

ACADEMIC COURSES

References to the timing of course offerings which follow apply only to day courses. Professional Studies and summer school course offerings are scheduled according to need. Christian Brothers University reserves the right to cancel classes at any time due to insufficient enrollment.

■ ACADEMIC PLANNING COURSE

ACAD 150. ACADEMIC PLANNING

Intended for students interested in developing and/or strengthening college study and test-taking skills, memory training, time and stress management, and educational and career planning, this course provides students with opportunities to assess their individual strengths and weaknesses and to explore campus resources for academic assistance. No prerequisites. *One semester; three credits*

■ ACCOUNTING COURSES

Requirements for the major are found on Page 75.

ACCT 260. FINANCIAL ACCOUNTING (Formerly ACCT 261 & ACCT 262)

This course will provide the student with an understanding of how financial accounting information is used in business decision making and its importance as a field of study regardless of major. Basic transaction analysis, journal entries, and T-accounts are used to provide the structure for understanding the interplay between management decisions and the analysis of financial statements. Prerequisites: MATH 105 or 106; ITM 153. *One semester; three credits*

ACCT 265. INTERMEDIATE ACCOUNTING I (Formerly ACCT 361)

This course provides an in-depth study of accounting theory and records, the reporting process, inventories, tangible and intangible assets, cash and temporary investments, receivable, and long-term investments such as stocks and bonds. Various pronouncements of the Financial Accounting Standards Board are covered. Prerequisite: ACCT 260. A grade of "C" or better in this course is required to proceed to 300 and 400 level accounting courses. *One semester; three credits*

ACCT 270. MANAGERIAL ACCOUNTING (Formerly ACCT 360)

Managerial accounting introduces the student to methods of using accounting information within an organization to plan operations, control activities, and make decisions. Accounting methods covered include cost-volume profit analysis, profit planning, variance analysis and other techniques that aid in decision making and evaluation of business performance. Prerequisite: ACCT 260. Corequisite: FIN 327 for non-accounting majors. *One semester; three credits*

ACCT 300/301 CAREERS IN ACCOUNTING

Intended to provide students with an overview of the various types of career opportunities available to finance and accounting graduates and how to prepare for each. Finance and Accounting professionals from industry will make presentations to the class regarding their own career experiences, the skills and knowledge required to obtain entry level positions in their field and internship opportunities. Students will be expected to develop a career plan as part of the course. Open to any interested student. No prerequisites but recommended for spring of the sophomore or junior years. (Same as FIN 300/301 – Careers in Finance) Pass/Fail. *One semester; one credit*

ACCT 312. ACCOUNTING SYSTEMS (Formerly ACCT 410)

Principles underlying establishment of complete accounting systems; application to typical business organizations; emphasis on the functions of control and protection. Prerequisite: ACCT 365. *One semester; three credits.*

ACCT 319. COST ACCOUNTING I

The course is designed to provide in-depth coverage of cost accounting concepts, objectives, and

accumulation and reporting procedures. Particular attention is given to material, labor and overhead costs in job order and process cost accumulation systems. The importance of cost accounting as a management tool in planning, controlling, and analysis is emphasized throughout the course. Prerequisite: ACCT 260. *One semester; three credits*

ACCT 365. INTERMEDIATE ACCOUNTING II (Formerly ACCT 362)

Coverage of corporate accounting is continued; accounting for bonds; special purpose funds; correction of prior periods; special problems of income determinations; comparative statements; ratio analysis; statement of cash flows. Various pronouncements of the Financial Accounting Standards Board are covered. Prerequisite: ACCT 265. A grade of "C" or better in this course is required to proceed to ACCT 312 or any 400 level accounting courses. *One semester; three credits*

ACCT 400. ACCOUNTING INTERNSHIP (Formerly BUS 400)

Under the supervision of a faculty member from the appropriate department, students in the School of Business, after receiving the approval of the faculty, are placed in the offices of cooperating firms to receive on-the-job training under the supervision of members of the firm. Credit is granted upon acceptance of periodic reports and a final summary report of work done verified by the authorized supervisor and the instructor. *Pass/Fail Grading. One semester; three credits*

ACCT 412. AUDITING (Formerly ACCT 405)

This course is an introduction to the auditing profession. Particular attention is given to the Generally Accepted Auditing Standards, audit reports, ethical and legal responsibilities, evidence, audit risk and materiality, internal control, audit programs and the overall audit plan. The auditor's decision-making process is emphasized throughout the course. Prerequisite: ACCT 312. *One semester; three credits*

ACCT 430. FEDERAL INCOME TAXATION I (Formerly ACCT 321)

This course introduces the student to the current Income Tax Code and the effect the Internal Revenue Service and the courts have had on the evolution of Federal tax law. Application of the Federal Income Tax to individuals, and the determination of their tax liability is explained. Basic tax research is introduced through the use of various tax services, court decisions, and regulations. This research is considered a prerequisite for success in tax practice. Principles and procedures of sound tax planning are introduced. Prerequisite: ACCT 365. *One semester; three credits*

ACCT 431. FEDERAL INCOME TAXATION II (Formerly ACCT 322)

This course is a follow-on course with more advanced tax areas such as gain and loss determination, net operating loss concepts, and other topics. The application of the Internal Revenue Code to partnerships and corporations and the development of their tax reporting are introduced. Tax research, as it applies to advanced tax topics, and further discussion of sound tax planning are continued. Prerequisite: ACCT 430. *One semester; three credits*

ACCT 460-464. SPECIAL TOPICS IN ACCOUNTING.

Each course is designed to permit intensive study into topics of special interest and timeliness in the area of Accounting. *One semester; three credits*

ACCT 465. ADVANCED ACCOUNTING I (Formerly ACCT 375 and ACCT 423)

Advanced Accounting I is a continuation of Intermediate Accounting in that it further explores financial accounting topics with an emphasis on consolidated financial statements. Coverage also includes accounting for branch offices and partnerships. Prerequisite: ACCT 365. *One semester; three credits*

ACCT 475. GOVERNMENTAL ACCOUNTING (Formerly Advanced Accounting II)

This course examines the procedures used by government units, particularly municipalities and not-for-profit entities. Emphasis in the course is on budgetary and fund accounts. Prerequisite: ACCT 365. *One semester; three credits*

ACCT480. FINANCIAL STATEMENT ANALYSIS

This course is a review of financial statements for fairness and completeness in reporting. The focus is on the analysis of financial statements and related footnotes from the standpoint of the different users of financial reports. Required of all Accounting majors. Open to any interested student. Prerequisite: ACCT 265; FIN 427. (Same as FIN 480). *One semester; three credits*

■ AIR FORCE ROTC

Air Force ROTC courses are offered through The University of Memphis under the instruction of The University of Memphis faculty.

■ ANTHROPOLOGY COURSES**ANTH 126. FORENSIC ANTHROPOLOGY**

The subspecialty of Physical Anthropology that involves excavation and identification of human remains for legal purposes. Students are exposed to the human skeleton and taught to examine bones for sex, age, ancestry, and stature differences. Interpretation of skeletal crime trauma is stressed. The most recent techniques and analyses in the forensic sciences, along with current and controversial trends in anthropology are discussed. Authentic case studies are used to illustrate the applied field of anthropology. This course is intended for applied psychology and science students. It assumes a basic familiarity with skeletal anatomy. Corequisite: ANTH 126L. (Same as NSCI 126) *One semester; three credits*

ANTH 126L. FORENSIC ANTHROPOLOGY LAB

Laboratory to accompany ANTH 126. Hands-on laboratory sessions will be used to teach basic techniques of skeletal analysis. Laboratory topics to include basic anatomy of the human skeleton, differences between animal and human remains, determination of the time interval since death, age, sex, ancestry, stature, the cause and manner of death, facial reconstruction, case report writing, etc. **Please note: Students will be expected to respectfully handle animal and human remains.** (Same as NSCI 126L) Corequisite: ANTH 126. *One semester; one credit*

ANTH 128. PHYSICAL ANTHROPOLOGY

This course is designed to introduce the student to the field of physical/biological anthropology, with an emphasis on human evolution. The larger themes investigated are the fundamentals of biological anthropology, major principles underlying our evolutionary history, and a review of the fossil evidence in an attempt to understand the development of the human species. Prerequisite: MATH 105 or higher. Corequisite: ANTH 128L. (Same as NSCI 128) *One semester; three credits*

ANTH 128L. PHYSICAL ANTHROPOLOGY LAB

Laboratory to accompany ANTH 128. It includes working with hominid casts, and primate and modern human skeletal material. (Same as NSCI 128L) Corequisite: ANTH 128. *One semester; one credit*

ANTH 160. CULTURAL ANTHROPOLOGY (Formerly ANTH 150 and SOC 150)

This course, which deals primarily with the concerns of cultural anthropology, focuses on the study of human diversity, and what defines humanity. It explores the beliefs, values, behaviors, technologies, and environments of a wide variety of cultures in an attempt to understand and appreciate variations within the human community in addition to evolution and modern biological variation. In attempting to understand the world's diversity, students have the opportunity to better understand themselves, their potentials, and their limitations. (Same as SOC 160) *One semester; three credits*

ANTH 190-199. SPECIAL TOPICS IN ANTHROPOLOGY

Courses in different areas of anthropology that are not offered on a regular basis. Corequisite: Corresponding lab course. *One semester; three credits*

ANTH 190L-199L. SPECIAL TOPICS IN ANTHROPOLOGY LABORATORIES

Laboratories to accompany ANTH 190-199. Corequisite: Corresponding ANTH 190-199 course. *One semester; one credit*

ANTH 279. INTRODUCTION TO ARCHAEOLOGY

The goal of archaeology is to gain an understanding of past cultures through the collection and analysis of cultural artifacts. The course will explore the methods and theories of archeology including excavation techniques, sampling techniques, and dating methods. It will investigate both prehistoric and historic cultures in attempting to understand the spread of culture and cultural diversity. *One semester; three credits*

ANTH 280-287. SELECTED TOPICS IN ANTHROPOLOGY

Directed work on a special topic or project in anthropology. *One semester; one to three credits*

ANTH 301. MEDICAL ANTHROPOLOGY (Formerly ANTH 305 and SOC 305)

Health, illness and treatment can be regarded very differently in various parts of the world and even within American society. This course will focus on the impact of beliefs and values on medicine. A range of definitions of health and illness, as well as the treatments which flow from these definitions, will be considered. (Same as SOC 301). *One semester; three credits*

ANTH 380-387. SELECTED TOPICS IN ANTHROPOLOGY

Directed work on a special topic or project in anthropology. *One semester; one to three credits*

■ ARMY ROTC CLASSES

Army ROTC courses are offered through The University of Memphis under the instruction of The University of Memphis faculty.

■ ART COURSES

Requirements for the major are found on Page 49.

ART 101. ART APPRECIATION

The student will be exposed to different areas of the visual arts which will include the study of the visual elements and the principles of design. The course will also cover a brief survey of the highlights of art from the Paleolithic period to modern times. *One semester; three credits*

ART 102. PAINTING AND 2-D DESIGN

Elements and principles of design will be the primary focus through the use of mixed media and collage techniques. How line, form, shape, and color influence composition will be the primary learning outcome of this course. *One semester; three credits.*

ART 104. BEGINNING SCULPTURE

An introduction to three-dimensional design concepts through traditional and non-traditional methods. An emphasis on the elements and principles of design as applied to the sculptural form. *One semester; three credits*

ART 200. BASIC OIL PAINTING

The student will learn the basics of design along with techniques of oil painting, using paint from tubes as well as oilbars. *One semester; three credits*

ART 203. PAINTING:WATER-BASED MEDIA

A study of painting methods in a variety of traditional and non-traditional water-based material and techniques. Students will begin to combine their understanding of drawing and design in the form of problem-solving exercises focusing on composition, value, color, and surface for both abstract and realistic work. Prerequisite: ART 102 or 230 or permission of the instructor. *One semester; three credits*

ART 207. OIL PAINTING II

An extension of the techniques learned in Basic Oil Painting (ART 200) with an emphasis on personal growth and creativity. Prerequisite: ART 200 or permission of the instructor. *One semester; three credits*

ART 208. CERAMICS I

Students will be introduced to the ceramic process using clay and hand building methods. *One semester; three credits*

ART 211. WORLD ART I

A survey of major visual art forms from prehistoric times to the Renaissance. *One semester; three credits*

ART 212. WORLD ART II

A survey of major visual art forms from the Renaissance period to the present. *One semester; three credits*

ART 230. BASIC DRAWING I

The student will learn the basics of composition, visual elements and principles of design. *One semester; three credits*

ART 231. BASIC DRAWING II

A continuation of Basic Drawing I, with the introduction of advanced techniques. Prerequisite: ART 230 or permission of the instructor. *One semester; three credits.*

ART 233. FIGURE DRAWING

A drawing class using live models as subjects. Drawing materials will include brush and ink, charcoal, pastel and various other media. Permission from the art instructor is required before enrolling in this class. *One semester; three credits*

ART 290-299. HONORS SPECIAL TOPICS.

Open to members of the Honors Program or by permission of instructor.

ART 301-ADVANCED DESIGN: MIXED MEDIA

An emphasis on cultivating individual creativity through combining the elements of two-dimensional and three-dimensional design using collage techniques. At this level, students will have a wide knowledge base of a variety of materials and techniques in order to make creative choices, with the guidance of the instructor, when meeting the goals for project assignments. *One semester; three credits*

ART 310. INTRODUCTION TO PRINTMAKING

The student will be instructed in the basics of printmaking using the techniques of woodcut, linocutting, screenprinting, and monoprinting. *One semester; three credits*

ART 311. PRINTMAKING II

Students will build on printmaking techniques learned in ART 310. An emphasis on personal growth through projects directed by the instructor. Prerequisite ART 310. *One semester; three credits*

ART 312. PAINTING III

At this level the student will have mastered basic oil painting techniques and have the ability to apply a more creative approach to the work. Prerequisites: ART 200, ART 207 or permission from the instructor. *One semester; three credits*

ART 330. SCULPTURE II

Students will apply design principles learned in ART 104 to 3-dimensional projects using various materials. Prerequisites: ART 104 or permission of instructor. *One semester; three credits*

ART 400-410. SPECIAL TOPICS IN ART

Content and credit variable with interest and instructor. Prerequisite: Approval of Department Chair. *One semester; one to three credits*

ART 411. DRAWING: EXPERIMENTAL

An advanced drawing course that allows students to experiment with techniques, materials and subject matter learned in previous courses. At this level the student will be expected to apply contemporary art historical references to their work along with creative choices when fulfilling assignments. Prerequisites: Any drawing course at 200 level or above. *One semester; three credits*

ART 412. PAINTING: EXPERIMENTAL

An advanced painting course that builds on the techniques, materials and subjects learned in other painting and art history courses. Students will fulfill assignments through the painting medium of their choice. Prerequisites: Any painting course at 200 level and above. *One semester; three credits*

ART 475. SENIOR PROBLEM

The student will be required to produce a large body of work which would be indicative of the level the student has achieved. The theme of the works will be decided by the student and instructor. The student will be required to have an exhibition of these works to be viewed by the public. Prerequisite: Approval of the instructor. *One semester; three credits*

ART 480-485. SPECIAL STUDIES IN ART

Content and credit variable with interest and instructor. Prerequisite: Approval of Department Chair. *One semester; one to three credits*

■ BIOLOGY COURSES

Requirements for the degree are found on Pages 102 and 104.

BIOL 103. BIOLOGY OF ADDICTION (Formerly BIOL 110)

In this course, we will cover the biological effects of alcohol and drugs on human organ systems, particularly the nervous, digestive, excretory and reproductive systems. We will discuss the psychological and sociological consequences of these effects. The use of drugs in both therapeutic and pathologic situations will be explored, and modalities of recovery will be discussed. Offered in the Spring semester. *One semester; three credits*

BIOL 103L. BIOLOGY OF ADDICTION LAB

In this course, we will examine the anatomy and physiology of organ systems affected by alcohol and other psychoactive drugs of abuse. We will use fruit flies as a model to determine the effects of alcohol on their physiology and reproductive success. We will conduct two experiments on human volunteers: effects of caffeine on the cardiovascular system and the effects of ethanol on balance, equilibrium, and judgement. With the laboratory component, this course fulfills University graduation requirements. Offered in the Spring semester. *One semester; one credit*

BIOL 107. ENVIRONMENTAL BIOLOGY

An interdisciplinary approach to the study of the environment. The course provides the scientific basis for understanding how environmental systems work. Topics include discussion of the economic impact and consequences of the disruptions of natural systems, the importance of public policy, and how environmental issues are linked to our everyday life. Designed for non-majors. Corequisite: BIOL 107L. Offered as needed. *One semester; three credits*

BIOL 107L. ENVIRONMENTAL BIOLOGY LABORATORY

A combination of laboratory experiences and field trips to illustrate the principles covered in BIOL 107. Visits to sewage treatment plant, pest control center, land field and forests will be scheduled when possible. Prerequisite or corequisite: BIOL 107. Offered as needed. *One semester; one credit*

BIOL 109. HUMAN BIOLOGY (Formerly BIOL 213)

A systematic study of the developmental structure and function of the human organism, including the anatomy and physiology of each organ system and common problems that may occur in each. Genetics, evolution, and ecology, as they apply to the human organism, are also studied. Designed for non-majors. Corequisite: BIOL 109L. Offered in Fall semester and Professional Studies program. *One semester; three credits*

BIOL 109L. HUMAN BIOLOGY LABORATORY (Formerly BIOL 231L)

Laboratory experience to illustrate and explain the principles covered in BIOL 109. Offered in the Fall semester and the Professional Studies program. Prerequisite or corequisite: BIOL 109. *One semester; one credit*

BIOL 111. PRINCIPLES OF BIOLOGY I

The first half of a comprehensive study of contemporary biology, this semester covers biochemistry, cytology, energy metabolism, photosynthesis, cell division, genetics, evolution, systematics and taxonomy of viruses, prokaryotes, protists, and fungi. This course includes three lectures and one discussion section per week. Corequisites: BIOL 111L and CHEM 101 or higher. Offered in both Fall and Spring semesters. *One semester; three credits.*

BIOL 111L. PRINCIPLES OF BIOLOGY I LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 111. Prerequisite or corequisite: BIOL 111. *One semester; one credit*

BIOL 112. PRINCIPLES OF BIOLOGY II

Continuation of BIOL 111, this semester covers systematics and taxonomy of plants and animals, anatomy and physiology of eukaryotic organisms, embryology and development, and ecology. This course includes three lectures and one discussion per week. Offered in the Spring semester and usually in Summer Term II. Prerequisite: BIOL 111. Corequisite BIOL 112L. *One semester; three credits.*

BIOL 112L. PRINCIPLES OF BIOLOGY II LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 112. Prerequisite: BIOL 111L. Corequisite: BIOL 112. *One semester; one credit*

BIOL 211. VERTEBRATE EMBRYOLOGY

A study of human embryology with emphasis on the fundamental development processes common to vertebrate embryos. Topics include gametogenesis, fertilization, and development of the embryo from zygote through the differentiation of the neural tube. The second half of the course is devoted to the development of selected human organ systems including the nervous system, sense organs, and the cardiovascular, digestive, respiratory, and urogenital systems. Prerequisite: Grades of "C" or better in BIOL 111 and 112. Corequisite: BIOL 211L. Offered in the Fall semester. *One semester; three credits.*

BIOL 211L. VERTEBRATE EMBRYOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 211. Histological, preserved, and selected living materials are studied to illustrate gametogenesis, fertilization, and development of the vertebrate embryo from zygote through the differentiation of organ systems in amphibian, avian and mammalian embryos. Prerequisite or corequisite: BIOL 211. Offered in the Fall semester. *One semester; one credit*

BIOL 212. COMPARATIVE VERTEBRATE ANATOMY

A study of the structural and functional evolution of selected organ systems in representative vertebrates. The first part of the course reviews the phylogenetic relationships among the vertebrates. In the remainder of the course, structures and their organizations are interpreted in terms of their embryological development, phylogeny, and functional adaptations. Prerequisite: Grades of "C"

or better in BIOL 111 and 112. Corequisite: BIOL 212L. Offered in the Spring semester. *One semester; three credits.*

BIOL 212L. COMPARATIVE VERTEBRATE ANATOMY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 212. Dissection of preserved representative specimens including shark, amphibian, and cat is required. Prerequisite or corequisite: BIOL 212. Offered in the Spring semester. *One semester; one credit.*

BIOL 213. MEDICAL AND SCIENTIFIC TERMINOLOGY

This course examines the Latin and Greek origins of words used in the medical community. In addition to learning the basic meaning of these words, their prefixes, suffixes and combining forms will also be studied. Emphasis will be given to terms applicable to the systems, structure, function and diseases of the human body. Attention will also be given to pronunciation, spelling and common abbreviations used in scientific writings. An understanding of etymology will give students in any area of specialization a better comprehension of the fundamental meaning of many English words. Prerequisite: BIOL 112. Offered in even numbered Spring semester. *One semester; one credit*

BIOL 216. BOTANY (Formerly BIOL 316)

A comprehensive study of the principles of botany. Topics include a survey of the major groups of plants, algae, fungi and bacteria, their life cycles, anatomy, metabolism, biogeography, ecology and evolution. Prerequisites: BIOL 112. Corequisite: BIOL 216L. Offered in even numbered Spring semesters. *One semester; three credits*

BIOL 216L. BOTANY LABORATORY (Formerly BIOL 316)

Laboratory experience to illustrate the principles of plant physiology, anatomy and ecology presented in BIOL 216 lecture. The course includes field trips and data gathering at a variety of biological communities. Prerequisite or corequisite: BIOL 216. Offered in even numbered Spring semesters. *One semester; one credit*

BIOL 217. HUMAN ANATOMY AND PHYSIOLOGY I (Formerly BIOL 317)

The first half of a study of the various levels of organization of the human body. The first semester covers cells, cell metabolism, tissues and the integumentary, skeletal, muscular, nervous, sensory, and endocrine systems. Prerequisite: Grades of "C" or better in BIOL 111 and 112; Prerequisite or Corequisite: CHEM 113. Corequisite: BIOL 217L. Offered in the Fall semester. *One semester; three credits.*

BIOL 217L. HUMAN ANATOMY AND PHYSIOLOGY I LABORATORY

(Formerly BIOL 317L) Laboratory experience to illustrate and explain the principles covered in BIOL 217. Dissection of a preserved mammalian specimen is required. Prerequisite or corequisite: BIOL 217. Offered in the Fall semester. *One semester; one credit*

BIOL 218. HUMAN ANATOMY AND PHYSIOLOGY II (Formerly BIOL 318)

A continuation of BIOL 217, this semester covers the cardiovascular, immune, digestive, respiratory, urinary and reproductive systems. Students will be responsible for a nominal fee to cover the required CPR course. Prerequisites: BIOL 217 and CHEM 113. Corequisite: BIOL 218L. Offered in the Spring semester. *One semester; three credits.*

BIOL 218L. HUMAN ANATOMY AND PHYSIOLOGY II LABORATORY (Formerly BIOL 318L)

Laboratory experience to illustrate and explain the principles covered in BIOL 218. Dissection of a preserved mammalian specimen is required. Prerequisite or corequisite: BIOL 218. Offered in the Spring semester. *One semester; one credit*

BIOL 236. NUTRITION (Formerly BIOL 256)

The basic principles of nutrition are studied with particular emphasis on their applications to hu-

man health and development. This course includes a study of the essential nutrients; current and past dietary trends, including ethnic considerations; relationship of RDAs and diets to health, disease and causes of death; changes in individual nutrient requirements based on factors such as age, gender, heredity, environment, etc.; governmental legislation regarding food labels, processing additives, contaminants, preservatives, and dietary guidelines; and a personal assessment of one's own eating habits, requirements and potential health problems. Outside reading materials related to current nutritional "trends" will be assigned. Prerequisite: BIOL 112. Offered in even numbered Fall semesters. *One semester; three credits*

BIOL 240. INTRODUCTION TO BIOINFORMATICS

The course considers introductory topics in bioinformatics. Topics include the structure of DNA, string representation in PERL, data searches, pairwise alignments, substitution patterns, protein structure prediction and modeling, proteomics and the use of web-based tools for topics in bioinformatics. Offered in the spring semester of even numbered years. (Same as CS 240). Prerequisite: BIOL 111. *One semester; three credits*

BIOL 246. EVOLUTION (Formerly BIOL 356)

Investigation of the evidence, proponents and theories of organic evolution with emphasis on modern contributions to the understanding of speciation. Prerequisite: BIOL 112. Offered in odd numbered Spring semesters. *One semester; three credits*

BIOL 275. BIOLOGICAL CAREER CHOICES

Students will visit working biologists and explore a variety of career choices in the biological sciences. The actual choices will be tailored to the interests of the students and availability of local veterinarians, researchers, wildlife biologists, physicians and allied health professionals. Offered in the Spring semester. Prerequisite: Sophomore standing. *Pass/Fail Grading. One semester; one credit*

BIOL 311. GENETICS

A study of the structure and function of nucleic acids in viruses, prokaryotes and eukaryotes. Basic concepts, principles and applications of classical, molecular and population genetics. Topics in clinical, agricultural, developmental, behavioral and immunogenetics. Prerequisites: Grade of "C" or better in BIOL 112 and CHEM 212. Corequisite: BIOL 311L. Offered in the Fall semester. *One semester; three credits*

BIOL 311L. GENETICS LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 311. Prerequisite or corequisite: BIOL 311. Offered in the Fall semester. *One semester; one credit*

BIOL 312. VERTEBRATE PHYSIOLOGY

A study of the biochemical and biophysical mechanism underlying vertebrate, especially human, function at all levels. Emphasis is placed on the role of membranes, nerves and hormones in maintaining homeostasis. Students will be required to participate in a trip to the Gulf Coast Research Laboratory for one weekend in March or April. Prerequisite: CHEM 211. Recommended: CHEM 312 and PHYS 201. Corequisite BIOL 312L. Offered in the Fall semester. *One semester; three credits*

BIOL 312L. VERTEBRATE PHYSIOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 312. Prerequisite or corequisite: BIOL 312. Offered in the Fall semester. *One semester; one credit*

BIOL 321. MICROBIOLOGY

A study of microbial biochemistry, molecular biology, morphology, physiology, metabolism, growth and growth control, taxonomy, diversity, genetics, evolution, ecology and immunology with emphasis on bacteria and viruses. Topics in medical, veterinary, food, industrial, and environmental microbiology. Prerequisites: Grade of "C" or better in BIOL 112 and CHEM 211 and Junior or Senior

standing. Corequisite: BIOL 321L. Offered in the Spring semester. *One semester; three credits*

BIOL 321L. MICROBIOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 321. Corequisite: BIOL 321. Offered in the Spring semester. *One semester; one credit*

BIOL 335. INVERTEBRATE ZOOLOGY

Taxonomy, ecology, evolution, morphology, and physiology of invertebrate phyla. Prerequisites: BIOL 112 and Junior or Senior status. Corequisite: BIOL 335L. Offered in even numbered Fall semesters. *One semester; three credits*

BIOL 335L. INVERTEBRATE ZOOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles in BIOL 335. Students are required to participate in the Gulf Coast Field trip. Offered in even numbered Fall semesters. Prerequisite or corequisite: BIOL 335. *One semester; one credit*

BIOL 362. BIOLOGY SEMINAR

Seminar series in which research scientists are invited to discuss their current research. Students are expected to submit a research proposal which they will use as the basis for their mandatory senior research project. Required of Junior Biology majors. Prerequisites: BIOL 275 and Junior standing. Offered in the Spring semester. *One semester; one credit*

BIOL 367. PHARMACOLOGY

An introduction to the structure, mechanisms, pharmacokinetics, pharmacodynamics, therapeutic uses and adverse reactions of prototypic agents from the major categories of drugs. Prerequisites: CHEM 212, and either BIOL 217 and 218 or BIOL 312. Offered in odd numbered Fall semesters. *One semester; three credits*

BIOL 381. ANIMAL BEHAVIOR

The study of the mechanisms and evolution of animal behavior. Topics include methods for the observation and quantification of behavior, natural selection and evolution of behavior, behavior genetics, neural and physiological mechanisms of behavior, communication, aggression, sexual reproduction, mating systems, and interspecific behavioral interactions. Prerequisites: BIOL 111, 112, and 4 additional hours in Biology. Offered in even numbered Spring semesters. *One semester; three credits.*

BIOL 390-398. SPECIAL TOPICS IN BIOLOGY

Selected topics of interest. Prerequisite: Permission of the instructor. *One semester; one to four credits*

BIOL 412. GENERAL ECOLOGY

Study of the principles of ecology. Topics to be investigated include population organization, demographics and regulation, community and ecosystem structure, coactions and change, abiotic factors, cycles of matter, energy flow, and characteristics of biomes. Prerequisites: BIOL 112 and Junior or Senior standing. Corequisite: BIOL 412L. Offered in the Fall semester. *One semester; three credits*

BIOL 412L. GENERAL ECOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 412. The course includes data gathering in both terrestrial and aquatic ecosystems and field trips to ecologically important sites. Students are required to participate in the Gulf Coast Field trip. Prerequisite or corequisite: BIOL 412. Offered in the Fall semester. *One semester; one credit*

BIOL 413. PARASITOLOGY

A study of the morphology, taxonomy, life cycle, distribution, pathology, and control of parasites of man and other animals. Alternates with Invertebrate Zoology. Prerequisites: BIOL 112 and Junior

or Senior standing. Corequisite: BIOL 413L. Offered in odd numbered Fall semesters. *One semester; three credits*

BIOL 413L. PARASITOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 413. Students conduct surveys to study the distribution of parasites and conduct long-term studies on the pathology of parasitic infection. Prerequisite: BIOL 112L. Corequisite: BIOL 413. Offered in odd numbered Fall semesters. *One semester; one credit*

BIOL 414. ANIMAL HISTOLOGY

A study of the microscopic and ultramicroscopic structure of vertebrate (primarily mammalian) tissues and organs, *i.e.*, microscopic anatomy. Special emphasis is placed on the relationship of structure to function. Prerequisites: BIOL 111, 112, four additional hours of Biology, and Junior or Senior standing. Corequisite: BIOL 414L. Offered in odd numbered Spring semesters. *One semester; three credits*

BIOL 414L. ANIMAL HISTOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 414. Prerequisite or corequisite: BIOL 414. Offered in odd numbered Spring semesters. *One semester; one credit*

BIOL 415. IMMUNOLOGY

The study of antigens, antibodies, organs and cells involved in humoral and cell-mediated immunity; immunologic techniques are discussed, as well as immune problems such as autoimmunity and AIDS. Prerequisites: BIOL 112 and CHEM 212. Recommended: BIOL 311. Corequisite: BIOL 415L. Offered in the Fall semester. *One semester; three credits*

BIOL 415L. IMMUNOLOGY LABORATORY

Laboratory experience to illustrate and explain the principles covered in BIOL 415. Prerequisite or corequisite: BIOL 415. Offered in the Fall semester. *One semester; one credit*

BIOL 421. CELL/MOLECULAR BIOLOGY

A study of eukaryotic cell structures and function. Special emphasis is placed on the role that biomolecules play in cell surface interactions that lead to intracellular signaling. The clinical and molecular nature of cancer is also discussed. Prerequisites: BIOL 112 and CHEM 212. Recommended: BIOL 311. Offered in the Spring semester. *One semester; three credits.*

BIOL 421L. CELL/MOLECULAR BIOLOGY LABORATORY

Laboratory experiences will demonstrate the concepts covered in BIOL 421. Experiments will employ techniques such as PCR, bacterial transformation, amplification and restriction mapping of plasmid DNA, western blotting and affinity chromatography. Corequisite: BIOL 421. Offered in the Spring semester. *One semester; one credit*

BIOL 451. NEUROSCIENCE

This course will investigate the field of neuroscience with emphasis on neuroanatomy of the mammalian brain. Also contained within this course will be the study of neurophysiology and neuropharmacology using both vertebrate and invertebrate central and peripheral nervous systems. Offered in the Fall semester. Prerequisite: Junior or Senior standing. BIOL 312 and CHEM 312 are recommended. Corequisite: BIOL 451L. *One semester; three credits*

BIOL 451L. NEUROSCIENCE LABORATORY

This laboratory is designed to complement the Neuroscience lecture course. Neuroanatomy will be taught at both the gross and microscopic level. Experiments and demonstrations will be used to study neurophysiology and neuropharmacology concepts. Corequisite: BIOL 451. Offered in the Fall semester. *One semester; one credit*

BIOL 461. INDEPENDENT RESEARCH I

Under the guidance of a faculty member, senior students design and conduct an organized research project usually requiring 100-150 in-lab hours. Course emphases include experimental design, controls, analysis of results, use of professional literature, and the writing of a draft of a journal-quality paper. Prerequisites: BIOL 275, 362, Permission of the Chair or Course Director, and Senior standing. *One semester; one credit*

BIOL 462. INDEPENDENT RESEARCH II

A continuation of BIOL 461, the students prepare to present their results in three forms - a final paper, an oral presentation at a public forum, and a poster session on campus. Prerequisites: BIOL 461 and Senior standing. *One semester; one credit*

BIOL 463. MENTORED RESEARCH I

Research projects are conducted under the guidance of a practicing researcher, generally off campus, but under some circumstances mentored research may be conducted at CBU. Research is performed in the summer preceding the senior year. Mentored Research I usually requires 200-300 in-lab hours. Students are required to attend group discussions and participate in tutorial meetings or correspondence with the course director. Students normally register for Mentored Research I during one of the summer terms. Students unable to begin their research during the summer will need permission of the course director to register for Mentored Research I concurrently during the Fall semester. Students are required to take the ETS Biology II exam as a requirement for graduation. Prerequisites: BIOL 362, Senior standing and Permission of the instructor. Offered in the Summer and Fall semesters. *One semester; one credit*

BIOL 464. MENTORED RESEARCH II

This course is a continuation of Mentored Research I. During this course the students will meet weekly to discuss their research results and analyze their data. Project results will be presented in a formal paper by the end of the Fall semester. Prerequisite or corequisite: BIOL 463. *One semester; two credits*

BIOL 465. MENTORED RESEARCH III

During this course the students will present the results of their work in a public forum as an oral paper and in a poster session on campus. Prerequisite: BIOL 464. Offered in the Spring semester. *One semester; two credits.*

BIOL 490-498. SPECIAL TOPICS IN BIOLOGY

Selected topics of interest. Prerequisite: Permission of instructor. *One semester; one to four credits*

BIOL 499. SENIOR COMPREHENSIVE

First semester seniors are required to take a comprehensive examination (ETS) on selected fields of biology. A passing score is required for graduation. Offered in the Fall semester. *One semester; zero credit*

TENTATIVE SUMMER COURSES in affiliation with the Gulf Coast Research Laboratory (GCRL), Ocean Springs, MS:

First Summer Term: Marine Biology, Marine Mammals, Marine Ichthyology, Shark Biology.

Second Summer Term: Oceanography, Marine Invertebrate Zoology, Marine Ecology, Marine Biology for Teachers.

For additional information about the course offerings at the GCRL, see the Chair of the Biology Department.

■ BUSINESS LAW COURSES

BLAW 301. BUSINESS LAW I (Formerly BUS 301)

The origins and general survey of contract law along with the nature, formation, execution, and interpretation of contracts in the common law system. Emphasis is on instruction in legal principles

that govern typical business situations and on the rules of law and procedure applied by the courts in the United States. *One semester; three credits*

BLAW 302. BUSINESS LAW II (Formerly BUS 302)

Continuation of BLAW 301. In-depth study of the Uniform Commercial Code and its far reaching effects on modern business transactions; the laws of agency, partnerships and corporations, and the legal concept of property. *One semester; three credits*

BLAW 345. LEGAL ENVIRONMENT OF BUSINESS (Formerly BUS 345)

The course deals with administrative law. Primary areas of concentration include anti-trust law, consumer protection, securities regulation, labor law, and environmental law. *One semester; three credits*

BUS LAW 360. INTERNATIONAL BUSINESS LAW

A course emphasizing practical application and theory of international business law, it shows how firms doing business between more than 200 countries of the world are governed and regulated. No single legal system is emphasized, rather, cases and materials from many countries are discussed to illustrate the similarity of businesses and the law. Recommended but not required, POLS 370 (International Law). *One semester; three credit hours*

■ CHEMICAL ENGINEERING COURSES

Requirements for the degree are found on Pages 88 and 89.

CH E 101, 201. CHEMICAL ENGINEERING PROJECT

Chemical Engineering Projects. A four-semester sequence of courses where all of the students participate in technical team projects and learn about written and oral presentations, use of the library, and other sources to retrieve technical data, prepare for and make effective job searches. Participate in the local Student AIChE chapter meetings, participate in discussions with panels of practicing engineers from local industry, and visit chemical plants. Industrial safety, ethics, environmental responsibility, and other suitable topics are covered. *Two semesters; one credit each*

CH E 111. INTRODUCTION TO CHEMICAL ENGINEERING I

This introductory course provides an understanding of the chemical engineer's role in industry. Students will be introduced to the system of measurement units, the concepts of mass and energy balances and the basic approaches for simple unit operations. The role of the computer in design will be highlighted. Offered in Fall semester. *One semester: one credit*

CHE 112. INTRODUCTION TO CHEMICAL ENGINEERING II

Continuation of CH E 111. Process variables and mass and energy balances. Graphical analysis of engineering problems using spreadsheets and other software. Prerequisite: CH E 111 or permission of the department. Offered in the Spring semester. *One semester; one credit.*

CH E 231. ELEMENTARY THERMODYNAMICS

Study of the fundamental principles and concepts of thermodynamics of pure materials. Properties of pure materials from tables, charts and ideal-gas equation. Heat and work. Energy balances on open and closed systems. An introduction to heat engines and heat pumps. Prerequisites: MATH 132 and CHEM 114 or PHYS 150. Offered in the Fall semester. *One semester; three credits*

CH E 232. MATERIAL AND ENERGY BALANCES

Multi-component material and energy balances in chemical reactions and processes. Compressibility of real-gases. Single and multi-phase material balances of multiple component chemical processes. Energy balances of reactive and non-reactive systems. Properties of ideal mixtures. Prerequisite: CH E 231. Offered in the Spring semester. *One semester; four credits*

CH E 245. MATERIAL SCIENCE (Formerly CH E 244 and CH E 445)

Materials classification, behavior, properties and selection. Relationship between internal structure of materials and their observed properties and behaviors. Methods of controlling properties and behavior of materials by manipulating internal structures. Prerequisite: CHEM 113 or CHEM 115. Offered in the Fall semester. *One semester; three credits*

CH E 314. ENGINEERING ECONOMY (Formerly CH E 414)

Fundamentals of engineering economy. Cost concepts. Time value of money and equivalence. Economic analysis of alternatives. Replacement analysis. Depreciation and after-tax analysis. Effects of inflation on economic analysis and currency exchange rates. Prerequisite: Junior standing. (Same as CE 314, ECE 314, ME 314) *One semester; three credits*

CH E 319. PRINCIPLES OF PACKAGING

Overview of the historical development of packaging, the system of packaging science, along with information about economic importance, social implications and packaging as a profession. Study of the functions of packaging and materials, container types, processes, technology and equipment employed to protect goods during handling, shipping and storage. Introduction of package development process, packaging testing and evaluation methods, standards, and equipment. Brief review of governmental regulations affecting packaging. (Same as ME 319) Prerequisites: MATH 131 and CHEM 113 or 115. *One semester; three credits*.

CH E 320. DISTRIBUTION/MEDICAL DEVICE PACKAGING

Overview of physical distribution systems, various distribution hazards imposed to products/packages in transit, rules and regulations governing distribution packaging, and common industry guidelines and practices on distribution packaging. Study of the package design process, protective packaging theories and applications, selection and design, other distribution packaging related materials and applications. Introduction to package testing and evaluation methods, standards, and equipment/systems. Introduction to basics of packaging materials, packaging design and development, and sterilization methods used in biomedical industry. (Same as ME 320) Prerequisites: MATH 131 and CHEM 113 or 115. *One semester; three credits*.

CH E 323. FLUID MECHANICS

A study of the principles of fluid mechanics and applications to Chemical Processing. Prerequisites: CH E 232 and MATH 231. Corequisite: CH E 325. Offered in the Fall semester. *One semester; three credits*

CH E 324. HEAT TRANSFER

Study of the principles of heat transfer and applications to Chemical Processes. Design of heat exchangers and evaporators. Prerequisite: CH E 323. Corequisite: CH E 326. Offered in the Spring semester. *One semester; three credits*.

CH E 325. JUNIOR LABORATORY I

Experimental study of flow of fluids. Flow measurements. Packed and fluidized bed hydraulics. Corequisite: CH E 323. Offered in the Fall semester. *One semester; one credit*

CH E 326. JUNIOR LABORATORY II

Experimental study of heat transfer. Includes double pipe heat exchanger, plate heat exchanger, temperature sensor response, air cooled exchanger. Corequisite: CH E 324. Offered in the Spring semester. *One semester; one credit*

CH E 327. CHEMICAL ENGINEERING THERMODYNAMICS

Thermodynamics analysis of multi-component, multiphase, and reacting systems. Calculation of properties for real materials. Application of First and Second Laws. Free-energy, activity, fugacity and activity coefficients. Phase equilibrium. Chemical reaction equilibrium and reaction rate kinetics.

Prerequisite: CH E 231 or ME 305. Offered in the Fall Semester. *One semester; three credits*

CH E 330. MASS TRANSFER & SEPARATIONS

Study of mass transfer and integration of heat, mass, and momentum transfer into analysis of process operations of gas absorption, distillation, adsorption, ion exchange and liquid extraction. Prerequisites: CH E 323, 327. Corequisite: CH E 324. Offered in Spring semester. *One semester; three credits*

CH E 400. THE COMPLETE ENGINEER

This course deals with a wide array of issues facing the practicing engineer. Topics include: engineering ethics, regulatory issues; health, safety, and environmental factors; reliability, maintainability, producibility, sustainability; and the context of engineering in the enterprise, in society, and as part of the global economy. (Same as ECE 400, CE 400, and ME 400) Prerequisite: Permission of the department. *One semester; three credits*

CH E 401, 402. CHEMICAL ENGINEERING SENIOR PROJECT

These courses introduce students to real world problems in chemical engineering and related fields. Senior project must be approved by the course instructor, and the work supervisor when conducted outside of CBU. Credit for CH E 402 is granted upon approval of periodic and final review of the report submitted by the student. Prerequisite: Senior standing in Chemical Engineering. Offered in the Fall and Spring semesters. *One semester each; two credits each*

CH E 425. PROCESS DESIGN I

Application of principles and concepts of prior course work with safety, economic and practical considerations to design equipment to meet a processing need. The emphasis is placed upon a particular unit or subsystem rather than a complete process which is the subject of CH E 426, Process Design II. Prerequisite: CH E 330. Corequisite: CH E 443. Offered in the Fall semester. *One semester; three credits*

CH E 426. PROCESS DESIGN II

Application of principles of process and plant design utilizing knowledge from earlier course material to solve comprehensive industrial problems. Includes flowsheet development, equipment sizing and determination of operating parameters, startup and safety considerations, cost estimation and economic analysis. Prerequisite: CH E 425 and CH E 443. Offered in the Spring semester. *One semester; three credits*

CH E 437. MODELING AND CONTROL IN CHEMICAL ENGINEERING

Development of mathematical models for Chemical Engineering systems in terms of ordinary differential equations. Design of feedback control systems. Controller stability and tuning. A laboratory project demonstrating control principles may be included. Prerequisite: CH E 330. Offered in the Fall semester. *One semester; three credits*

CH E 441. SENIOR LABORATORY I

Experimental study of applications of heat, mass and momentum transfer. Studies include filtration, ion exchange, distillation, etc. Both written and oral reports required on results of experiments. Prerequisites: CH E 330. Offered in the Fall semester. *One semester; one credit*

CH E 442. SENIOR LABORATORY II

Topics includes, experimental study of Reaction Kinetics and behavior of various reactors, polymerization and characterization of polymers. Both written and oral reports are required on experimental results. Prerequisite: CH E 443. Offered in the Spring semester. *One semester; one credit*

CH E 443. REACTOR DESIGN

A study of the terminology and theory of chemical kinetics of homogeneous and heterogeneous

isothermal systems and homogeneous non-isothermal systems. Application of kinetics to analysis and design of batch and flow reactors and their combinations to achieve specified production. Prerequisites: CH E 324, 327. Corequisite: CH E 441. Offered in the Fall semester. *One semester; three credits*

CH E 444. POLYMERIC MATERIALS

Introduction to chemistry, physics, technology and uses of common high polymers currently being produced. Prerequisite: CH E 443. Offered in the Spring semester. *One semester; three credits*

CH E 446. BIOCHEMICAL ENGINEERING

Extension of chemical engineering fundamentals to biological systems. The topics will include principles of bioreaction engineering and bioseparation. Laboratory experiments will support the concepts introduced in the lecture. Prerequisites: CH E 312 or CHEM 315 and 443. Offered in the Spring semester. *One semester; three credits*

CH E 490-494. SPECIAL TOPICS

Elective courses of special or current interest. Taught by faculty with special or unique qualifications. Prerequisites are announced with course offerings. *One semester; one to four credits*

CH E 495. INTERNSHIP IN CHEMICAL ENGINEERING

Students majoring in chemical engineering may be placed in the engineering offices of contracted firms to receive job training under the supervision of qualified engineers. Tasks completed as part of the internship must be approved by an authorized work supervisor. Credit is granted upon faculty approval of periodic review reports and a final summary report describing the work performed. Minimum time 200 hours. Prerequisites: Junior standing and Permission of the department. *Pass/Fail Grading. One semester; one to three credits*

■ CHEMISTRY COURSES

Requirements for the degrees are found on Pages 107-110.

CHEM 101. INTRODUCTION TO COLLEGE CHEMISTRY

This course is designed for students who are unprepared to begin the study of chemical principles. Emphasis is on elements and their symbols, names and formulas of compounds, valences, balancing equations, stoichiometry, and the algebra required for proficiency in chemistry. Prerequisite or corequisite: MATH 100 or 103 or placement in a higher numbered MATH course. This course does not supply any portion of the science credits required in any CBU degree program. Offered in the Fall semester. *One semester; three credits*

CHEM 113. PRINCIPLES OF CHEMISTRY I

This is the first-semester chemistry course for all students of science and chemical engineering. Topics include matter, measurements, atoms, molecules, ions, use of formulas and equations, thermochemistry, gases, electronic structure, the periodic table, covalent bonding, molecular structure, liquids and solids, and solutions. Prerequisite: CHEM 101 at Christian Brothers University or high school chemistry and satisfactory performance on departmental placement examination. Prerequisite or corequisite: MATH 117 or MATH 129 or MATH 131; CHEM 113L. Offered in the Fall and Spring semesters. *One semester; three credits*

CHEM 113L. CHEMICAL PRINCIPLES I LABORATORY

This course is designed to illustrate and explain the principles covered in CHEM 113. Prerequisite or corequisite: CHEM 113. Offered in the Fall and Spring. *One semester; one credit*

CHEM 114. PRINCIPLES OF CHEMISTRY II

This is the second-semester chemistry course for students of science and chemical engineering. Topics include chemical equilibrium, precipitations, acids and bases, chemical thermodynamics and kinetics,

oxidation and reduction, electrochemistry, and nuclear reactions. Prerequisites: CHEM 113, 113L. Prerequisite or corequisite: CHEM 114L. Offered in the Spring semester. *One semester; three credit*

CHEM 114L. CHEMICAL PRINCIPLES II LABORATORY

This course is designed to illustrate and explain the principles covered in CHEM 114. Prerequisite or corequisite: CHEM 114. Prerequisite: CHEM 113, 113L. Offered in the Spring semester. *One semester; one credit*

CHEM 115. GENERAL CHEMISTRY

A one-semester survey course in chemistry. Topics include matter, formulas and equations, thermochemistry, gases, electronic structure of the atom, the periodic table, bonding, molecular structure, liquids and solids, chemical kinetics, equilibrium, and electrochemistry. Prerequisite: MATH 117 or equivalent. Prerequisite or corequisite: CHEM 115L. Offered in the Fall semester. *One semester; three credits*

CHEM 115L. GENERAL CHEMISTRY LABORATORY

A one-semester laboratory course in chemistry designed to illustrate and explain the concepts covered in CHEM 115. Prerequisite or corequisite: CHEM 115. *One semester; one credit*

CHEM 211. ORGANIC CHEMISTRY I

This course uses both a mechanistic and functional-group approach to introduce organic concepts. Topics include bonding, functional groups, stereochemistry, acids and bases, and conformations. Mechanisms covered include electrophilic addition, SN_2 , SN_1 , E_1 , E_2 and radical reactions. This course deals with compounds from the aliphatic series. Prerequisites: CHEM 113, CHEM 113L, CHEM 114, and CHEM 114L with a minimum grade of "C" in each course. Prerequisite or corequisite: CHEM 211L. Offered in the Fall semester. *One semester; three credits*

CHEM 211L. ORGANIC CHEMISTRY I LABORATORY

This course is designed to teach the student the techniques of organic chemistry as well as to carry out reactions discussed in class. Some of the techniques presented are distillation, recrystallization, and extraction. The experiments will teach the proper methods of carrying out reactions. Prerequisites: CHEM 113, CHEM 113L, CHEM 114, and CHEM 114L with a minimum grade of "C" in each course. Prerequisite or corequisite: CHEM 211. Offered in the Fall semester. *One semester; one credit*

CHEM 212. ORGANIC CHEMISTRY II

This is the second in a two-semester sequence which builds on CHEM 211. This course will use a mechanistic and functional-group approach to introduce organic concepts. Topics include NMR, IR, and UV spectroscopy, aromaticity, enolates, and polymers. Mechanisms include EAS, NAS, nucleophilic addition and nucleophilic acyl substitution. This course deals with compounds from both the aliphatic and aromatic series. Prerequisites: CHEM 211, 211L. Prerequisite or corequisite: CHEM 212L. Offered in the Spring semester. *One semester; three credits*

CHEM 212L. ORGANIC CHEMISTRY II LABORATORY

This class is a continuation of CHEM 211L. The lab will be a combination of spectroscopy, reactions and identification of unknowns. The experiments carried out in lab will correspond to ones discussed in class. The identities of the organic unknowns will be determined by chemical and spectroscopic means. The skills learned in the first semester are used extensively in this class. Prerequisites: CHEM 211, 211L. Prerequisite or corequisite: CHEM 212. Offered in the Spring semester. *One semester; one credit*

CHEM 214. QUANTITATIVE ANALYSIS

A course which covers analytical principles and sources of error, principles of volumetric and gravimetric analysis, electrogravimetry, potentiometric titrations, and spectrophotometric analysis. Prerequisites: CHEM 114, 114L. Prerequisite or corequisite: CHEM 214L. Offered in the Spring

semester. *One semester; two credits*

CHEM 214L. QUANTITATIVE ANALYSIS LABORATORY

Laboratory to accompany CHEM 214. Prerequisite or corequisite: CHEM 214. Offered in the Spring semester. *One semester; two credits*

CHEM 311. ORGANIC QUALITATIVE ANALYSIS

This course covers the identification of pure organic compounds and mixtures. The course includes use of spectroscopy and chromatography as well as classical techniques. Prerequisites: CHEM 212, 212L. One hour of lecture and six hours of laboratory work per week. Offered as needed. *One semester; three credits*

CHEM 312. BIOCHEMISTRY

Introduction to the chemistry and metabolism of biologically important amino acids, proteins, carbohydrates and lipids, including enzyme systems, vitamins, hormones and nucleic acids. Prerequisites: CHEM 212, 212L. Prerequisite or corequisite: CHEM 312L. Offered in the Fall semester. *One semester; three credits*

CHEM 312L. BIOCHEMISTRY LABORATORY

This course is a study of the various compounds and reactions considered in CHEM 312. Typical biochemical analytical methods such as spectrophotometry, chromatography and centrifugation are utilized. A rigorous study of enzyme kinetics is included. Prerequisite or corequisite: CHEM 312. Offered in the Fall semester. *One semester; one credit*

CHEM 315. BIOCHEMISTRY I (Introduction to Biochemistry)

This course is a detailed introduction to the chemistry of the major classes of biologically important molecules including amino acids, proteins, carbohydrates, lipids, and nucleic acids. A discussion of the role of water in biological systems, techniques for isolation and characterization of biomolecules, enzyme kinetics, mechanism of and regulation of enzyme activity, membrane structure and function, bioenergetics, and an introduction to metabolic pathways will be included. Prerequisites: CHEM 212, 212L. Prerequisite or Corequisite: CHEM 315L Offered in the Fall semester. *One semester; three credits*

CHEM 315L BIOCHEMISTRY I LABORATORY

This course is designed to accompany Biochemistry I. It will provide an introduction to laboratory techniques used in the isolation and characterization of the major classes of biological molecules. Emphasis will be placed on techniques for protein purification and assay including chromatography, electrophoretic methods, centrifugation, spectroscopy, and enzyme kinetics. Prerequisites: CHEM 212, 212L. Prerequisite or corequisite: CHEM 315, Offered in the Fall semester. *One semester; one credit*

CHEM 316. BIOCHEMISTRY II (Metabolic Regulation and Signal Transduction)

This course is a continuation of Biochemistry I, providing a comprehensive introduction to the study of metabolic pathways with emphasis on basic principles of regulation. The mechanism of hormone action, membrane transport, and interrelationships between signal transduction and metabolic regulation will be discussed. The course will conclude with an introduction to molecular biology including DNA replication, transcription, and translation. Prerequisites: BIOL 112, 112L and CHEM 315, 315L. Offered in the Spring semester. *One semester; three credits*

CHEM 330. RESEARCH SEMINAR I (formerly CHEM 430)

A study of the chemical literature, selection of a research project, and initiation of research. Prerequisites: CHEM 212, 212L. Offered in the Fall semester. *One semester; zero credit*

CHEM 351. PHYSICAL CHEMISTRY I

Studies of the kinetic theory and properties of gases, the laws of thermodynamics, molecular ener-

gies, free energy and equilibrium, phase equilibria, ideal and real solutions, colligative properties, electrochemistry, rates and mechanisms of chemical reactions, catalysis, photochemistry, and collision theory. Prerequisites: CHEM 114, 114L; MATH 231; and PHYS 251, 251L. Prerequisite or corequisite: CHEM 351L. Offered in the Fall semester. *One semester; three credits*

CHEM 351L. PHYSICAL CHEMISTRY I LABORATORY

Laboratory work corresponding to CHEM 351. Prerequisite or corequisite: CHEM 351. Offered in the Fall semester. *One semester; one credit*

CHEM 352. PHYSICAL CHEMISTRY II

Studies of quantum mechanics and atomic structure, chemical bonding, spectroscopy and term symbols, molecular statistics, partition functions, diffraction and crystallography, intermolecular forces, liquids, surface chemistry, colloids, viscosity and diffusion, and macromolecules. Prerequisites: CHEM 351, 351L; PHYS 252, 252L; and MATH 232. Prerequisite or corequisite: CHEM 352L. Offered in the Spring semester. *One semester; three credits*

CHEM 352L. PHYSICAL CHEMISTRY II LABORATORY

Laboratory work corresponding to CHEM 352. Prerequisite or corequisite: CHEM 352. Offered in the Spring semester. *One semester; one credit*

CHEM 415. ANALYTICAL CHEMISTRY

This course is oriented toward the study and use of instruments in chemical analysis and research. Theory and its application to instrumental methods of analysis are covered, including basic electronics, spectrophotometry, electrochemical analysis, and chromatography. Three one-hour lectures per week. Prerequisites: CHEM 212, 212L, 214, 214L, 351, 351L. Prerequisite or corequisite: CHEM 352, 352L, 415L. Offered in the Spring semester of even-numbered years. *One semester; three credits*

CHEM 415L. ANALYTICAL CHEMISTRY LABORATORY

Experiments dealing with basic electronics, optical spectrophotometry, non-optical spectrometry, electrochemical analysis, and chromatography are performed. Prerequisite or corequisite: CHEM 415. Offered in the Spring semester of even-numbered years. *One semester; one credit*

CHEM 422. INORGANIC CHEMISTRY

This course is an in-depth study of the elements (metals and non-metals) and their compounds. Emphasis is on periodic relationships, theory of solutions, coordination compounds, and the kinetics of inorganic reactions in solution. Three one-hour lectures per week. Prerequisites: CHEM 351, 351L. Prerequisites or corequisites: CHEM 212, 212L, 352, 352L, 422L. Offered in the Spring semester of odd-numbered years. *One semester; three credits*

CHEM 422L. INORGANIC CHEMISTRY LABORATORY

Advanced laboratory techniques are used in the synthesis, analysis, and purification of inorganic coordination compounds. Prerequisite or corequisite: CHEM 422. Offered in the Spring semester of odd-numbered years. *One semester; one credit*

CHEM 431. RESEARCH SEMINAR II

Completion of research project. Oral presentation of research at a meeting of a learned society. Completion of a written research paper in a format suitable for publication in a refereed journal. In addition, each student will prepare a poster and present it at a poster session on campus. The student must also pass a comprehensive examination in chemistry. This examination may be administered by the department, or it may be an external test (such as the GRE) approved by the department. Prerequisite: CHEM 330 or 430. Offered in the Spring semester. *One semester; two credits*

CHEM 432-437, 440-441. SPECIAL TOPICS

An advanced study in one of the following fields: Inorganic, Organic, Analytical, Polymer, Physical,

or Biochemistry. Prerequisites and corequisites as described in the syllabus for each Special Topics course. *One semester; one to four credits each*

CHEM 438. LIPIDS

A second semester of Biochemistry, designed to assist students in the application of biochemical concepts to all areas of future study in the health sciences and biotechnology. Special emphasis will be given to current research and topics of special interest to students. Topics will include lipids, membranes, and cellular transport; lipid metabolism; steroids, isoprenoids, and eicosanoids; metabolic coordination, control, and signal transduction; cholesterol, hormones, and vitamins; and current journal articles. Prerequisites: CHEM 312 and 312L or CHEM 315 and 315L. Offered in the Spring semester. *One semester; three credits*

CHEM 439. ASTROPHYSICAL CHEMISTRY

This is an interdisciplinary capstone course for Science and Engineering majors. Astronomy is used as the framework upon which to hang many other topics; the student's previous knowledge of chemistry, physics, mathematics, and biology will be reviewed and expanded upon, along with history, philosophy, music, and religion. Topics include an overview of the Universe, the sky and the Earth, the history of astronomy, light and telescopes, origin and evolution of the Solar System, the nature and evolution of stars, including supernovae, neutron stars, pulsars, and black holes, the Milky Way and other galaxies, interstellar molecules, life in the Universe, quasars, and cosmology, including the Big Bang and the expanding Universe. Optional observing sessions included. Prerequisites: CHEM 114, PHYS 150 or 201, MATH 131. Junior standing recommended. Offered in the Spring semester of even-numbered years. *One semester; three credits*

■ CHINESE COURSES

The following foreign language courses will be offered on the campus of Rhodes College under the instruction of Rhodes faculty. See Dean of the School of Arts concerning these courses.

CHIN 101-102. ELEMENTARY CHINESE

This two-semester course introduces Chinese to students with no knowledge of the language. Equal emphasis will be given to acquiring the rudiments of spoken and written Chinese. Students who complete the year-long course will master approximately 700 characters and a vocabulary of a little more than 1,000 words. It also intends to acquaint students with some basic aspects of Chinese culture and society as a necessary part of their education in this language. Offered in sequence in the Fall and Spring. *Two semesters; eight credits*

CHIN 201-202. INTERMEDIATE CHINESE.

In addition to the same objectives for the first year, this course aims at improving students' aural-oral skills to achieve fluency and comprehension, further developing their proficiency in reading for understanding, and enhancing their ability to write in Chinese and to translate from Chinese into English and vice versa. Prerequisite: Chinese 102 or the equivalent. Offered in sequence in the Fall and Spring. *Two semesters; eight credits*

CHIN 205-215. SPECIAL TOPICS IN CHINESE.

Topics of special interest related to Chinese literature, language, or culture. Offered in Fall or Spring. *One semester; three credits*

CHIN 300-302. SPECIAL TOPICS IN CHINESE.

Studies in Asian Humanities and in Advanced Chinese. Prerequisite: Chinese 202 or the equivalent. Offered in Fall or Spring in alternate years. *One semester; three credits*

■ CIVIL AND ENVIRONMENTAL ENGINEERING COURSES

Requirements for the degree are found on Page 90.

CE 100. INTRODUCTION TO CIVIL AND ENVIRONMENTAL ENGINEERING

New students are introduced to different areas of civil and environmental engineering, professional registration, ethics, and professional responsibilities. The course is team-taught by the faculty and practitioners. Offered in the Fall semester. *One semester; zero credit.*

CE 105. INTRODUCTION TO CIVIL AND ENVIRONMENTAL ENGINEERING DESIGN

Interdisciplinary team design projects are assigned by the faculty. Student teams are introduced to elementary design concepts and are involved in hands-on experiences in typical civil and environmental engineering projects. Reports are presented in both oral and written form. Offered in the Fall semester. *One semester; two credits*

CE 111. ENGINEERING DESIGN GRAPHICS

Emphasis on visual aspects of engineering communications, expression of ideas, developing spatial concepts as related to design. Graphical design is taught using orthographic projection, technical sketching, and 3-D modeling. CAD applications in Civil and Environmental Engineering. Offered in the Fall semester. *One semester; three credits*

CE 112. COMPUTER APPLICATIONS IN CIVIL AND ENVIRONMENTAL ENGINEERING

Introduction to the use of computers in civil and environmental engineering problem solving. Topics include computer operations, an overview of computer programming, input/output file operations, algorithms, control statements, strings, arrays, and functions. Computer applications in civil and environmental engineering are included. Offered in Spring semester. *One semester; three credits*

CE 115. FIELD MEASUREMENTS

Theory of measurements and errors. Measurement of line, direction and angles. Principles of leveling, traversing and topographic surveys. Horizontal and vertical route alignments. Computer applications. Two lectures and three laboratory hours each week. Report writing skills are required. Offered in the Fall semester. Corequisites: CE 111 and ENG 111. *One semester; three credits*

CE 200. MECHANICS OF SOLIDS I

Principles of statics; coplanar and non-coplanar force systems. Equilibrium of force systems. Centroids and moment of inertia. Axial load, shear and moment diagrams. Differential equations of beams. Study of stresses due to axial, bending and torsional loading. Mohr's circle of stress. Design applications. Prerequisites: PHYS 150 (Same as ME 200) *One semester; three credits.*

CE 213. MECHANICS OF SOLIDS II

Analysis of structures. Deflection of beams. Statically indeterminate structures. Shear center. Thin-walled pressure vessels. Combined loadings. Column buckling. Stress concentrations. Computer analysis of structures. Hands-on laboratory projects. Written communication skills are required. Prerequisites: CE 200 or ME 200. Offered in the Spring semester. *One semester; three credits*

CE 299. HYDRAULICS

Study of hydrostatics includes pressure heads, pressure centers, buoyancy and flotation, stability of gravity dams, flow of fluids in pipes and open channels, nozzles, weirs, compound and branching pipe networks. Fundamentals of conveyance system design. Oral and written communication skills are required. Prerequisites: CE 105, 200. Corequisite CE 299L. Offered in the Spring semester. *One semester; three credits*

CE 299L. HYDRAULICS LABORATORY

Laboratory experimental work to support theory covered in CE 299. Corequisite: CE 299. Offered

in the Spring semester. *One semester; one credit*

CE 305. ENVIRONMENTAL SITE ASSESSMENT

Environmental assessment; environmental laws and regulations; planning and conducting; title search, site walk-through, water and soil sampling; laboratory and field testing of soil and groundwater; fundamentals of site remediation. Written and oral communication skills are required. Prerequisite: Junior standing. Offered depending on enrollment. *One semester; three credits*

CE 310. ANALYSIS AND DESIGN OF STEEL STRUCTURES

Integrated structural analysis and design of steel structures. Approximate methods in the analysis of indeterminate structures. Influence lines for statically determinate structures. Design of structural elements and simple connections in accordance with AISC Specification. Computer analysis and design. Hands-on lab projects. Prerequisites: CE 213. Offered in the Fall semester. *One semester; three credits*

CE 311. ANALYSIS AND DESIGN OF CONCRETE STRUCTURES

Integrated structural analysis and design of concrete structures. Approximate methods in the analysis of indeterminate structures. Design of concrete structures and structural elements (such as beams, one-way slabs, columns, and spread footings) in accordance with ACI 318 Code. Introduction to pre-stressed concrete. Hands-on laboratory experiments. Prerequisite: CE 213. Offered depending on enrollment. *One semester; three credits*

CE 313. HYDROLOGY

The aspects of hydrology which are of concern to an engineer: water balance, probability and statistics in hydrologic design and analysis, basin modeling, hydrographs, stream flow routing, flood control, groundwater hydrology, and computer applications. Oral and written communication skills are required. Prerequisites: CE 299. Offered in the Fall semester. *One semester; three credits*

CE 314. ENGINEERING ECONOMY (Formerly CE 314 Economic Factors in Design)

Fundamentals of engineering economy. Cost concepts. Time value of money and equivalence. Economic analysis of alternatives. Replacement analysis. Depreciation and after-tax analysis. Effects of inflation on economic analysis. Currency exchange rates. Prerequisite: Junior standing. (Same as CH E 314, ECE 314, ME 314) *One semester; three credits*

CE 315. JUNIOR PROJECT

Interdisciplinary team design projects are initiated by the student (or suggested by the faculty) and approved by the faculty, investigated and developed throughout three semesters preceding the student's graduation. Students submit proposals for CE 315, CE 431, and CE 432. Students attend senior presentations and other professional lectures. Report writing and oral presentation. Prerequisite: Junior Standing; to be taken three semesters preceding the student's graduation. Offered in the Fall and Spring semesters. *One semester; zero credit*

CE 316. TIMBER DESIGN

Design of beams, tension and compression members, members with combined loading, wall and floor plywood sheathing. Connections, nails, bolts, and split rings. Sawn lumber and glued laminated timber. Design for wind and seismic forces, horizontal diaphragms and shear walls. Concrete formwork. Crate/ Container design. Individual design project. Oral and written communication skills are required. Prerequisite: CE 213 or equivalent. *One semester; three credits*

CE 317. INTRODUCTION TO ENVIRONMENTAL ENGINEERING

Introduction of pollution in Environmental Engineering, mass balance, environmental regulations, water/wastewater characteristics, water/wastewater treatment, solid and hazardous waste management, and air pollution and control. Written communication skills are required. Prerequisites: CHEM

115,115L and junior standing. Offered in the Spring semester. *One semester; three credits*

CE 318. HIGHWAY ENGINEERING

Study of driver and vehicle characteristics as they relate to the geometric design of highways. Highway capacity and safety. Design of drainage structures. Highway materials and the structural design of flexible and rigid pavements. Students are required to develop plans for a design project assigned by the instructor. Discussion of transportation planning, land use/transportation relationships, economy, mass transit facilities and intermodal systems. Computer applications. Oral and written communication skills are required. Prerequisite: CE 115. Offered in the Spring semester. *One semester; three credits*

CE 319. TRAFFIC ENGINEERING

Travel time, delay, speed and volume studies. Capacity of freeways, expressways, urban streets, arterials and intersections. Pedestrian, parking and accident studies. Traffic markings, signs, signals both pretimed and actuated, and progression. Geometric design of urban arterials and intersections. Students are required to submit functional plans for design projects assigned by the instructor. Emphasis on intersection, interchange, and expressway design. Computer applications. Written communication skills are required. Offered depending on enrollment. Prerequisite: CE 115. *One semester; three credits.*

CE 320. TRANSPORTATION AND URBAN PLANNING

Urban transportation planning, data collection and analysis, growth of cities, study of transportation systems, highway, railroad, air, water, pipeline, conveyor belt, and systems for the future. Public transportation. Offered depending on enrollment. Prerequisite: Junior standing. *One semester; three credits*

CE 322. GEOTECHNICAL ENGINEERING

A study of the origin and composition of soils; character and properties; gradation and permeability; seepage phenomena and frost action. Introduction to mechanics of earth masses including consideration of stresses, strains, consolidation theory, rate of consolidation, total and differential settlements, and shearing resistance. Prerequisites: CE 200, 299; Corequisite: CE 322L. Offered in the Fall semester. *One semester; three credits*

CE 322L. GEOTECHNICAL ENGINEERING LABORATORY

Standard laboratory tests to determine soil properties. Written communication skills are required. Corequisite: CE 322. Offered in the Fall semester. *One semester; one credit*

CE 340. DESIGN OF FOUNDATIONS

Sub-surface investigations and geotechnical reports; bearing capacity of soils, theory and design of shallow and deep foundations; settlement analysis; lateral earth pressure and cantilever retaining walls; slope stability analysis. Computer applications. Emphasis on design throughout. Written communication skills are required. Prerequisite: CE 322. Offered in the Spring semester. *One semester; three credits*

CE 345. PLANNING AND SCHEDULING

Various methods of scheduling will be presented including CPM, PPM, PERT, and LSM. Discussion of issues relating to activity duration, contractual considerations, time cost trade-off, schedule monitoring/updating and integration of schedule and cost. Computer applications. Offered depending on enrollment. Prerequisite: Junior standing. *One semester; three credits*

CE 350. CONSTRUCTION ESTIMATING AND COST CONTROL

Methods of making quantity surveys, estimating construction cost, construction scheduling and methods of cost control. The study of labor relations as they affect construction cost, scheduling and job control. Prerequisite: Junior standing. *One semester; three credits*

CE 400. THE COMPLEAT ENGINEER (Same as CH E 400, ECE 400, and ME 400)

This course deals with a wide array of issues facing the practicing engineer. Topics include: engineering ethics; regulatory issues; health, safety, and environmental factors; reliability, maintainability, producibility, sustainability; and the context of engineering in the enterprise, in society, and as part of the global economy. Prerequisite: Permission of the department. *One semester; three credits*

CE 401. ADVANCED ENVIRONMENTAL ENGINEERING ANALYSIS AND DESIGN

Advanced concepts in environmental engineering. Industrial waste treatment, toxic material disposal, physical, biological, and chemical treatment schemes. Oral and written communication skills are required. Prerequisite: CE 317. *One semester; three credits*

CE 402. OPEN CHANNEL HYDRAULICS

Study of open channel fluid conveyance systems. Special emphasis on the design and analysis of natural and artificial channels. Characteristics of flow systems. Prerequisite: CE 313 or equivalent. *One semester; three credits*

CE 403. COMPUTER ANALYSIS OF STRUCTURES

Theory of matrix algebra and solution of linear algebraic equations. Basic energy principles and virtual work. Analysis of frame and truss structures using the direct stiffness method. Computer applications. Prerequisites: CE 112, 213. *One semester; three credits*

CE 404. SOLID AND HAZARDOUS WASTE MANAGEMENT

Introduction to solid and hazardous waste management, legislation and social impact. Engineering design, planning and analysis associated with waste sources, handling, storage, collection, transport, and disposal of solid and hazardous wastes. Written communication skills are required. Offered depending on enrollment. Prerequisite: Junior standing. *One semester; three credits*

CE 405. REMEDIATION OF ORGANICALLY CONTAMINATED SOIL AND WATER

Soil Remediation: soil venting, air sparging, vapor extraction, bioremediation, soil washing, land farming, and thermal desorption; groundwater remediation; pump and treat and carbon adsorption; cost estimates; case histories. Written communication skills are required. Prerequisite: Senior standing. Offered depending on enrollment. *One semester; three credits*

CE 406. AIR POLLUTION

A basic knowledge of air pollution terminology, legislative standards, and fundamentals of control equipment including cyclones, baghouses, electrostatic precipitators, wet scrubbers, carbon adsorbers, and incinerators. Written communication skills are required. Prerequisite: Junior standing. Offered depending on enrollment. *One semester; three credits*

CE 407. GEOTECHNOLOGY OF WASTE MANAGEMENT

Site selection; ground modification and compaction; liners; leachate generation and collection; caps; gas management; properties of wastes. Prerequisite: CE 322. Offered depending on enrollment. *One semester; three credits*

CE 411. ADVANCED STEEL DESIGN

Topics related to steel bridge and building design, such as building connections, building floor systems, bridge composite beams, and bridge plate girders. Hands-on projects. Topics may vary from semester to semester. Prerequisite: CE 310. *One semester; three credits*

CE 412. ADVANCED CONCRETE DESIGN

Topics related to concrete bridge and building design, such as building floor systems and pre-stressed concrete bridge girders. Hands-on projects. Topics may vary from semester to semester. Prerequisite: CE 311. *One semester; three credits*

CE 414. DESIGN OF TRANSPORTATION SYSTEMS

Discussion of topics relevant to the design of transportation facilities: design controls and criteria, geometric design, design of drainage structures and cost analysis. Students will be required to prepare a set of plans, including calculations, for a design project assigned by the instructor. Computer applications. Oral and written communication skills are required. Offered depending on enrollment. Prerequisite: CE 318. *One semester; three credits*

CE 417. ENVIRONMENTAL ENGINEERING LABORATORY

Laboratory work to support treatment concepts presented in CE 317. Written communication skills are required. Prerequisites: CE 317. Offered in the Fall semester. *One semester; one credit*

CE 418. ADVANCED DESIGN OF FOUNDATIONS

Counterfort retaining walls; construction of earth dams; seepage; sheet piles; foundations on swelling soils; soil improvement. Oral and written communication skills are required. Offered depending on enrollment. Prerequisite: CE 340. *One semester; three credits*

CE 420. CONTRACTS AND SPECIFICATIONS

Consideration of fundamental principles of contract law with particular reference and application to engineering contracts. Study of specification documents. Preparation of typical documents for public and private construction projects. Prerequisite: Junior standing. Offered depending on enrollment. *One semester; three credits*

CE 421. DESIGN OF PAVEMENTS

Factors affecting design of pavements: loads, climate, and environment; stresses in flexible and rigid pavements; properties of pavement components; materials characterization; soil stabilization; theory and design of flexible and rigid pavements for highways and airports; pavement evaluation and rehabilitation. Oral and written communication skills are required. Prerequisite: CE 322. *One semester; three credits*

CE 425. HEAVY CONSTRUCTION EQUIPMENT AND METHODS

Study of the equipment, methods and materials used in "horizontal" construction. Methods of estimating the production and costs of heavy construction equipment will be presented. Prerequisite: Junior standing. *One semester; three credits*

CE 431-432. SENIOR DESIGN PROJECT

Interdisciplinary team design projects are initiated by students (or suggested by the faculty) and approved by the faculty. Investigated and developed throughout the senior year by the students. Reports are presented in both oral and written form. Practitioner involvement is required in each project. Professional registration, responsibility, and ethics. Prerequisite: CE 315. Taken in sequence during the last two semesters before graduation. *Two semesters; four credits*

CE 490-495. SPECIAL TOPICS

Elective courses of special or current interest. Taught by faculty with special or unique qualifications. Taken by Juniors and Seniors. Prerequisites are announced with course offerings. *One semester; one to four credits*

CE 496, 497, 498. TOPICS IN CIVIL ENGINEERING

Directed work on a special problem. Problems of an inter-disciplinary nature are encouraged. A written report is required. A contract outlining the scope of the project is required prior to the initiation of work. Prerequisites: Senior standing and a duly executed contract. *One semester; one, two, and three credits respectively*

CE 499. INTERNSHIP IN CIVIL AND/OR ENVIRONMENTAL ENGINEERING

Students majoring in civil/environmental engineering may be placed in the engineering offices of

contracted firms to receive job training under the supervision of qualified engineers. Tasks completed as part of the internship must be approved by an authorized work supervisor. Credit is granted upon faculty approval of periodic review reports and a final summary report describing the work performed. Minimum time 200 hours. Prerequisites: Junior Standing and Permission of department. *One semester; three credits*

■ COMPUTER SCIENCE COURSES

The requirements for the degree are found on Pages 111. Requirements for the dual degree in Computer Science and Mathematics are found on Page 112. Requirements for the dual degree in Computer Science and Electrical Engineering are found on Page 93.

CS 171. INTRODUCTION TO PROGRAMMING AND ALGORITHMS (Formerly CS 109)

This course concerns elementary algorithms and programming. Topics include an overview of computer hardware and software, system architecture, data representation, basic data structures, Boolean logic, digital circuit design, discovery and expression of algorithms, implementation and efficiency of algorithms, programming and control structures and basic UNIX commands. It uses a Java based language for programming exercises. *One semester; three credits*

CS 172. INTERMEDIATE PROGRAMMING AND ALGORITHMS (Formerly CS 122)

This course concerns more topics in algorithms and program development using object-oriented programming concepts. Topics include methods, arrays, classes, objects, encapsulation, inheritance, composition, abstraction and graphical user interfaces. It uses the Java language for programming exercises and projects. Prerequisite: CS 171. Corequisite: CS / ECE 172L. *One semester; three credits*

CS 172L. INTERMEDIATE PROGRAMMING AND ALGORITHMS LAB (Formerly CS 122L)

Lab to accompany CS 172. Corequisite: CS/ECE 172L. *One semester; one credit*

CS 234. DATA STRUCTURES

The course teaches the student important data structures, such as lists, stacks, queues, trees and tables. The student designs and implements correct readable and efficient software systems with interacting components. Prerequisite: CS/ECE172. Corequisite: CS 234L/ECE 234L. *One semester; three credits*

CS 234L. DATA STRUCTURES LAB

Lab to accompany CS 234. Corequisite: CS 234/ ECE 234. *One semester; one credit*

CS 240. INTRODUCTION TO BIOINFORMATICS (Same as BIOL 240.)

CS 295. DATA COMMUNICATIONS

This course is designed to cover fundamentals of telecommunications and network designs. It covers basic telecommunications concepts such as data transmission methods, signals encoding, transmission media characteristics, and the hybrid TCP/IP-OSI architecture, Ethernet LANs, wireless LANs and wide area networks as well as network security issues and standards. Prerequisite: CS/ECE 172 and MATH 105 or 131. *One semester. Three credits.*

CS 360. OBJECT ORIENTED DESIGN

The course uses object oriented analysis and design techniques and tools to develop and implement solutions to problems in business, engineering and science. Prerequisite: CS/ECE 172 or CS/ECE 234. *One semester; three credits*

CS 370. OPERATING SYSTEMS (Formerly CS 380)

The course presents the topics that govern the behavior of operating systems. Topics include processor scheduling, memory management, input, output, file storage allocation, protection and security. Prerequisite: CS 295 or CS/ECE 234. *One semester; three credits.*

CS 400. INTERNSHIP IN COMPUTER SCIENCE

Computer science majors receive on-the-job training in the offices of cooperating firms. To receive credit, the student must submit periodic reports and a detailed final report of the work done. The authorized supervisor at the firm must verify these reports. Prerequisites: Junior standing and approval of the Computer Science faculty. *Pass/Fail Grading. One semester; one to three credits*

CS 440. ALGORITHMS

The course studies standard methods and examples in the design and analysis of algorithms. Topics include some basic paradigms in algorithm design and analysis of the efficiency and optimality of representative algorithms selected from some of graph, pattern matching, numerical, randomized and approximation algorithms. Offered in the spring semester of even numbered years. Prerequisites: MATH 141 and CS/ECE 360. *One semester; three credits*

CS 453. COMPUTER GRAPHICS (Formerly CS 423)

(Same as ECE 453) Prerequisites: CS 234 or ECE 112 and Permission of the instructor. *One semester; three credits*

CS 460-469. TOPICS IN COMPUTER SCIENCE

Courses are designed each semester to meet the current needs of the students and to express the particular interests of the instructor. Prerequisite: CS/ECE 360. Offered in the Spring semester of odd numbered years. *One semester; one to three credits*

CS 471. DATABASE DESIGN

The course stresses the design of databases and their implementation using a relational database management system. Topics include entity-relationship and relational data models and database design. Abstract query languages (relational algebra) and SQL (language for creating, querying, and modifying relational and object-relational databases). Views, integrity, constraints, triggers, transactions and security. Data warehouses, data mining, temporal databases, XML. Prerequisite: CS/ECE 172. *One semester; three credits*

CS 481. COMPUTER SCIENCE PROJECT I

The course requires that the student design, develop and implement a major project that solves a real problem in either business or engineering in the field of computer science. The project requires the presentation of oral and written reports. Prerequisites: CS/ECE 360 and Senior standing. Offered in the Fall semester. *One semester; one credit*

CS 482. COMPUTER SCIENCE PROJECT II

The course is a continuation of CS 481. The student completes the project begun in CS 481 and must pass a departmental assessment test. The student may have to take an external assessment examination approved by the department. Prerequisite or corequisite: CS 481. Offered in the Spring semester. *One semester; three credits*

■ COUNSELING COURSES**COUN 300, 301. COUNSELOR TRAINING** (Formerly EDUC 300, 301)

This is a special training program for selected volunteers chosen as Peer Counselors. The paraprofessional trainee participates in an intensive counseling internship designed to bring about the best possible adjustment of new students to University life in the ORIN 100 course required of all freshmen. Prerequisite: Approval of instructor. Offered in the Fall and Spring. *Two semesters; three credits each*

COUN 310, 311. CAREER COUNSELOR TRAINING (Formerly EDUC 300, 301)

This special program is designed to train selected Career Peer counselors to assist fellow students in various stages of their career development and to assist with various projects associated with the Career Center. Students will learn to clarify their own career objectives and develop job search

skills, learn the dynamics of counseling others, and gain valuable leadership experience. Prerequisite: Approval of instructor. Offered in the Spring semester. *Two semesters; three credits each*

■ CRIMINAL JUSTICE COURSES

CJ 150. PUBLIC ADMINISTRATION

A history and overview of the field of Public Administration as a profession and an academic discipline. It is designed to give the student a solid and in-depth understanding of past, present, and future problems of administrators in managing government organizations in the political environment. Interrelationships between chief executives, legislators, the judiciary, interest groups, and bureaucracies are considered. *One semester; three credits*

CJ 200. CRIMINAL JUSTICE

An analysis of the structure, functions, and decision process of social agencies that deal with the management and control of crime and criminal offenders. Includes study of the nature, causes, and role of criminal behavior in society. *One semester; three credits*

CJ 225. JUVENILE JUSTICE

The focus of this course is to examine the juvenile delinquency phenomenon through the historical context of delinquency, the changing legal environment (including major court decisions which have transformed the juvenile system), exploring the theories of the causes of juvenile delinquency, and discussion of juvenile delinquency prevention and control programs. *One semester; three credits*

CJ 245. CHILD SEXUAL ABUSE

This class will acquaint the student with the various players involved in the crime of child sexual abuse, dispel many of the popular myths associated with this crime and introduce the physical and behavioral indicators of abuse. The most recent research on forensic interviewing and repressed memory will be reviewed. Guest speakers will include prosecutors and police investigators with the Child Protection Investigation Team. *One semester; three credits*

CJ 250. SERIAL KILLERS

This class will present a brief history of the more famous serial killers in both the United States and abroad and the increasing phenomenon of serial killings will be discussed. Students will be introduced to the science of profiling and other techniques used in the investigation of serial killings and psychological profiles of two contemporary serial killers will be compared. *One semester; three credits*

CJ 280-287. SELECTED TOPICS IN CRIMINAL JUSTICE

Directed work on a special topic or project in criminal justice. *One semester; one to three credits*

CJ 290-299. HONORS SPECIAL TOPICS.

Special topics in criminal justice open to members of the Honors Program or by permission of instructor. *One semester; one to four credits*

CJ 315. CROSS-CULTURAL CRIMINAL JUSTICE

Crime, justice, and retribution vary tremendously around the globe. Some cultures have meetings with parties rather than courts, and, in some, suspects merely vanish never to be seen again. This course will look at varieties of concepts of crime, wrongdoing, punishment (or lack of), and systems for dealing with these in other parts of the world, and compare some of these systems to the criminal justice system and its ideology in the United States. *One semester; three credits*

CJ 362. SOCIOLOGY OF ADDICTION

(Same as SOC 362) Prerequisite: SOC 101. *One semester; three credits*

CJ 365. DEVIANT BEHAVIOR

An exploration of theoretical perspectives on deviance, problems in defining deviance and specific

categories of deviance. Deviant behaviors discussed may include but are not limited to prostitution, gambling, transgenderedness, pornography, mental illness, sexualities, and physical disability. (Same as PSYC 365 and SOC 365) *One semester; three credits*

CJ 370. APPLICATIONS OF MEMORY

An examination of the application of memory in such diverse areas as courtroom testimony (e.g. factors influencing witnesses, hypnosis, repressed memory, false memory, voice identification), memory for everyday events, memory aids, and advertising. The relevant theories and research in each are examined. Prerequisite: PSYC 105. (Same as PSYC 370) *One semester; three credits*

CJ 380-387. SELECTED TOPICS IN CRIMINAL JUSTICE

Directed work on a special topic or project in criminal justice. *One semester; one to three credits*

CJ 401. CONSTITUTIONAL LAW

(Same as POLS 471) Prerequisite: POLS 112 or HIST 151 or Permissions of the department chair. *One semester; three credits*

CJ 455. CORRECTIONAL COUNSELING

This course is designed to present some of the counseling and treatment techniques that are available to assist correctional workers toward assisting the offender to establish a satisfying lifestyle that conforms to the regulations as well as protecting the community from harmful activity by offenders placed under the correctional workers' supervision. (Same as PSYC 455) *One semester; three credits*

CJ 480-487. ADVANCED TOPICS IN CRIMINAL JUSTICE

Directed work on a special topic or project in criminal justice. *One semester; one to three credits*