour. Career choices and survival skills for the life sciences. Introduction to opportunities for life science majors in academia, industry, teaching and government, and information on preparation for these careers. Prerequisite(s): 15 hours of biology or junior standing.

**3050. Developmental Biology.** 4 hours. (3;3;1) Animal development including gametogenesis, embryogenesis, differentiation, growth, and cellular and molecular bases of these processes. Prerequisite(s): 12 hours of biological sciences.

**3150. Biology and Conservation of Birds.** 2 hours. (1;3) The anatomy, functional and behavioral adaptations and ecology of birds. Laboratory emphasis on field identification, behavior, habitats, migrations, food habits of birds. Population management and conservation practices. Prerequisite(s): 6 hours of biology or permission of instructor. Can be taken as optional supplement to BIOL 3160 or separately.

**3160. Biological Resource Conservation and Management.** 3 hours. Principles and values relating to natural biological resources; ecological concepts applied to resource management and protection of aquatic organisms, rangelands, forests and wildlife. Prerequisite(s): 6 hours of biological sciences.

**3170. Plants and Human Society.** 3 hours. Relationships of plants to the environment and human activities; impact of plants on human social development, history, economics and religion. Prerequisite(s): BIOL 1720/1740 or general biology.

**3331. Biomedical Criminalistics.** 3 hours. Survey of the various forensic sciences with emphasis on direct examination of human remains and directly related biological evidence; e.g. anthropology, pathology, odontology. Students learn how cases arise, i.e. how remains are located, recovered and processed. Supporting biological, clinical and physical sciences will also be covered; e.g. toxicology, entomology, DNA science, forensic geology/palynology and remote sensing. Prerequisite(s): CJUS 3330 or consent of department. (Same as ANTH 3331.)

**3350. Human Heredity.** 3 hours. Study of the fundamental principles of human genetics. Prerequisite(s): BIOL 1112. May not be counted toward a major in biology. For education, kinesiology, health promotion and allied health majors.

**3360. Heredity Lab.** 1 hour. (0;3) Laboratory exercises dealing with basic principles of Mendelian genetics, introductory cytogenetics and probability problems. May not be used to fulfill the requirements for the BA or BS in biology. For the minor in biology and education, kinesiology, health promotion and allied health majors. Prerequisite(s): BIOL 3350 (may be taken concurrently) or consent of instructor.

**3381. Medical Bacteriology.** 3 hours. Bacteria and disease; host-parasite relationships, immunology and epidemiology. Prerequisite(s): BIOL 2041/2042 and CHEM 2380.

**3382. Medical Bacteriology Laboratory.** 1 hour. (0;4) Laboratory techniques in medical bacteriology that emphasize the isolation and characterization of the clinical organisms, including techniques used in their control. Prerequisite(s): BIOL 3381 and CHEM 2380 (both may be taken concurrently).

**3451. Genetics.** 3 hours. Genetic structure and inheritance in viruses, bacteria and higher organisms with emphasis on gene biochemistry, Mendelian genetics and population genetics. Prerequisite(s): 8 hours of biological sciences and organic chemistry (may be taken concurrently) and admission to the biology/biochemistry major, or consent of department.

**3452. Genetics Laboratory.** 1 hour. (0;4) Laboratory studies examining classical transmission genetics and modern molecular genetics. Heavy emphasis on experimental crosses and application of molecular genetics. Prerequisite(s): BIOL 3451 (may be taken concurrently).

**3500. Medical Terminology.** 2 hours. Basic-level medical terminology using a word building system in a programmed learning format. Emphasis is on learning Latin and Greek prefixes and word roots and utilizing these to build medical terms. Recommended as advanced elective to assist students in preprofessional programs leading to working in medicine, physical therapy, and other health care fields or for those wishing to seek advanced degrees relating to human medical research. May not be counted for advanced division of science hours for the BA or BS in biology and biochemistry.

**3510. Cell Biology.** 3 hours. Structure and function of animal and plant cells with emphasis on cell membranes, cytoplasmic organelles and the nucleus. Prerequisite(s): 8 hours of organic chemistry or equivalent and admission to the biology/biochemistry major, or consent of department.

**3520. Cell Biology Laboratory.** 1 hour. (0;4) Laboratory studies emphasizing the isolation and characterization of subcellular organelles. Prerequisite(s): BIOL 3510 (may be taken concurrently).

**3800. Animal Physiology.** 3 hours. Cardiovascular, respiratory, renal, gastrointestinal, endocrine and neuromuscular function. Prerequisite(s): 8 hours of biological sciences, 8 hours of chemistry and 4 hours of physics; admission to the biology/biochemistry major, or consent of department.

**3810. Animal Physiology Laboratory.** 1 hour. (0;3.5) Experimental physiology with emphasis on membrane transport, neurophysiology, and cardiovascular, respiratory and muscle function. Prerequisite(s): BIOL 3800 (may be taken concurrently).

**4000. Plant Ecology.** 4 hours. (3;4) Role of plants in biological communities. Field and laboratory studies of the major local community types. Prerequisite(s): BIOL 1720/1740 or general biology.

**4005. Contemporary Topics in Biology.** 1–3 hours.

Contemporary topics in biological sciences. Specific titles vary but may include microbiology, molecular biology, physiology/neuroscience, ecology/environmental science, botany and zoology. May be repeated for credit as topics vary. Same topic may not be repeated at the graduate level as BIOL 5005. Prerequisite(s): junior or senior standing or consent of department.

**4006. Topics in Forensic Biology.** 1–3 hours. Topics include forensic entomology, forensic toxicology or forensic biology of the human skeleton. Prerequisite(s): junior or senior standing or consent of department. May be repeated for credit as topics vary. Same topic may not be repeated at the graduate level as BIOL 5006.

**4050. Animal Ecology.** 4 hours. (3;4) Role of animals in biological communities. Field and laboratory studies of the ecology of local fauna. Prerequisite(s): 6 hours of biological sciences. May not be counted toward a BA or BS degree in biology.

**4051. Community Ecology.** 3 hours. Structure, dynamics and diversity of biotic communities and ecosystems. Focus on population interactions, niche relationships and processing of matter and energy. Prerequisite(s): 6 hours of biology including BIOL 2140. May not be repeated at the graduate level as BIOL 5051.

**4052. Community Ecology Laboratory.** 1 hour. (0;4) Field and laboratory exercises on distribution, dispersion, abundance and diversity of organisms and their populations. Focus on quantitative description of biotic communities and ecosystems. Prerequisite(s): BIOL 4051 (may be taken concurrently) or consent of department. May not be repeated at the graduate level as BIOL 5052.

**4070. Insect Biology.** 4 hours. (3;3) Morphology, physiology, ethology, classification and control of insects and related arthropods. Prerequisite(s): 6 hours of biological sciences. May not be repeated at the graduate level as BIOL 5070.

**4080. Radiation Safety.** 1 hour. (1;0) Radiation sources, interaction of radiation with matter and human tissues, radiation measurement and dosage, instrumentation, regulations and practical safety procedures. Meets state training requirements for use of radioactive isotopes or radiation producing equipment. Prerequisite(s): 12 hours of biology, chemistry, or physics, or combination of the three. May not be repeated at the graduate level as BIOL 5080. (Same as BIOL 5080.)

**4091. Parasitology.** 3 hours. Biology, ecology and classification of animal parasites; immunology and physiology of host-parasite interaction. Prerequisite(s): 8 hours of biology. May not be repeated at the graduate level as BIOL 5091.

**4092. Parasitology Laboratory.** 1 hour. (0;3) Laboratory studies on the basic identification and transmission of common eukaryotic parasites of humans with heavy emphasis on identification of organisms using preserved and fresh preparations and the study of parasite morphology. Prerequisite(s): BIOL 4091 (may be taken concurrently).

**4100. Introduction to Environmental Impact Assessment.** 3 hours. Principles and practices of preparing environmental impact assessments and statements. Addresses how to understand the effects that projects, plans and policies have on the environment and the impact those effects have on specific resources, ecosystems and human communities. Methods for identifying impacts, describing the affected

environment, predicting and assessing impacts and selecting the proposed action from a group of alternatives for meeting specified needs are examined. Prerequisite(s): two semesters of biology to include ecology, one semester of chemistry and one semester of college level math. May not be repeated at the graduate level as BIOL 5100.

**4110. Endocrinology.** 3 hours. Regulation of physiological processes in animals by hormones and related chemical agents. Prerequisite(s): BIOL 3800 or equivalent, or consent of department. May not be repeated at the graduate level as BIOL 5110.

**4130. Economic Botany.** 3 hours. Distribution, production, history and botany of plants of economic importance. Prerequisite(s): BIOL 1720/1740 or equivalent.

**4160. Advanced Techniques in Microbiology and Molecular Biology.** 4 hours. (1;4) Intensive laboratory exercises in cultivation, analysis and gene transfer in bacterial mutants. Emphasis on techniques for studying macromolecular and enzyme synthesis, preparation and analysis of plasmid DNA, cloning and gene expression. Prerequisite(s): microbiology and biochemistry or cell biology; concurrent enrollment in BIOL 4170. May not be used for advanced biology hours for the biology BA. May not be repeated at the graduate level as BIOL 5160. Offered only in a five-week summer session.

**4170. Advanced Techniques in Microbiology and Molecular Biology Laboratory.** 2 hours. (0;3) Continuation of BIOL 4160 lab exercises. Prerequisite(s): concurrent enrollment in BIOL 4160.

**4180. Techniques in Molecular Biology.** 4 hours. (1;4) Advanced molecular biology laboratory methodology. Techniques include gene cloning, plasmid purification, restriction analysis, DNA fingerprinting and DNA sequencing. Prerequisite(s): BIOL 2041/2042, BIOL 3451/3452 and organic chemistry or consent of department; concurrent enrollment in BIOL 4190. May not be used for advanced biology hours for the BA in biology. May not be repeated at the graduate level as BIOL 5180. Offered summer only.

**4190. Techniques in Molecular Biology Lab.** 2 hours. (0;3) Continuation of BIOL 4180 lab exercises. Prerequisite(s): concurrent enrollment in BIOL 4180.

**4201. Immunology.** 3 hours. Immune defense mechanisms including immunobiology, immunochemistry, immunogenetics, immune response to infectious agents, allergy and autoimmune diseases. Prerequisite(s): CHEM 2380 (may be taken concurrently). May not be repeated at the graduate level as BIOL 5201.

**4202. Immunology Laboratory.** 1 hour. (0;4) Laboratory studies on the basic anatomy of the immune system and analytical techniques and experimental design in immunology. Prerequisite(s): BIOL 4201 (may be taken concurrently). May not be repeated at the graduate level as BIOL 5202.

**4220. Neuropsychopharmacology.** 3 hours. Comprehensive examination of the physiological effects of major psychotropic drug classes that affect the central nervous system, including the interactions between neurotransmitter systems and physiology; neuroanatomical pathways and behavior; synaptic functions and behavioral disorders. Open to all majors. Prerequisite(s): junior standing. May not be repeated at the graduate level as BIOL 5220.

**4240. Forensic Microscopy.** 3 hours. (2;4) Introduction to microscopic analysis with emphasis on the fundamentals necessary for identification and characterization of trace evidence materials such as glass, hair, fibers, explosives, soil, paint and biological samples. Prerequisite(s): successful completion of a minimum of 60 semester hours; 8 hours organic chemistry; CJUS 3330; BIOL 3331, 3451/3452 and admission to Biomedical Criminalistics Certificate or consent of department.

**4250. Pharmacology: Biological Basis of Drug Action.** 3 hours. An overview of pharmacology based on principles of drug action; emphasis on drugs by class, and not specific drugs per se. General principles, antibiotics and pharmacology of the autonomic, cardiovascular, central nervous and endocrine systems. Prerequisite(s): BIOL 3800 and second term/semester organic chemistry (may be taken concurrently) or consent of instructor. May not be repeated at the graduate level as BIOL 5150.

**4260. Principles of Evolution.** 3 hours. Population genetics; ecological, geographical and historical concepts of evolution. Prerequisite(s): BIOL 3350 or 3451/3452, or equivalent. May not be repeated at the graduate level as BIOL 5260.

**4280. Aquatic Botany.** 3 hours. (2;3) Ecology, identification and management of aquatic plants and algae. Special emphasis on the role of aquatic plants in reservoir and river ecosystems. Prerequisite(s): 8 hours of biology. May not be repeated at the graduate level as BIOL 5280.

**4300. Histology.** 4 hours. (2;5) Microstructure and ultrastructure of animal cells and tissues; relationship of structure and function in tissues and organs. Laboratory studies of tissue structure using the light microscope. Prerequisite(s): 12 hours of biology.

**4360. Bioanalytical Chemistry.** 4 hours. (3;3) Principles of chromatographic and detection systems. Recent advances in separation sciences and their applications to the analysis of chiral amino acids, proteins, DNA sequence, vitamins and toxicants in biological and environmental samples. Laboratory experiments illustrate methods used in biochemistry, biotechnology, toxicology and environmental sciences. Prerequisite(s): 16 hours of chemistry.

**4380. Fundamentals of Aquatic Toxicology.** 3 hours. (2;3) Theory and methodologies used by scientists, regulatory agencies and industry to measure the impact of man's activities on freshwater aquatic ecosystems. The course has its foundations in history, but concentrates on current methodologies and theories. Prerequisite(s): 8 hours each of chemistry and biology. May not be repeated at the graduate level as BIOL 5380.

**4400. Wetland Ecology and Management.** 4 hours. (3;4) Ecology and management of various types of wetlands with emphasis on the role of aquatic and wetland plants in determining wetland structure and function. Wetland restoration and creation for wildlife habitat or water quality benefits are reviewed. Prerequisite(s): 8 hours of biological sciences. May not be repeated at the graduate level as BIOL 5400.

**4420. Invertebrate Biology.** 4 hours. (3;3) Biology of non-vertebrate animals with emphasis on phylogenetic relationships and anatomical, physiological and behavioral adaptation to varied environments. Prerequisite(s): 12 hours of biological sciences. May not be repeated at the graduate level as BIOL 5520.

**4440. Stream Ecology.** 4 hours. (3;4) Ecological principles of how stream dynamics influence the biological and hydrologic patterns and processes occurring in stream ecosystems. Laboratory studies designed to teach techniques and test hypotheses related to environmental assessment. Prerequisite(s): 3 hours of ecology. May not be repeated at the graduate level as BIOL 5440.

**4460. Eukaryotic Genetics.** 3 hours. Research and theory in eukaryotic genetics with an emphasis in metazoan genetic model systems and human genetics, including chromosome structure, genomic analysis, developmental genetics and diseases. Prerequisite(s): BIOL 3451/3452 and 3510/3520; previous or concurrent enrollment in molecular biology or biochemistry recommended. May not be repeated at the graduate level as BIOL 5460.

**4480. Medical Genetics and Genetic Counseling.** 3 hours. Human genetics including cytogenetics, immunogenetics, population genetics, molecular genetics, human biochemical genetics and genetic counseling. Prerequisite(s): 12 hours of biology, including BIOL 3350 or 3451/3452 or equivalent, and 8 hours of organic chemistry or equivalent. May not be repeated at the graduate level as BIOL 5840.

**4501. Bacterial Diversity and Physiology.** 3 hours. Comparative survey of bacteria. Growth, ecology, metabolism, energy transformations, differentiation and adaptive mechanisms. Prerequisite(s): BIOL 2041/2042 and at least one term/semester of organic chemistry. May not be repeated at the graduate level as BIOL 5501.

**4502. Bacterial Diversity and Physiology Laboratory.** 1 hour. (0;3) Isolation of bacteria from nature. Enrichment methods, morphology, enumeration of bacterial growth and enzymes. Prerequisite(s): BIOL 4501 (may be taken concurrently). May not be repeated at the graduate level as BIOL 5502.

**4503. Plant Physiology.** 3 hours. Plant physiology from the molecular to organismal level with ecosystem considerations. Topics include nutrient acquisition and distribution, biochemistry and metabolism, growth and development. Prerequisite(s): BIOL 1710/1730 and 1720/1740; CHEM 2370/ 3210; previous or concurrent enrollment in cell biology, genetics or biochemistry recommended. May not be repeated at the graduate level as BIOL 5503.

**4504. Plant Physiology Laboratory.** 1 hour. (0;3) Companion laboratory to BIOL 4503. Prerequisite(s): BIOL 4503 (may be taken concurrently).

**4505. Comparative Animal Physiology.** 3 hours. Comparison of structure and physiological function in a wide variety of animals. Emphasis on thermoregulation and on respiratory, circulatory, excretory, endocrine and digestive systems. Prerequisite(s): BIOL 1710/1730 and 1720/1740 or equivalent. May not be repeated at the graduate level as BIOL 5505.

**4506. Comparative Animal Physiology Laboratory.** 1 hour. (0;3.5) Experimental studies of physiological function in animals to arrive at an understanding of how different animal systems work. Emphasis on energetics, thermoregulation, and osmoregulation along with muscular, respiratory and cardiovascular function. Prerequisite(s): BIOL 4505 (may be taken concurrently).

**4530. Virology.** 3 hours. Molecular biology of viruses infecting bacteria, plants and animals; interaction of viruses and host cells; viral genetics; replication, pathogenesis, oncology, immunology, chemotherapy and vaccines. Prerequisite(s): BIOL 2041/2042.

- 4540. Virology Laboratory.** 1 hour. (0;4;0) Growth and cultivation of bacterial viruses including the production and purification of viral stocks. The use of bacteriophage as model systems to study virus reproduction and cellular metabolism, and as tools in modern molecular biology to study genetic processes. Prerequisite(s): BIOL 4530 (may be taken concurrently), or consent of department.
- 4560. Aquatic Insects of North America.** 4 hours. (3;4) Ecology, sampling methods, systematics and classification of Nearctic aquatic insects at the family level; use of keys and key terminology in aquatic insect identification. Prerequisite(s): invertebrate zoology or entomology, or consent of department. May not be repeated at the graduate level as BIOL 5570.
- 4570. Biochemistry and Molecular Biology of the Gene.** 3 hours. Mechanisms and regulation of genetic expression, chromosome replication, mutagenesis and DNA repair, and gene cloning in prokaryotic and eukaryotic systems. May not be used to satisfy minor requirements in chemistry. Prerequisite(s): at least one of the following: BIOL 3451/3452, 3510/3520 or BIOC 4540. (Same as BIOC 4570.)
- 4580. Molecular Biology and Biotechnology Laboratory.** 2 hours. (0;5;0) Experiments in recombinant DNA techniques, gene regulation and other areas of molecular biology. Prerequisite(s): BIOL 4570 (may be taken concurrently) or BIOL 4770 (may be taken concurrently), or consent of department. May not be repeated at the graduate level as BIOL or BIOC 5580. (Same as BIOC 4580.)
- 4620. Human Development – Conception Through Childhood.** 3 hours. Basic embryology, human reproduction, child development including both physiological and cognitive from the neonatal period through the teenage years. Prerequisite(s): 8 hours of biological sciences and junior standing or consent of department. May not be repeated at the graduate level as BIOL 5620.
- 4630. Human Teratology.** 3 hours. Principles of teratology and embryology, including study strategies, reproduction toxicants, drugs and lactation, risk assessment, and known human teratogenic agents. Prerequisite(s): 8 hours of biological sciences and junior standing or consent of department. May not be repeated at the graduate level as BIOL 5630.
- 4650. Environmental Science Field Course.** 6 hours. (3;8) Advanced field course primarily emphasizing the biological, ecological, natural history and philosophical attributes of various habitats or ecoregions. Topics and field experience may vary from desert river systems to alpine limnology to coastal estuaries. Prerequisite(s): junior standing and consent of department. May be repeated as topics vary. The same topic may not be repeated at the graduate level as BIOL 5650 or 5670.
- 4700. Procedures and Materials for Science Instruction.** 3 hours. (2;4) Problems, techniques and procedures for classroom and laboratory experiences based on current science education research. Recommended for students who are obtaining secondary teacher certification in a science field. Field experience in the public schools is a required component. Prerequisite(s): 18 hours of biology, completion of freshman and sophomore science courses required for certification, and consent of department. Does not count as an elective toward a major or minor in biology except for students seeking certification. May not be repeated at the graduate level as BIOL 5700. (Same as CHEM 4700 and PHYS 4700.)
- 4720. Sediment Toxicology.** 3 hours. Mechanisms of contaminant transport and fate in freshwater marine sediments and pollutant effects at the individual, population and biotic community levels. Sediment contaminant bio-availability and bioaccumulation into food webs and the scientific aspects of legal control and remediation of hazardous sediments. Prerequisite(s): one year of chemistry and biology, or consent of department. May not be repeated at the graduate level as BIOL 5720.
- 4750. Neuroscience.** 3 hours. Brain chemistry, physiology and anatomy; neural basis of memory, perception, rhythms, emotion, cognition; development of the nervous system; neurological disorders. Prerequisite(s): 16 hours of biology or consent of department. May not be repeated at the graduate level as BIOL 5750.
- 4760. Neurobiology Laboratory.** 1 hour. (0;3) Vertebrate neuroanatomy and experimental neurobiology using electrophysiological and behavioral methods. Prerequisite(s): BIOL 4750 (may be taken concurrently). May not be repeated at the graduate level as BIOL 5760.
- 4770. Biotechnology.** 3 hours. Applications of biotechnology in today's society. Emphasis on molecular biotechnology and its applications in industry, agriculture, medicine and forensic science. Students may enroll in BIOL 4580 for the companion laboratory component. Prerequisite(s): BIOL 2041/2042 and 3350 or 3451/3452.
- 4800. Biological Sciences Seminar Series.** 1 hour. A weekly seminar series covering a broad range of biological research topics. Invited speakers are prominent local, regional or national researchers. Maximum of 2 hours may be used toward advanced biology electives in the BS Biology degree, but not the BA degree with a major in biology. Prerequisite(s): 12 hours of biological science and admission to the biology/biochemistry major, or consent of department. May be repeated for credit.
- 4900–4910. Special Problems.** 1–3 hours each. Individual readings and laboratory research projects in biological sciences. Prerequisite(s): approval of supervisory faculty member, proposal filed in department advising office prior to registration and junior or senior standing. Three hours may be applied to advanced biology electives for the BS degree, but not the BA degree in biology.
- 4920. Cooperative Education in Biological Sciences.** 1–3 hours. Supervised work in a job directly related to the student's major, professional field of study or career objective. Prerequisite(s): 12 hours of credit in biological sciences; student must meet employer's requirements and have consent of department. May not count toward a major or minor in biological sciences. May be repeated for credit.
- 4930. Special Problems.** 1–3 hours. Individual study. Prerequisite(s): junior or senior standing and approval of supervising faculty member and/or consent of department.
- 4940. Honors Research in Biology.** 3 hours. Advanced original independent research supervised by a faculty member in the biological sciences. For students interested in pursuing careers in research or medicine. May not be applied to the biology requirements for the BA degree in biology. Prerequisite(s): 3.25 GPA or better in the sciences, at least 20 hours of biology and 16 hours of chemistry, junior or senior standing and departmental approval.
- 4950. Honors Thesis in Biology.** 3 hours. A continuation of BIOL 4940 involving advanced original independent research culminating in a written report supervised by a faculty member in the biological sciences. The results are written in standard thesis format and presented orally. For students interested in pursuing careers in research or medicine. May not be applied to the biology requirements for the BA degree in biology. Prerequisite(s): BIOL 4940 and departmental approval.

**4951. Honors College Capstone Thesis.** 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

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## Business Administration, College of

### **Business Administration, Interdepartmental, BUSI**

**1200. Careers and Professional Development Strategies for Business.** 1 hour. Introduces students to the process of business career exploration through integrating knowledge of self with knowledge of business career opportunities. Explores career opportunities within the disciplines of business (professional field choices) through a variety of sources. Introduces students to professional development activities and academic strategies/planning techniques that can work to enhance their business education and assist in timely completion of a business degree. Pass/no pass only.

**1340. The Free Enterprise System in a Global Environment.** 3 hours. Study of the free enterprise system in a global social, economic, and political environment. Overview of influence of global competition on the disciplines of business administration with particular emphasis on such markets as the Pacific Rim, Latin America, Europe, and the OPEC nations. Open to all university students regardless of major. Cannot be used to meet business foundation, business professional field, or business supporting field requirements. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.*

**2900. Special Problems.** 1–3 hours.

**3400. Readings in Business.** 1–3 hours. Reading books influencing American business philosophy; reading for pleasure; study of current problems reported in business periodicals. (Credit varies depending upon amount and types of reading.)

**4660. International Business Operations.** 3 hours. Foreign operations of American firms and impact of foreign competition on the domestic market; organization for foreign production, marketing and finance; foreign markets, resources, institutions and managerial problems arising out of governmental relations. Prerequisite(s): MKTG 3650, FINA 3770 and senior standing.

**4700. Topics in Mexican Business Practices and Policies.** 3 hours. Topics include analysis of issues in accounting, marketing, management, finance, the legal environment, or information systems of Mexican companies and of U.S. companies dealing with Mexican counterparts. Students are introduced to the Mexican way of doing business and the role culture plays in transacting business with Mexican companies. Prerequisite(s): ACCT 2010 and 2020; MGMT 3330; and MKTG 3010 or BCIS 3615. May be repeated for credit as topics vary, for up to 9 hours of credit. Taught in Mexico.

**4900. Special Problems.** 1–3 hours.

**4940. Business Policy.** 3 hours. Enterprise management integrating the functional areas of business administration into a realistic approach to business problems; applying

principles to complex problems at the executive level. Prerequisite(s): completion of all other business foundation courses with a grade of C or better and senior standing. To be taken during the last term/semester of course work.

**4951. Honors College Capstone Thesis.** 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

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## Business Computer Information Systems

see Information Technology and Decision Sciences

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## Business Law

see Finance, Insurance, Real Estate and Law

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## Center for Public Service

see Public Service

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## Chamber Music

see Music

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## Chemistry

### **Chemistry, CHEM**

**1360. Context of Chemistry.** 3 hours. (3;2) Fundamentals of chemistry for students who are not science majors. Applications of chemistry to its role in the world. Topics include historical and philosophical development of modern chemistry, the environment, energy, industrial and economic development, modern materials, popular perspectives of chemistry. Includes laboratory. May not be counted toward a major or minor in chemistry. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1410-1420. General Chemistry for Science Majors.** 3 hours each. (3;0;1\*) \*This hour is a problem-solving session.

**1410 (CHEM 1311).** Fundamental concepts, states of matter, periodic table, structure and bonding, stoichiometry, oxidation and reduction, solutions, and compounds of representative elements. Prerequisite(s): MATH 1100 or equivalent. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**1420 (CHEM 1312).** Thermodynamics, reaction rates, equilibrium, electrochemistry, organic chemistry, polymers, radioactivity and nuclear reactions. Prerequisite(s): CHEM 1410 or 1413 or consent of department. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*