

ARTS 6377–BIOL 1407

mixed or experimental media and techniques. May be repeated. Formerly ART 5545.

- ARTS 6377 Special Problems in Computer Art. (3 0 0-6)**
Prerequisite: 3377 or consent of instructor. Advanced projects in computer art. Individual exploration of computer imagery with emphasis on content and production of major professional-quality pieces. May be repeated once. Fall, spring. Formerly ART 5546.
- ARTS 6378 Special Problems in Illustration. (3 0 0-6)** Prerequisite: 4379. Advanced individual exploration of problems in illustration. May involve work in mixed media or experimental techniques. May be repeated. Formerly ARTS 5561.
- ARTS 6394 M.A. Project. (3 0 0,6*)** Advanced exploration and research in the student's major studio area culminating in the execution of a major studio project and exhibition of the project. Must be repeated once. Classes may meet on a TBA schedule. Fall, spring. Formerly ART 5590.
- ARTS 6395 Problems in Art History. (3 0-3 0)** Prerequisite: six hours advanced art history. Advanced exploration and research in art history. May be repeated. Fall, spring. Formerly ART 5551.
- ARTS 6397 Research Problems in Art History. (3 0-3 0)** Prerequisite: six hours advanced art history. Advanced individual research in art history. Topics to be selected in conference with adviser. May be repeated. Fall, spring. Formerly ART 5553.
- ARTS 7302 M.F.A. Terminal Project/Thesis. (3,6 0 0,12*)** Formerly ART 5602.

*Classes may meet on a TBA schedule. Fall, spring.

ATTR—Athletic Training

(Offered through the Department of Sports and Exercise Sciences.)

- ATTR 2271 Clinical Experience in Athletic Training I. (2 1 2)**
Prerequisite: admission to the Athletic Training Education Program (ATEP). First of six athletic-training, clinical-education courses. Foundations to pursue an athletic-training career. Formerly AT 261.
- ATTR 2272 Clinical Experience in Athletic Training II. (2 1 2)**
Prerequisite: 2271. Second of six athletic-training, clinical-education courses. Athletic-training experience with pre-season, athletic-training administrative and athletic-training service provision. Formerly AT 262.
- ATTR 2371 Athletic Training I. (3 2 2)** Prevention, care and rehabilitation of athletic injuries and illnesses. Formerly SES 210.
- ATTR 2372 CPR for the Health Professional. (3 3 0)** Course will provide student the ability to recognize and care for breathing and cardiac emergencies using professional rescuer techniques. Acute care for injuries and sudden illness, prevention of disease transmission, use of automated external defibrillation.
- ATTR 3263 Clinical Experience in Athletic Training III. (2 1 2)**
Prerequisite: 2272. Third of six athletic-training, clinical-education courses. Athletic-training experience with equipment-intensive sports and knowledge regarding common injuries during collision-type activities. Formerly AT 363.
- ATTR 3264 Clinical Experience in Athletic Training IV. (2 1 2)**
Prerequisite: 3263. Fourth of six athletic-training, clinical-education courses. Common injuries associated with throwing sports. Formerly AT 364.

- ATTR 3308 Therapeutic Exercise. (3 2 2)** Prerequisite: 2371, SES 3302. Designed for student to attain competency in procedures and techniques used in sports rehabilitation. Specific indications, contraindications, physiological effects and resistance methods. In laboratory setting, the student will demonstrate the ability to develop, instruct, and evaluate rehabilitation and reconditioning programs. Formerly AT 308.
- ATTR 3309 Therapeutic Modalities. (3 2 2)** Prerequisite: 2371. Designed for student to attain competency in application and use of modalities in treating injuries. Exploration of wound healing, thermal, electrical and mechanical agents. In laboratory setting, student will demonstrate the ability to develop, implement and evaluate modality treatment programs. Formerly AT 309.
- ATTR 3331 Athletic Training Evaluation I—Lower Extremity. (3 2 2)** Prerequisite: 2371. Lower-extremity and lumbar spine evaluation techniques and injury/illness conditions to assist in assessment of injuries. In laboratory setting, student will identify and demonstrate accepted techniques and procedures for clinical evaluation of athletic injuries/illnesses. Formerly AT 331.
- ATTR 3332 Athletic Training Evaluation II—Upper Extremity. (3 2 2)** Prerequisite: 2371. Upper-extremity, head and cervical spine evaluation techniques and injury/illness conditions to assist in assessment of injuries. In laboratory setting, student will identify and demonstrate accepted techniques and procedures for clinical evaluation of athletic injuries/illnesses. Formerly AT 332.
- ATTR 4265 Clinical Experience in Athletic Training V. (2 1 2)**
Prerequisite: 3264. Fifth of six athletic-training, clinical-education courses. Experience with common injuries associated with running sports. Formerly AT 465.
- ATTR 4266 Clinical Experience in Athletic Training VI. (2 1 2)**
Prerequisite: 4265. Capstone of six athletic-training, clinical-education courses with specific exposure to general medical, high-school and non-traditional athletic training practice settings. Broad-based internship experience outside the University athletic-training setting. Practical experiences directed by interacting with clinical instructor and assisting in athletic training as assigned by clinical instructor. Formerly AT 466.
- ATTR 4412 Advanced Athletic Training. (4 3 2)** Prerequisite: 3331, 3332 or consent of instructor. Current trends in athletic training. Emphasis on evaluation of thorax, abdomen and non-orthopedic injuries and illnesses, pharmacology, and activities of professional preparations, credentialing, continuing education and practice settings. Formerly AT 412.

BIOL—Biology

(Offered through the Department of Life, Earth and Environmental Sciences.)

- BIOL 1406 Basic and Contemporary Biology I. (4 3 2)**
Introduction to principles and concepts of biological sciences. Contemporary problems in biology are integrated into discussion of principles and concepts in the lecture and experiments demonstrate principles and concepts in the lab. May not receive credit for both BIOL 1406 and NSCI 2372. Fall, spring, summer I. Formerly BIOL 101.
- BIOL 1407 Basic and Contemporary Biology II. (4 3 2)**
Prerequisite: 1406. Continuation of discussion of basic principles, and concepts of biology sciences in the lecture coupled with experiments to demonstrate principles

- and concepts in the lab. Fall, spring, summer II. Formerly BIOL 102.
- BIOL 1411 Botany. (4 3 2)** Introduction to botanical principles including structure and functions of leaves, stems, roots, seeds and fruits. Basic cell chemistry, plant and community ecology, taxonomy, reproduction and natural selection with laboratory investigations and observations of cells, leaves, stems, roots, plant physiology and ecology. Fall, spring. Formerly BIOL 122.
- BIOL 1413 Zoology. (4 3 2)** General zoological principles, including life histories and classification of invertebrates and vertebrates with laboratory investigations of various zoological principles and study of representative organisms. Fall, spring. Formerly BIOL 121.
- BIOL 2374 Wildlife Conservation. (3 3 0)** Introduction to principles of wildlife ecology and management with emphasis on North American wildlife. Fall. Formerly BIOL 204.
- BIOL 2401 Human Anatomy and Physiology I. (4 3 2)** Introduction to basic biological principles as applied to the human. Detailed studies of the human body plan, terminology and the integumentary, skeletal, muscular and nervous systems. Fall, spring. Formerly BIOL 240.
- BIOL 2402 Human Anatomy and Physiology II. (4 3 2)** Prerequisite: 2401 or equivalent. Continuation of 2401. Endocrine, digestive respiratory, cardiovascular and blood, lymphatic, urinary and reproductive systems. Cannot receive credit for both 2402 and 3440. Fall, spring. Formerly BIOL 241.
- BIOL 2420 Applied Microbiology. [BIOL 2420] (4 3 2)** Prerequisite: four hours of biology. General review of characteristics of microorganisms and how activities of microbes relate to public health and industry. Not open to biology and allied-health majors. Cannot receive credit for both 2420 and 2572. Fall, summer I. Formerly BIOL 210.
- BIOL 2572 Microbiology. (5 3 4)** Prerequisite: four hours of biology. Fundamental biological processes observed in microorganisms together with beneficial and harmful activities related to man and other forms of life. Cannot receive credit for both 2420 and 2572. Fall, spring. Formerly BIOL 212.
- BIOL 3092 Special Topics. (1-6 0-6 0-12)** Prerequisite: consent of instructor. Consideration of recent advances in biology. Formerly BIOL 399.
- BIOL 3099 Field Biology. (1-8 0-8 0-16)** Field trips to various ecological areas. Practice in procurement, analysis and evaluation of both extensive and intensive data on plants, invertebrates and vertebrates. Summer. Formerly BIOL 325.
- BIOL 3301 Genetics. (3 3 0)** Principles of genetics and the bearing that recent developments in the field of genetics have on modern concepts of plant and animal biology. Cannot receive credit for both BIOL 3301 and AGRI 3301. Same as AGRI 3301. Fall, spring. Formerly BIOL 301.
- BIOL 3303 Human Genetics. (3 3 0)** Modern principles of genetics applied to both normal and abnormal characteristics of human beings. Summer. Formerly BIOL 303.
- BIOL 3312 Environmental Microbiology. (3 2 2)** Prerequisite: 2420 or 2572. Role of microorganisms in maintaining the balance in nature, disposing of human pollution through bioremediation and future use of non-polluting pesticides, herbicides and chemical synthesizers. Spring of odd years. Formerly BIOL 312.
- BIOL 3331 Parasitology. (3 3 0)** Important parasites affecting man and domestic animals with concentration on protozoans and helminths. Spring of odd years. Formerly BIOL 331.
- BIOL 3340 Reproductive Physiology. (3 2 2)** Prerequisite: 2401 or ANSC 1319 or consent of instructor. Anatomy and physiology of reproduction in mammals. Includes hormones, reproductive communications, cycles, spermatogenesis, folliculogenesis, oogenesis, ovulation, gestation, parturition, lactation and reproductive management techniques. Same as ANSC 3340.
- BIOL 3345 Fisheries Techniques. (3 2 2)** Prerequisite: 2374 or consent of instructor. Laboratory and field techniques used in management of fishes in Texas and southwest United States. Formerly BIOL 345.
- BIOL 3350 Hematology. (3 2 2)** Characteristics of the formed elements of blood and their relationship to physiological and pathological processes. Fall. Formerly BIOL 350.
- BIOL 3385 Marine Biology. (3 3 0)** Chemical and physical characteristics of major ocean habitats and organisms occupying those habitats. Analysis of man's impact on oceans and the potential of oceans as a food source. Spring of even years. Formerly BIOL 385.
- BIOL 3402 Cell Biology. (4 3 2)** Prerequisite: CHEM 2525 or permission of instructor. Morphology, anatomy, physiology and biochemistry of cells as the basic structural unit of life. Spring. Formerly BIOL 302.
- BIOL 3404 Evolution. (4 3 2)** Prerequisite: genetics or permission of instructor. Nature of the evolutionary process; history and philosophical issues, including creationism. Spring of even years. Formerly BIOL 304.
- BIOL 3406 Paleontology. (4 3 2)** Prerequisite: GEOL 1404 or BIOL 1413 or permission of instructor. Origin, classification, morphology, evolution, paleoecology, geographic distribution and geologic occurrences of fossil animals. Field collecting. Identification and museum preparation of fossils in the laboratory. Same as GEOL 3406. Spring of even years. Formerly BIOL 306.
- BIOL 3411 Arthropods and Public Health. (4 3 2)** Prerequisite: 1406, 1407, or 1413. Arthropods (insects and arachnids) which directly or indirectly affect the health of man. Spring of even years. Formerly BIOL 311.
- BIOL 3418 Wildland Soils. (4 3 2)** Formation, properties, classification, distribution and problems of soils of uncultivated lands. Fall of even years. Formerly BIOL 318.
- BIOL 3420 Natural History of Vertebrates. (4 3 2)** Classification, taxonomy and distribution of vertebrates. Spring of even years. Formerly BIOL 320.
- BIOL 3424 Wildlife Management Techniques. (4 2 4)** Prerequisite: 2374. Laboratory and field techniques used in management of game mammals, non-migratory and migratory game birds. Techniques in management of populations of non-game birds and mammals. Spring of odd years. Formerly BIOL 324.
- BIOL 3440 Anatomy and Physiology of Humans. (4 3 2)** Basic structure and functioning of organ systems of the human. Cannot receive credit for both 2402 and 3440. Summer I. Formerly BIOL 340.
- BIOL 3451 Histology. (4 3 2)** Microscopic anatomy of normal animal and human tissues and organs. Fall. Formerly BIOL 351.
- BIOL 3452 Embryology. (4 3 2)** Prerequisite: 2402 or 3440 or consent of instructor. Embryonic development and morphogenesis in vertebrates with emphasis on human development. Spring. Formerly BIOL 352.

BIOL 3510-4460

- BIOL 3510 Entomology. (5 3 4)** General biology of insects: structure, function, ecology, importance and classification. Fall of odd years. Formerly BIOL 310.
- BIOL 3521 Invertebrate Zoology. (5 3 4)** Prerequisite: 1413 or consent of instructor. Biology of invertebrate animals, including natural history, classification, phylogeny, basic anatomical design and function. Formerly BIOL 321.
- BIOL 3522 Comparative Anatomy. (5 3 4)** Anatomy of representative vertebrate animals. Lecture and laboratory observations of structural variations that occur among vertebrate animals with emphasis on aquatic and terrestrial forms. Fall. Formerly BIOL 322.
- BIOL 3532 Plant Classification. (5 3 4)** Prerequisite: 1407 or 1411 or permission of instructor. Classification of spermatophytes, including vocabulary describing characters, ordinal and familial characteristics, systems of classification and nomenclature. Fall of even years. Formerly BIOL 332.
- BIOL 3575 Medical Microbiology. (5 3 4)** Prerequisite: four hours of microbiology or permission of instructor. Characteristics of disease-causing microorganisms with emphasis on pathogenic bacteria. Formerly BIOL 375.
- BIOL 4095 Problems. (1-6 0 0)** Prerequisite: at least 24 hours of biology and permission of department head. Problems course in biology not covered by regular courses. Not to be used as one of the eight courses for a biology major except under special conditions arranged through the department head and dean. Fall, spring, summer I, summer II. Formerly BIOL 421.
- BIOL 4097 Research. (2-4 0 0)** Selected individual research problems. Completion of a problem which is much more extensive than problems encountered in normal class work. Fall, spring, summer I, summer II. Formerly BIOL 498.
- BIOL 4098 Internship in Wildlife/Fisheries. (1-6 0 0)** Prerequisite: consent of instructor and 60 hours of course work. One semester internship with state, federal or private professional agency to observe and participate in daily operations under supervision of co-operating agency personnel involved in wildlife and/or fisheries conservation or management. Not to be used as one of the eight courses for a biology major. Fall, spring, summer I, summer II. Formerly BIOL 490.
- BIOL 4099 Internship in Health Care. (1-6 0 0)** Prerequisite: consent of department head and 60 hours course work. One semester internship with a private, county, state or federal institution that will provide the student with additional experience and training for their desired occupation. Not to be used as one of the eight courses for a biology major. Fall, spring, summer I, summer II. Formerly BIOL 491.
- BIOL 4335 Animal Behavior. (3 3 0)** Psychobiology: behavior of non-human animals, behavior of vertebrates. Fall of even years. Formerly BIOL 435.
- BIOL 4351 Conservation Biology. (3 3 0)** Prerequisite: 3424 or 4510 or consent of instructor. Fundamentals of the theory, techniques and applications of conservation ecology as it relates to maintenance of biodiversity and sustainable management of the biosphere. Includes elements from population genetics; biogeography; habitat management, public policy and design strategies for natural preserves. Formerly BIOL 450.
- BIOL 4365 Marine Fisheries. (3 3 0)** Prerequisite: consent of instructor. Survey of fisheries for marine vertebrates and invertebrates primarily in the Gulf of Mexico and South Atlantic with emphasis on their biology, economics and management. Spring of even years. Formerly BIOL 465.
- BIOL 4375 Immunology and Serology. (3 3 0)** Investigation into theories of the human body's defense mechanisms against infection and study of human blood (serology) as a diagnostic tool to detect and evaluate infection. Summer I. Formerly BIOL 475.
- BIOL 4393 Honors. (3 0 0)** Prerequisite: senior standing and approval of department head. Completion of a senior thesis or research project by a student who is a candidate for graduation with honors in the department. Formerly BIOL 499.
- BIOL 4401 Molecular Cytogenetics. (4 3 2)** Prerequisite: 3301. Advanced course in molecular cytogenetics focusing on mechanisms and cytological interpretation of eukaryotic karyotypes and chromosomal aberration. Laboratory will include classic cytogenetic methodology as well as preparation of tagged DNA probes, comparative genome hybridization, and image and data analysis. Same as BIOL 4401. Fall of odd years. Formerly BIOL 401.
- BIOL 4416 Introductory Biometry. (4 3 2)** Introduction to statistical methods and techniques as applied to biology. Fall. Formerly BIOL 416.
- BIOL 4425 Limnology. (4 3 2)** Physical, chemical and biological factors affecting productivity in lakes and ponds. Familiarization with approved methods of studying static fresh water areas in the Texas Panhandle. Fall of odd years. Formerly BIOL 425.
- BIOL 4430 Introduction to Dendrochronology. (4 3 2)** Dendrochronology or tree-ring science; principles and applications to archaeology, environmental studies, ecology and climatology. Same as ESC 4430. Formerly BIOL 430.
- BIOL 4431 Ichthyology. (4 3 2)** Biology of fresh-water and marine fish of the world with emphasis on natural history, ecology, physiology and taxonomy. Spring of odd years. Formerly BIOL 431.
- BIOL 4432 Herpetology. (4 3 2)** Biology of amphibians and reptiles; classification, ecology, and adaptation and economic importance. Spring of even years. Formerly BIOL 432.
- BIOL 4433 Ornithology. (4 2 4)** Morphological and anatomical adaptations to flight, origin of birds and flight, mating systems, population ecology, habitat relationships and community ecology of birds. Taxonomic relationships through use of museum specimens and field identification during field trips. Spring of odd years. Formerly BIOL 433.
- BIOL 4434 Mammalogy. (4 2 4)** Diversity of mammals, taxonomic relationships, morphological and physiological adaptations to different environments, mating systems, population genetics, habitat requirements and conservation biology. Identification of orders, families, genera and species of common mammals of Texas through use of museum specimens and field trips. Fall of odd years. Formerly BIOL 434.
- BIOL 4440 Advanced Physiology. (4 3 2)** Prerequisite: 2401 and 2402 or 3440 or permission of instructor. Fundamentals of the physiology of basic organs and systems. Homeostatic mechanisms of neural, muscular, cardiovascular, respiratory and renal systems emphasized. Spring. Formerly BIOL 440.
- BIOL 4460 Arachnology. (4 3 2)** Natural history, classification, phylogeny and functional morphology of scorpions, spiders and related forms. Laboratory study of comparative morphology as well as collection and identification of specimens. Fall of even years. Formerly BIOL 460.

- BIOL 4480 Aquaculture. (4 3 2)** Introduction to culture of freshwater organisms used for both aesthetic and food purposes. Reproduction, nutritional and environmental requirements for optimal productivity. Fall of odd years. Formerly BIOL 480.
- BIOL 4510 General Ecology. (5 3 4)** Interrelationships between plants, animals and the environment. Fall, summer I. Formerly BIOL 410.
- BIOL 4513 Plant Ecology. (5 3 4)** Autecology and synecology of plants, integrating various aspects of range and crop ecology into theoretical ecology. Classical and modern techniques of vegetational and environmental analysis will be applied to Texas High Plains habitat. Spring of even years. Formerly BIOL 412.
- BIOL 5099 Field Biology. (1-8 0-8 0-16)** Field trips to various, diverse ecological areas. Practice in procurement, analysis and evaluation of extensive and intensive data on plants, invertebrates and vertebrates. Summer. Formerly BIOL 5325.
- BIOL 5312 Environmental Microbiology. (3 2 2)** Prerequisite: 2420 or 2572. Role microorganisms play in maintaining balance in nature, disposing of human pollution through bioremediation, and future use as non-polluting pesticides, herbicides and chemical synthesizers. Spring of even years.
- BIOL 5335 Animal Behavior. (3 3 0)** Psychobiology—behavior of nonhuman animals, behavior of vertebrates. Fall of even years. Formerly BIOL 5435.
- BIOL 5350 Hematology. (3 2 2)** Characteristics of formed elements of blood and their relationship to physiological and pathological processes. Fall. Formerly BIOL 5350.
- BIOL 5351 Conservation Biology. (3 3 0)** Prerequisite: 3424 or 4510 or consent of instructor. Fundamentals of theory, techniques and applications of conservation ecology as it relates to maintenance of biodiversity and sustainable management of the biosphere. Includes elements from population genetics; biogeography; habitat management, public policy and design strategies for natural preserves. Formerly BIOL 5450.
- BIOL 5365 Marine Fisheries. (3 3 0)** Prerequisite: consent of instructor. Survey of fisheries for marine vertebrates and invertebrates primarily in the Gulf of Mexico and South Atlantic with emphasis on their biology, economics and management. Spring of odd years. Formerly BIOL 5465.
- BIOL 5375 Immunology and Serology. (3 3 0)** Investigation into theories of the human body's defense mechanisms against infection. Human serum (serology) as a diagnostic tool to detect and evaluate infection. Summer I. Formerly BIOL 5475.
- BIOL 5401 Molecular Cytogenetics. (4 3 2)** Prerequisite: 3301. Advanced course in molecular cytogenetics focusing on mechanisms and cytological interpretation of eukaryotic karyotypes and chromosomal aberration. Laboratory will include classic cytogenetic methodology as well as preparation of tagged DNA probes, comparative genome hybridization, and image and data analysis. Fall of odd years.
- BIOL 5416 Introductory Biometry. (4 3 2)** Introduction to statistical methods and techniques as applies to biology. Fall. Formerly BIOL 5416.
- BIOL 5418 Wildland Soils. (4 3 2)** Formation, properties, classification, distribution and problems of soils of uncultivated lands. Fall of even years. Formerly BIOL 5318.
- BIOL 5425 Limnology. (4 3 2)** Prerequisite: 1413. Physical, chemical and biological factors affecting productivity in lakes and ponds. Familiarization with approved methods of studying static fresh-water areas in the Texas Panhandle. Fall of odd years.
- BIOL 5430 Introduction to Dendrochronology. (4 3 2)** Dendrochronology or tree-ring science; principles and application to archaeology, environmental studies, ecology and climatology. Same as ESC 5430.
- BIOL 5431 Ichthyology. (4 3 2)** Prerequisite: 1413. Biology of fresh-water and marine fish of the world with emphasis on natural history, ecology, physiology and taxonomy. Spring of odd years. Formerly BIOL 5431.
- BIOL 5432 Herpetology. (4 3 2)** Prerequisite: 1413. Biology of amphibians and reptiles; classification, ecology, and adaptation and economic importance. Spring of even years. Formerly BIOL 5432.
- BIOL 5433 Ornithology. (4 2 4)** Morphological and anatomical adaptations to flight, origin of birds and flight, mating systems, population ecology, habitat relationships and community ecology of birds. Taxonomic relationships through use of museum specimens and field identification during field trips. Spring of odd years. Formerly BIOL 5433.
- BIOL 5434 Mammalogy. (4 2 4)** Diversity of mammals, taxonomic relationships, morphological and physiological adaptations to different environments, mating systems, population genetics, habitat requirements and conservation biology. Identification of orders, families, genera and species of common mammals of Texas through use of museum specimens and field trips. Fall of odd years. Formerly BIOL 5434.
- BIOL 5440 Advanced Physiology. (4 3 2)** Prerequisite: 2401, 2402 or 3440, or permission of instructor. Fundamentals of the physiology of protoplasm; basic processes and functions of organs and systems. Digestion, respiration, metabolism, excretion, muscular action and reproduction. Use of basic physiological instruments and techniques in laboratory periods. Spring. Formerly BIOL 5440.
- BIOL 5460 Arachnology. (4 3 2)** Natural history, classification, phylogeny, and functional morphology of scorpions, spiders and related forms. Laboratory will emphasize comparative morphology, collection and identification of specimens. Fall of even years. Formerly BIOL 5460.
- BIOL 5480 Aquaculture. (4 3 2)** Introduction to the culture of freshwater organisms used for both aesthetic and food purposes. Reproduction, nutritional and environmental requirements for optimal productivity. Fall of even years. Formerly BIOL 5480.
- BIOL 5513 Plant Ecology. (5 3 4)** Autecology and synecology of plants, integrating various aspects of range and crop ecology into theoretical ecology. Classical and modern techniques of vegetational and environmental analysis will be applied to the Texas High Plains habitat. Spring of every other year. Formerly BIOL 5412.
- BIOL 6092 Special Topics. (1-6 0-6 0-12)** Graduate level consideration of recent advances in biology. Formerly BIOL 5599.
- BIOL 6110 Seminar. (1 0 0)** Designed to give the graduate student greater contact with source materials published in his field. Fall of even years. Formerly BIOL 5510.
- BIOL 6301 Thesis. (3 0 0)** Fall, spring, summer I, summer II. Formerly BIOL 5501.
- BIOL 6302 Thesis. (3 0 0)** Fall, spring, summer I, summer II. Formerly BIOL 5502.

BIOL 6303–BUSI 3312

- BIOL 6303 Design and Analysis of Experiments. (3 3 0)** Theory and application of experimental design and analysis for biological investigation and experimentation. Fall of even years. Formerly BIOL 5503.
- BIOL 6311 History of Biology. (3 3 0)** Historical development of major concepts of botany and zoology from pre-Greeks to present-day man. Spring of even years. Formerly BIOL 5511.
- BIOL 6312 Zoogeography. (3 3 0)** Geographical distribution of animals. Formerly BIOL 5512.
- BIOL 6314 Plant Geography. (3 3 0)** Geographical distribution of plants as influenced by climatic, geological and ecological conditions. Spring of odd years. Formerly BIOL 5514.
- BIOL 6320 Pathophysiology. (3 3 0)** Examination of scientific concepts of the disease process and human responses to illness. Formerly BIOL 5520.
- BIOL 6330 Principles of Systematics. (3 3 0)** Principles and methods of systematic biology, including taxonomy, rules of nomenclature and phylogeny reconstruction. Spring of odd years. Formerly BIOL 5530.
- BIOL 6331 Speciation. (3 3 0)** Prerequisite: 301. Facts and theories pertaining to biological principles of evolution, methods and products of speciation. Formerly BIOL 5531.
- BIOL 6365 Reproductive Biology. (3 3 0)** Evolution of sex, mating systems and reproductive strategies of animals with emphasis on vertebrates. Formerly BIOL 5565.
- BIOL 6370 Endocrinology. (3 3 0)** Prerequisite: permission of instructor. Function of endocrine glands and hormonal regulatory systems. Mechanisms of action of hormones at cellular and molecular levels. Recent advances in endocrinological research. Formerly BIOL 5570.
- BIOL 6375 Microbial Genetics. (3 3 0)** Prerequisite: permission of instructor. Molecular genetics of bacteria and bacteriophages including mechanisms of DNA transfer, uptake, recombination, replication and mutation. Fall of even years. Formerly BIOL 5575.
- BIOL 6395 Advanced Problems. (3 0 0)** Readings, library and laboratory investigations at graduate level. Lectures and conferences with staff. Fall, spring, summer I, summer II. Formerly BIOL 5581.
- BIOL 6397 Advanced Problems. (3 0 0)** Continuation of 5581. Fall, spring, summer I, summer II. Formerly BIOL 5582.
- BIOL 6401 The Process of Scientific Investigation. (4 3 2)** Overview of the process of science and procedures for conducting research, including proposal, grant and manuscript preparation, the peer-review process and presentation style. Fall of even years.
- BIOL 6445 Fisheries Biology. (4 3 2)** Prerequisite: permission of instructor. Biological aspects of fresh-water fisheries including breeding and feeding habits, adaptations to changing environments and use of fish in water-pollution studies. Field and laboratory work in fisheries survey methods and in lake and pond management. Spring of even years. Formerly BIOL 5545.
- BIOL 6509 Human Ecology. (5 3 4)** Prerequisite: BIOL 4510 or 4513. Critical evaluation of the impact of human activities on the environment. Same as ESC 6509. Fall of odd years. Formerly BIOL 5509.

BIOT—Biotechnology

(Offered through the Department of Life, Earth and Environmental Sciences.)

- BIOT 4095 Problems in Biotechnology. (1-6 0 0)** Prerequisite: permission of department head and at least 24 hours of advanced course work. Independent study in biotechnology not otherwise covered in courses. May be repeated for maximum of six hours. Formerly BIOL 421.
- BIOT 4098 Internship in Biotechnology. (1-6 0 0)** Prerequisite: Permission of department head. One semester of prearranged internship in industry or research laboratory. Internship will be external; interns will work under supervision of personnel involved in biotechnology industry. A comprehensive report will be required at the end of the internship. Formerly BIOL 492.
- BIOT 4385 Biotechnology. (3 3 0)** Prerequisite: BIOT 4401, CHEM 4324. Provides a foundation in contemporary aspects of biotechnology. Current issues in biotechnology include new technologies in gene expression, DNA microarray technology and bioinformatics; and ethical, social and legal implications of biotechnology and resultant products, therapeutics and databases. Fall of even years. Formerly BIOL 485.
- BIOT 4401 Molecular Cytogenetics. (4 3 2)** Advanced course in molecular cytogenetics focusing on mechanisms as well as preparation of tagged DNA probes, comparative genomic hybridization and image and data analysis. Same as BIOL 4401. Fall of odd years. Formerly BIOT 401.

BUSI—Business

(Offered through the Department of Management, Marketing and General Business.)

- BUSI 1301 Survey of Business. (3 3 0)** Open to non-business majors. Introduces areas of accounting, computer information systems, economics, finance, marketing, management and production. Furnishes an overview of subjects covered in more depth in more specialized business and economic courses. May not be taken to satisfy requirements for B.B.A. degree after junior standing has been attained without advance permission of instructor and dean. Formerly GBUS 110.
- BUSI 1304 Business Communication. (3 3 0)** Prerequisite: ENGL 1302. Relationship of creative, logical and critical thought to problem-solving aspects of business communication designed to build and develop effective letters and reports. Fall, spring, summer. Formerly GBUS 215.
- BUSI 1371 Keyboarding/Introduction to Word Processing. (3 3 0)** Basic keyboarding skills to key accurately and rapidly; format letters, memoranda, reports, tables and administrative documents appropriately; produce documents efficiently; and apply total quality management concepts to document production. Basic use of Word or Word Perfect features to create and print a document. Summer. Formerly GBUS 111.
- BUSI 3312 Business Law. (3 3 0)** Prerequisite: junior standing. Overview of U.S. judicial process; constitutional, criminal, contract, bankruptcy, commercial paper, tort, property, agency, securities regulation, antitrust, employment, discrimination and environmental law as related to business activity; business organization, ethics, self-regulation and government regulation. Formerly GBUS 312.

- BUSI 3319 International Business. (3 3 0)** Prerequisite: MGT 3330, MKT 3340, junior standing. Study and analysis of business activities that cross national boundaries. Includes growth of multinational enterprise, foreign direct investment, cross-cultural management, international marketing, international finance, global business strategy, and exports and imports. Fall. Formerly GBUS 319.
- BUSI 3391 Applications in Free Enterprise. (3 0 0)** Prerequisite: member of Students in Free Enterprise team and consent of instructor. Project management, leadership development, team building, service learning, and presentation delivery skills are enhanced through hands-on free enterprise education and consultation projects. Course is repeatable with consent of instructor. Formerly GBUS 391.
- BUSI 4096 Supervised Readings in Business. (1-6 0-6 0)** Prerequisite: 12 semester hours of advanced work in a business major, junior standing and permission of department head. Current problems in business through reading business periodicals, government publications and books which have had a profound influence on American business philosophy. Fall, spring, summer. Formerly GBUS 412.
- BUSI 4370 Legal Aspects of Healthcare. (3 3 0)** Prerequisite: junior standing. Healthcare law course designed for healthcare and research-related business administrators and executives who do not have a background in law. Topics include the U.S. legal system, government regulation, privacy, insurance and government payments, fraud and abuse, antitrust, intellectual property, torts and malpractice, and business organization.
- BUSI 4398 Supervised Internship. (3 0 0)** Prerequisite: junior standing and approval of department head. One semester of prearranged work in Department of Management, Marketing and General Business operational activities in a designated enterprise cooperating with the T. Boone Pickens College of Business. Students will obtain comprehensive work experience and be responsible for periodic reports and appraisals as required by the instructor. No class hours are to be met; conferences are arranged. Maximum of six credits, total, may be taken in BUSI 4398, MGT 4398 and MKT 4398. Fall, spring. Formerly GBUS 497.
- BUSI 5370 Legal Aspects of Healthcare. (3 3 0)** Healthcare law course designed for healthcare and research-related business administrators and executives who do not have a background in law. Topics include U.S. legal system, government regulation, privacy, insurance and government payments, fraud and abuse, antitrust, intellectual property, torts and malpractice, and business organization.
- BUSI 6300 Business Law. (3 3 0)** Prerequisite: graduate standing, consent of department head. Legal environment of business, contracts, business organizations, government regulation and application of ethics to each aspect of law. Spring. Formerly GBUS 5500.
- BUSI 6317 Current Issues in Business. (3 3 0)** Prerequisite: completion of all M.B.A. degree leveling courses or equivalent. Current issues relevant to business. Focus on issues that are timely and relevant to problems facing decision makers including ethics in business and the impact of the information age. Formerly GBUS 5517.
- BUSI 6319 Seminar in International Business Strategy. (3 3 0)** Prerequisite: MKT 6300, MGT 6300, FIN 6300, or proficiency in these courses in an undergraduate program. International business in foreign environments, integration and coordination of international business operations and strategies and all other activities across national borders, as

well as the role/problems of multi-national enterprises, political, social and economic constraints of foreign direct investment, and global operations/strategies. Fall. Formerly GBUS 5519.

- BUSI 6396 Reading and Conference. (3 0-3 0)** Prerequisite: approval of instructor of record. Directed reading and reporting in areas of business related to the student's sphere of concentration. Fall, spring. Formerly GBUS 5516.
- BUSI 6398 Internship. (3 0 0)** Prerequisite: approval of department head. One semester of prearranged work in operational activities of designated enterprises. Comprehensive experience in management of special projects. Students will be responsible for periodic reports as required by the instructor. May be repeated once. Fall, spring, summer. Formerly GBUS 5570.

CD—Communication Disorders

(Offered through the Department of Art, Communication and Theatre.)

- CD 1474 American Sign Language. [SGNL 1474] (4 3 2)** Basic signing receptive/expressive conversational skills. Formerly CD 174.
- CD 1475 American Sign Language II. (4 3 2)** Prerequisite: 1474. Further development of receptive/expressive conversational skills in ASL. Formerly CD 175.
- CD 2074 Independent Study in Communication Disorders. (1-3 0 0)** Prerequisite: consent of program director. Individual study designed to meet needs and interests of student. May be repeated for a maximum of six hours.
- CD 2370 Phonetics. (3 3 0)** An introduction to English phonetics. Fall. Formerly CD 205.
- CD 2371 Anatomy and Physiology of Speech. (3 3 0)** Anatomical physiological systems that underlie speech production. Fall. Formerly CD 240.
- CD 2372 Language Development. (3 3 0)** Speech and language development in the normally developing child. Five hours of observation of normal speech and language development required. Fall. Formerly CD 220.
- CD 2373 Survey of Communication Disorders. (3 3 0)** Survey of human communication and disorders in children and adults. Fall. Formerly CD 201.
- CD 2375 Anatomy and Physiology of Hearing. (3 3 0)** Prerequisite: MATH 1314. Physical characteristics of sound and the structure and function of the human auditory system. Fall. Formerly CD 250.
- CD 2474 American Sign Language III. (4 3 2)** Prerequisite: 1475. Development of greater fluency in ASL. Formerly CD 274.
- CD 2475 American Sign Language IV. (4 3 2)** Prerequisite: 2474. Development of ASL syntax and grammar, conceptually accurate use of vocabulary, deaf culture, text analysis and translation. Presentations, finger spelling, drills and stories. Formerly CD 275.
- CD 3094 Advanced Independent Study in Communication Disorders. (1-3 0 0)** Prerequisite: consent of program director. Advanced individual study designed to meet needs and interests of student. May be repeated for a maximum of six hours.
- CD 3330 Child Language and Phonological Disorders. (3 3 0)** Prerequisite: 2370, 2372, 2371. The nature of articulation, phonological and language disorders in childhood. Five

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- hours of childhood disorders observation required. Formerly CD 330.
- CD 3350 Fluency and Voice Disorders. (3 3 0)** Prerequisite: 2372, 3330. The nature and fluency resonance and voice disorders in childhood. Two-and-a-half clock hours of observation required. Spring. Formerly CD 350.
- CD 3355 Introduction to Audiological Assessment. (3 3 0)** Prerequisite: 2375. Measurement of basic audiologic test battery, including audiograms, masking, speech recognition and immittance. Five hours of audiology observation required. Spring. Formerly CD 355.
- CD 3360 Cultural Diversity in Communication Disorders. (3 3 0)** Prerequisite: 2370, 2372. Exploration of a wide range of cultural differences and their implications in the general community. Spring. Formerly CD 360.
- CD 3370 Diagnosis in Communication Disorders. (3 3 0)** Prerequisite: 3330, 3350. Overview of general procedures in diagnosis in communication disorders. Fall. Formerly CD 370.
- CD 3392 Special Topics. (3 3 0)** Prerequisite: 2371, 3350. Intensive exploration of a selected topic in communication disorders. Topic to be determined each semester course is offered. (3 3 0) Formerly CD 399.
- CD 4317 Hearing Disorders. (3 3 0)** Prerequisite: 2375, 3355. Pathologies of the ear and disorders of hearing. Five hours of hearing disorders observation required. Spring. Formerly CD 417.
- CD 4370 Counseling in Communication Disorders. (3 3 0)** Prerequisite: 2373. Specific applications of counseling in working with people with communication disorders and their communication partners. Fall. Formerly CD 470.
- CD 4381 Neural Basis of Communication Disorders. (3 3 0)** Prerequisite: 2370, 2371. Neuroscience and its application to aspects of normal and disordered communication. Spring. formerly CD 480.
- CD 4385 Technology Applications in Communication Disorders. (3 3 0)** Prerequisite: 3350. The application of current technology as it relates to the assessment and intervention with people with communication disorders. Fall. Formerly CD 490.
- CD 4386 Acquired Speech and Language Disorders. (3 3 0)** Prerequisite: 3350, 3370. Introduction to acquired speech and language disorders across the life span. Five hours of acquired speech and language disorders observation required. Spring. Formerly CD 496.
- CD 4387 Augmentative Communication. (3 3 0)** Prerequisite: 3350, 3370. Introduction to augmented communication for severe speech and language disorders across the life span. Two-and-a-half hours of augmentative communication disorders observation required. Spring. Formerly CD 497.
- CD 4399 Clinical Procedures/Professional Practices in Communication Disorders. (3 0 0)** Prerequisite: 3330, 3350. Senior-level introduction to clinical procedures and professional practices. Students work as apprentices to graduate students in planning of evaluations and treatment for clients with speech and language disorders. May be repeated up to two semesters. Fall, spring. Formerly CD 495.
- CD 6301 Thesis. (3 0 0)** Fall, spring. Formerly CD 5501.
- CD 6302 Thesis. (3 0 0)** Prerequisite: 5501, consent of instructor, graduate standing. Fall, spring. Formerly CD 5502.
- CD 6305 Neuromotor Speech Disorders. (3 3 0)** Evaluation and treatment of dysarthrias and apraxia of speech. Fall. Formerly CD 5505.
- CD 6310 Voice Disorders. (3 3 0)** Communication disorders related to dysfunction of the phonatory and resonance system. Voice production, assessment and treatment intervention. Spring. Formerly CD 5510.
- CD 6315 Research in Communication Disorders. (3 3 0)** Research design in behavioral sciences with emphasis in speech-language pathology. Development of a research protocol and design, data analysis and manuscript preparation. Fall. Formerly CD 5515.
- CD 6320 Cleft Palate and Craniofacial Anomalies. (3 3 0)** Communication disorders related to anomalies of craniofacial structures, including orafacial clefting of lips and palate. Fall. Formerly CD 5520.
- CD 6330 Aphasia and Related Neurogenic Language Disorders. (3 3 0)** Assessment and treatment of acquired neurologically based disorders including aphasias, dementia and Alzheimer's disease as well as closed-head injuries. Spring. Formerly CD 5530.
- CD 6335 Fluency Disorders. (3 3 0)** Theories, etiology, assessment, personal impact and therapeutic intervention of fluency disorders in children and adults. Fall. Formerly CD 5535.
- CD 6350 Swallowing Disorders. (3 3 0)** Cognitive and methodologic approaches to research, therapy and training of the preprofessional in the area of swallowing disorders (dysphagia). Fall. Formerly CD 5550.
- CD 6360 Aural Rehabilitation. (3 3 0)** Approaches to aural rehabilitation in children and adults. Introduction to educational audiogy and assistive listening devices. Fall. Formerly CD 5560.
- CD 6370 Assessment of Articulation and Phonological Disorders. (3 3 0)** Assessment of articulation and phonological disorders in culturally diverse populations and across the lifespan with transcription, scoring and analysis of assessment results explored. Fall. Formerly CD 5570.
- CD 6375 Language Assessment in the School-Age Child. (3 3 0)** Language assessment of school-age children. Problems and techniques of assessing the individual with later language development. Spring. Formerly CD 5575.
- CD 6380 Speech Science and Instrumentation. (3 2 2)** Normal process of speech production from anatomic, physiologic, kinematic, aerodynamic, acoustic and perceptual perspectives. Emphasis on measurement and analysis techniques, instrumentation and experimental paradigms used to study speech production and perception. Spring. Formerly CD 5580.
- CD 6392 Special Topics. (3 3 0)** Various areas of speech-language pathology. Attention to individual needs of the student will be a primary objective. Emphasis on habilitative and rehabilitative aspect of the field. May be repeated once for credit. Spring. Formerly CD 5599.
- CD 6394 Advanced Independent Study in Communication Disorders. (3 0 0)** Various areas of speech-language pathology with attention to individual needs of the student. Emphasis on habilitative and rehabilitative aspects of the field. May be repeated once for credit. Spring. Formerly CD 5555.
- CD 6398 Application of Clinical Principles. (3 0 0)** Prerequisite: consent of instructor; student must not have provisional admission status. Supervised clinical practicum in

communication disorders. Techniques to elicit and support appropriate professional behaviors in clinic, home and school situations; methods for facilitating social skills for communication, social interaction guidelines for clients of diverse cultural backgrounds; ASHA Code of Ethics and Scope of Practice, universal health precautions, clinical procedures in written clinical documentation and appropriate evidence-based intervention methods. Student will address standards of the Council of Academic Program in Communication Sciences and Disorders (CAPCSD)—Standard IV-D and Standard III-G. Portfolio of current information on wide range of professional issues, including policies, practices and guidelines to document knowledge of contemporary professional issues will be required. May be repeated for six hours credit. Fall, spring, summer. Formerly CD 5540.

- CD 6399 Advanced Application of Clinical Principles. (3 0 0)**
Prerequisite: consent of instructor; student must not have provisional admission status. Supervised advanced clinical practicum in communication disorders at selected external practicum sites. Student will address standard of the Council of Academic Programs in Communication Sciences and Disorders (CAPCSD): Standard III-H, Standard IC-A, Standard IV-G, Standard IV-B, Standard IV-C and Standard IV-D. Student must consult with clinical coordinator for contract with externship site, approval of outside facility. Maximum of nine hours credit. Fall, spring, summer. Formerly CD 5545.

CHEM—Chemistry

(Offered through the Department of Mathematics, Physical Sciences and Engineering.)

- CHEM 1405 General Chemistry I. (4 3 2)** Introductory course for non-chemistry majors. Fundamental concepts of chemistry, including atomic structure, chemical bonding, chemical reactions and states of matter. Not open to students who have credit in 1411. It is recommended that MATH 1314 be taken concurrently or earlier. Selected laboratory experiments. Fall, spring. Formerly CHEM 121.
- CHEM 1411 Chemistry I. (4 3 2)** Prerequisite or concurrent enrollment in MATH 1314 or 1324. Introductory course for science majors. Fundamental concepts of chemistry, including atomic structure, chemical bonding and molecular structure, chemical reactions and states of matter. Selected laboratory experiments. Not open to students who have credit in 1405. Fall, spring, summer I. Formerly CHEM 101.
- CHEM 1412 Chemistry II. (4 3 2)** Prerequisite: 1411. Continuation of 1411. Solutions, chemical equilibrium, ionic equilibria, acids and bases, thermodynamics and chemistry of selected elements. Selected laboratory experiments. Fall, spring, summer II. Formerly CHEM 102.
- CHEM 2523 Organic Chemistry I. [CHEM 2423] (5 3 4)** Prerequisite: 1412. Comprehensive study of carbon compounds, including discussion of properties, stereochemistry, resonance, and reactions and preparations of hydrocarbons. Laboratory techniques of organic chemistry; methods of purification and more important reactions; reactions used to classify organic compounds. Fall. Formerly CHEM 201.
- CHEM 2525 Organic Chemistry II. [CHEM 2425] (5 3 4)**
Prerequisite: 2523. Continuation of 201. Halides, alcohols, ethers, carboxylic acids and functional derivatives, aldehydes, ketones, amines and sugars are discussed. Selected laboratory experiments. Spring. Formerly CHEM 202.
- CHEM 2533 Elementary Organic Chemistry. [CHEM 1419] (5 3 4)**
Prerequisite: 1412. Fundamental concepts of organic chemistry, including bonding and electronic structure, nomenclature, stereochemistry and reactions and preparations of organic compounds. Not open to students who have credit in 2623. Selected experiments in organic chemistry including techniques of crystallization, distillation, extraction and organic reactions. Fall and spring of even years, fall of odd years. Formerly CHEM 233.
- CHEM 3310 Environmental Chemistry. (3 3 0)** Prerequisite: 1412. Environmental impacts of technological developments: air and water pollution, pesticides, food additives, energy production and distribution. Spring. Formerly CHEM 310.
- CHEM 3511 Analytical Chemistry. [CHEM 2401] (5 3 4)**
Prerequisite: 1412. Principles and methods of quantitative chemical analysis, dealing with volumetric, gravimetric and selected instrumental methods of analysis. Fall. Formerly CHEM 311.
- CHEM 3521 Physical Chemistry I. (5 3 4)** Prerequisite: 1412 and MATH 2414. Quantum theory, atomic structure and molecular structure. Selected laboratory experiments. Fall of even years. Formerly CHEM 321.
- CHEM 3522 Physical Chemistry II. (5 3 4)** Prerequisite: 3521. Continuation of 2521. Molecular symmetry, rotational and vibrational spectroscopy, electronic transitions, magnetic resonance, and electric and magnetic properties of molecules. Selected laboratory experiments. Spring of odd years. Formerly CHEM 322.
- CHEM 4323 Biochemistry I. (3 3 0)** Prerequisite: 2525 (or 2533 and permission of instructor). Chemical structures and reactions that occur in living systems: amino acids, lipids and membranes, carbohydrates, nucleic acids, proteins, enzymes, mechanisms of enzymes, coenzymes and vitamins. Fall. Formerly CHEM 421.
- CHEM 4223L Biochemistry I Laboratory. (2 0 4)** Prerequisite: 4323 or concurrent enrollment. Current methods in biochemistry using modern equipment for spectrophotometry, chromatography, electrophoresis and immunology. Fall. Formerly CHEM 421L.
- CHEM 4324 Biochemistry II. (3 3 0)** Prerequisite: 4323. Continuation of 4323. Metabolic pathways (such as glycolysis, citric acid cycle, and urea cycle), bioenergetics, electron transport and oxidative phosphorylation, photosynthesis and biological information flow. Spring. Formerly CHEM 422.
- CHEM 4224L Biochemistry II Laboratory. (2 0 4)** Prerequisite: 4324 or current enrollment. Continuation of 4223L. Selected experiments to complement lectures. Spring. Formerly CHEM 422L.
- CHEM 4335 Industrial Laboratory Procedures and Techniques. (3 0 0)** Prerequisite: 3511 and consent of instructor prior to registration. Introduction to industrial laboratory procedures and techniques. Fall, spring, summer I, summer II. Formerly CHEM 497.
- CHEM 4397 Undergraduate Research. (3 0 0)** Prerequisite: 3511 and consent of instructor prior to registration. Selected individual research problems in chemistry. May be repeated once for credit. Fall, spring, summer I, summer II. Formerly CHEM 498.
- CHEM 4411 Instrumental Analysis. (4 3 4)** Prerequisite or concurrent enrollment in 3511, 3522. Introduction to theory of instrumental methods of chemical analysis. Infrared, visible ultraviolet, atomic absorption, and magnetic resonance spectroscopy, mass spectrometry, gas chromatography and

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electroanalytical methods. Same as PHYS 4411. Spring of even years. Formerly CHEM 411.

- CHEM 4431 Inorganic Chemistry. (4 3 4)** Prerequisite or concurrent enrollment in 3522. Modern theories of chemical bonding and molecular structures of inorganic compounds, including elementary concepts of molecular orbital, valence bond, crystal field and ligand field theories. Use of physical measurements to solve current problems in inorganic chemistry. Fall of odd years. Formerly CHEM 431.
- CHEM 5223L Biochemistry I Laboratory. (2 0 4)** Prerequisite or concurrent enrollment: 4323 or 5323. Current methods in biochemistry using modern equipment for spectrophotometry, chromatography, electrophoresis and immunology. Fall. Formerly CHEM 5421L.
- CHEM 5224L Biochemistry II Laboratory. (2 0 4)** Prerequisite or concurrent enrollment: 4324 or 5324. Continuation of 5423L. Selected experiments to complement lectures. Spring. Formerly CHEM 5422L.
- CHEM 5323 Biochemistry I. (3 3 0)** Prerequisite: 2525 (or 2533 and permission of instructor). Chemical structures and reactions that occur in living systems: amino acids, lipids and membranes, carbohydrates, nucleic acids, proteins, enzymes, mechanisms of enzymes, coenzymes and vitamins. Fall. Formerly CHEM 5421.
- CHEM 5324 Biochemistry II. (3 3 0)** Prerequisite: 4323 or 5323. Continuation of 5323. Metabolic pathways (such as glycolysis, citric acid cycle and urea cycle), bioenergetics, electron transport and oxidative phosphorylation, photosynthesis and biological information flow. Spring. Formerly CHEM 5422.
- CHEM 5411 Instrumental Analysis. (4 3 4)** Prerequisite or concurrent enrollment: 3511, 3522. Introduction to theory of instrumental methods of chemical analysis. Infrared, ultraviolet and magnetic resonance spectroscopy, mass spectrometry, gas or chromatography, and radiochemical and electroanalytical methods. Spring of even years. Formerly CHEM 5411.
- CHEM 5431 Inorganic Chemistry. (4 3 4)** Prerequisite: 3511 and MATH 2414. Modern theories of chemical bonding and molecular structures of inorganic compounds, including elementary concepts of molecular orbital, valence bond, crystal field and ligand field theories. Use of physical measurements to solve current problems in inorganic chemistry. Fall of odd years.
- CHEM 5521 Physical Chemistry I. (5 3 4)** Prerequisite: 3511 and MATH 2414. Quantum theory, atomic structure and molecular structure. Selected laboratory experiment. Fall of even years. Formerly CHEM 5321.
- CHEM 5522 Physical Chemistry II. (5 3 4)** Prerequisite: 3521 or 5321. Continuation of 5321. Molecular symmetry, rotational and vibrational spectroscopy, electronic transitions, magnetic resonance, and electric and magnetic properties of molecules. Selected laboratory experiments. Spring of odd years. Formerly CHEM 5322.
- CHEM 6094 Advanced Problems. (1-6 0 0)** Individual special topics not covered by regular course work. Fall, spring, summer I, summer II. Formerly CHEM 5591.
- CHEM 6095 Graduate Research. (1-6 0 0)** Graduate research in chemistry. Fall, spring, summer I, summer II. Formerly CHEM 5581.
- CHEM 6097 Graduate Research. (1-6 0 0)** Graduate research in chemistry. Fall, spring, summer I, summer II. Formerly CHEM 5582.

- CHEM 6110 Graduate Seminar. (1 0 0)** Discussion of selected topics from chemical literature and from the student's thesis research. May be repeated once. Fall, spring, summer I, summer II. Formerly CHEM 5510.
- CHEM 6301 Thesis. (3 0 0)** Fall, spring, summer I, summer II. Formerly CHEM 5501.
- CHEM 6302 Thesis. (3 0 0)** Fall, spring, summer I, summer II. Formerly CHEM 5502.
- CHEM 6312 Molecular Spectra and Structure. (3 3 0)** Prerequisite: 3522. Introduction to molecular spectroscopy and its relations to structure, theoretical treatments, quantum and wave mechanics, rotational, vibrational, electronic and magnetic transitions in molecules. Fall of even years. Formerly CHEM 5512.
- CHEM 6320 Advanced Inorganic Chemistry. (3 3 0)** Prerequisite: 4431. Determination of molecular structure of inorganic and organometallic species, modern aspects of diffraction, magnetic resonance, vibrational and electronic methods. Spring of even years. Formerly CHEM 5520.
- CHEM 6340 Advanced Organic Chemistry. (3 3 0)** Prerequisite: 2525. Topics vary from year to year and include stereochemistry, conformational analysis, heterocyclic chemistry and alkaloids. Spring of odd years. Formerly CHEM 5540.
- CHEM 6350 Introduction to Quantum Mechanics. (3 3 0)** Prerequisite: 3522. Basic concepts of quantum mechanics; square well, rigid rotator, harmonic oscillator and hydrogen atom. Application to chemical systems in terms of resonance, wave mechanics, perturbation and variation methods. Fall of odd years. Formerly CHEM 5550.

CIS—Computer Information Systems

(Offered through the Department of Computer Information Systems.)

- CIS COMP Computer Competency. (0 0 0)** Required of all students who, in lieu of receiving credit for demonstrated computer competency, opt to demonstrate computer literacy by passing the computer literacy test developed by the Department of Computer Information Systems. A grade of "S" will appear on the student's transcript when the computer literacy test is passed.
- CIS 1301 Introduction to Information Science. [BCIS 1301] (3 3 0)** Beginning course emphasizing use of productivity software to develop technological skills for the Information Age. Focuses on enhancing personal productivity and communication through effective retrieval, evaluation, synthesis and presentation of information from the Internet and other sources. Fall, spring, summer. Formerly CIS 105.
- CIS 1315 Programming Fundamentals. [COSC 1315] (3 3 0)** Introduces the fundamental concepts of procedural programming. Topics include data types, control structures, functions, arrays, files and the mechanics of running, testing and debugging. The course also offers an introduction to the historical and social context of computing and an overview of computer science as a discipline. Fall, spring. Formerly CIS 204.
- CIS 2390 Systems Analysis and Design. [BCIS 2390] (3 3 0)** Prerequisite: demonstrated computer competency or 1315 or consent of instructor. Examination of information analysis, logical and physical specifications of the system development process in an organizational setting, and use of analysis and design to meet business objectives. Topics

- include systems theory, role of the modern systems analyst, requirement analysis, system analysis methods, data gathering, feasibility, modeling methods, systems design and construction methods, system implementation and project management. Fall, spring. Formerly CIS 260.
- CIS 3306 Advanced Programming Techniques. (3 3 0)**
Prerequisite: 2390. Further application of techniques with emphasis on subscripting, subprogramming, batch processing and random access. Formerly CIS 306.
- CIS 3310 Using Application Software on Microcomputers. (3 3 0)**
Prerequisite: demonstrated computer competency. Use of microcomputer software packages. Spreadsheets, graphics, data-base packages and text processing. Emphasis on advanced use and integration of software packages. Formerly CIS 310.
- CIS 3312 Computing for the Business Enterprise. (3 3 0)**
Prerequisite: 3310. Broad-based treatment of the integration of computing into the business environment for the experienced user. Emphasis on efficient use of software and productivity tools. Once per year. Formerly CIS 312.
- CIS 3330 Management Information Systems. (3 3 0)**
Prerequisite: demonstrated computer competency and junior standing. In-depth study of conceptual, behavioral and psychological aspects of organizational information systems. Topics include development, operation, management, uses, parties involved, control, structure and social impacts of information systems. Fall, spring. Formerly CIS 330.
- CIS 3350 Database Systems Design. (3 3 0)**
Prerequisite: 2390, CS 2315. Principles of database design and structure. Analysis and implementation of database systems with emphasis on the relational mode. Detailed study of data modeling concepts and techniques. Topics include physical and logical design, normalization, SQL, transaction and concurrency control, security and data integrity. Students design and implement a major database application project. Fall, spring. Formerly CIS 450.
- CIS 3360 Object-Oriented Analysis and Design. (3 3 0)**
Prerequisite: 2390, CS 2315. Thorough overview of concepts of object-oriented analysis and design methods. Focus on modeling to analyze and specify logical requirements in an organizational context. Emphasis on software development process, static architecture, dynamic models and development cycles. Evaluation and selection of appropriate design patterns. Use of models in design of object-oriented applications using documentation standards such as UML. Case studies will be utilized. Formerly CIS 360.
- CIS 3382 Enterprise Web-Based Applications Development. (3 3 0)**
Prerequisite: 3350. Conceptual foundation of issues, principles, methodologies, system architectures and information infrastructure in building enterprise-level Web applications that use component object model (COM) components on both the client and server side in an integrated visual-development environment. Formerly CIS 382.
- CIS 3385 Data Communications and Networking Technologies. (3 3 0)**
Prerequisite: demonstrated computer competency or consent of instructor. Introduction to data communications and network concepts. Survey of emerging local area network (LAN) technologies. Students will be exposed to designing, configuring and implementing LANs. Topics include integration of hardware and software elements, network architecture, protocols, security, control, configuration and design fundamentals. Formerly CIS 385.
- CIS 4096 Supervised Reading in Information Systems (1-6 0 0)**
Current problems in information systems through reading periodicals, government publications and books which have had a profound effect on this rapidly changing technology. Formerly CIS 476.
- CIS 4098 Internship in CIS. (3 0 0)**
Prerequisite: junior standing and approval of department head. One semester of prearranged work in CIS in a designated business or industry cooperating with WTAMU. Students will obtain comprehensive work experience and be responsible for reports and appraisals as required by the instructor. Formerly CIS 497.
- CIS 4310 Decision Support/Artificial Intelligence Systems. (3 3 0)**
Prerequisite: QBA 2342. Concepts of decision support systems (DSS), including DSS architecture, information management, model management and interface subsystems. Concept of artificial intelligence (AI) systems. Exploration of AI languages, knowledge representation techniques, reasoning methods and learning approaches. Formerly CIS 410.
- CIS 4355 Strategies and E-Business Models. (3 3 0)**
Prerequisite: 2390. Examination of core concepts related to alignment between technology, business enterprise and information management. Emphasis on value and components of different Business, E-Business models and new paradigms for IT strategies development and strategic planning. (3 3 0)
- CIS 4370 Health Informatics and E-Medicine. (3 3 0)**
Prerequisite: demonstrated computer competency or consent of instructor. Applications and management of information technology (IT) in the healthcare sector with the goal of improving quality and efficiency of delivery. Review of health information systems, IT architecture requirements, "best practice" knowledge bases, tele-health, patient privacy issues and health care automation.
- CIS 4372 Information Visualization and User Interface Design. (3 3 0)**
Prerequisite: CS 2315. Study and application of the design of computer-human interfaces. Utilizes both concepts and principles developed from studies in cognitive psychology and empirical studies of software interfaces. Focuses on visual presentation of large multi-dimensional data sets for data analysis.
- CIS 4382 Software Development in a Database Environment. (3 3 0)**
Prerequisite: 3382 or consent of instructor. Development of front-end database applications using a visual, event-driven, Rapid Application Development (RAD) tool, including a report generator. Extensive study of Structured Query Language (SQL) with Data Access Objects (DAO), Remote Data Objects (RDO) and ActiveX Data Objects (ADO). Formerly CIS 482.
- CIS 4390 Software Systems Development. (3 3 0)**
Prerequisite: 3350 and senior standing. A capstone project for the study of software engineering. Emphasis on requirement specifications, logical design, issues in OOP, design pattern, client-server computing, project management. Students construct original and significant projects that synthesize all course experiences to produce well-designed software applications. Fall, spring. Formerly CIS 490.
- CIS 4392 Applied Problems in Computer and Information Systems. (3 3 0)**
Prerequisite: consent of instructor. Case problems dealing with data processing in business with emphasis on applications. Formerly CIS 498.
- CIS 6096 Reading and Conference. (1-3 0 0)**
Prerequisite: 6305 and consent of instructor. Directed reading and reporting