B&EE Business And Economics

B&EE 100 INTRODUCTION TO BUSINESS AND ECONOMICS. (1)
An overview of the business enterprise, emphasizing the functional areas of business, their interrelationships, and how they are integrated into the business enterprise.

B&EE 300 CAREER DEVELOPMENT IN BUSINESS AND ECONOMICS. (1)
The course will emphasize the application of analytical, communicative, and critical thinking skills in the development of students' careers. It will address career opportunities, selection of personally appropriate career plans, and job search activities. It will enhance analytical skills through career analysis and company analysis, and enhance written and oral communication skills through their application to job search activities. Prereq: At least 60 hours of earned credit.

B&EE 309 INTRODUCTION TO INTERNATIONAL BUSINESS. (3)
The course focuses on the management of international businesses, investigating the effects of differences in national requirements, and cultural expectations on management. Lectures by a variety of faculty and guest speakers will discuss the global economy, address a variety of topics.

BA Business Administration

BA 601 TOTAL QUALITY MANAGEMENT. (3)
An examination of the theory and practice of total quality management. The course emphasizes cross functional analysis of contemporary quality management practice.

BA 610 GLOBAL BUSINESS MANAGEMENT. (3)
This course examines the problems of managing a business enterprise which spans international boundaries. Students will develop an understanding of the political, social, economic, and technological factors driving globalization and will consider the impact of these forces on competition, markets, industry structure, and organization.

BA 700 TEACHING METHODS IN BUSINESS. (1)
A three part course that examines what constitutes good teaching and explores effective techniques for college instruction. Seminars emphasize practical information for both the principal activities and the details of teaching. Departmental discussions allow students to discuss issues that arise in their teaching practice. Reviews of classroom performance provide professional feedback in order to enhance on-the-job learning. Seminar, two hours per week. Prereq: Approval of Director of Graduate Studies. (Same as ECO 700.)

BA 749 DISSERTATION RESEARCH. (0)
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

BA 762 RESEARCH METHODOLOGY. (3)
Examines fundamental concepts in design, control, and measurement for social science research with emphasis on: reliability, internal and external validity, and causality. Prereq: Admission to DBA program and prior completion of or concurrent enrollment in a graduate level course on the general linear model.

BA 768 RESIDENCE CREDIT FOR THE MASTER'S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

BA 769 RESIDENCE CREDIT FOR THE DOCTOR'S DEGREE. (0-12)
May be repeated indefinitely.

BCH Biochemistry

BCH 395 INDEPENDENT WORK IN BIOCHEMISTRY. (3-12)
Students will carry out a laboratory research project and related reference reading. Laboratory: 9-36 hours per week. May be repeated to a maximum of 12 credits. Prereq: Permission of instructor.

BCH 401G FUNDAMENTALS OF BIOCHEMISTRY. (3)
Descriptive chemistry of amino acids and proteins, carbohydrates, lipids and nucleic acids and discussion of major metabolic pathways and of methods of energy production in cells. Lecture, three hours; one optional conference. Prereq: CHE 107, CHE 236 and BIO 152 or equivalent.

BCH 501 GENERAL BIOCHEMISTRY. (3)
An introductory course devoted to the structure and function of proteins and enzymes and the generation and storage of metabolic energy associated with the metabolism of carbohydrates, lipids, and amino acids. Prereq: CHE 107, CHE 230 and 232, or equivalent. BIO 152 is also recommended.

BCH 502 GENERAL BIOCHEMISTRY. (3)
A continuation of BCH 501. The topics discussed include the molecular basis of gene expression; molecular endocrinology; biochemistry of connective tissue, muscle, erythrocyte, and the immune system; structure, function and metabolism of membranes. The sequence BCH 501, BCH 502 covers the material of BCH 811. Prereq: BCH 501 or equivalent.

BCH 503 PLANT BIOCHEMISTRY. (3)
The chemical constituents of plants, their interaction and the regulation of their interaction in key plant metabolic systems will be studied. Included in the course will be discussions of photosynthesis, nitrogen, nitrate reduction, nitrogen assimilation, plant growth and its regulation and the structure and metabolism of constituents unique to plants. Prereq: BCH 501 and 502 or equivalent or consent of instructor. (Same as PPA 503.)

BCH 504 PHYSICAL BIOCHEMISTRY. (3)
Thermodynamic, hydrodynamic, structure, and kinetic properties of biological systems and macromolecules. Prereq: CHE 444G or equivalent.

BCH 517 EXPERIMENTAL METHODS IN BIOCHEMISTRY. (4)
A laboratory course dealing with the instrumentation and procedures of biochemical research. Because many of the materials used are labile, the course is given in a block during a four-week period at the end of the spring semester. Five days per week during four-week intersession, or summer session. Prereq: BCH 401G, 502 or 811 and consent of instructor.

BCH 501G TOTAL QUALITY MANAGEMENT. (3)
An examination of the theory and practice of total quality management. The course emphasizes cross functional analysis of contemporary quality management practice.

BCH 502 GENERAL BIOCHEMISTRY. (3)
A continuation of BCH 501. The topics discussed include the molecular basis of gene expression; molecular endocrinology; biochemistry of connective tissue, muscle, erythrocyte, and the immune system; structure, function and metabolism of membranes. The sequence BCH 501, BCH 502 covers the material of BCH 811. Prereq: BCH 501 or equivalent.

BCH 503 PLANT BIOCHEMISTRY. (3)
The chemical constituents of plants, their interaction and the regulation of their interaction in key plant metabolic systems will be studied. Included in the course will be discussions of photosynthesis, nitrogen, nitrate reduction, nitrogen assimilation, plant growth and its regulation and the structure and metabolism of constituents unique to plants. Prereq: BCH 501 and 502 or equivalent or consent of instructor. (Same as PPA 503.)

BCH 504 PHYSICAL BIOCHEMISTRY. (3)
Thermodynamic, hydrodynamic, structure, and kinetic properties of biological systems and macromolecules. Prereq: CHE 444G or equivalent.

BCH 517 EXPERIMENTAL METHODS IN BIOCHEMISTRY. (4)
A laboratory course dealing with the instrumentation and procedures of biochemical research. Because many of the materials used are labile, the course is given in a block during a four-week period at the end of the spring semester. Five days per week during four-week intersession, or summer session. Prereq: BCH 401G, 502 or 811 and consent of instructor.

BCH 601 SPECIAL TOPICS IN MOLECULAR AND CELLULAR GENETICS. (3)
Each semester five distinguished scientists visit the UK campus to deliver a series of three formal lectures each and participate in numerous informal contacts with graduate students. The emphasis is on the presentation of the most current advances (often unpublished) in selected topics in molecular and cellular genomics. May be repeated to a maximum of six credits. (Same as AGR/BIO/MI/PPA 601.)

BCH 605 PRINCIPLES OF NEUROBIOLOGY. (4)
The objective of this course is to provide graduate students of diverse backgrounds with an introduction and overview of neurobiology. Areas covered will include neuronal and glial cell biology, neurotransmitters, signaling mechanisms, neuroanatomy, and neuronal development. The course is designed to provide a brief overview of each of the areas and introduce students to current research questions. The course will consist of lectures and informal presentations in a "Journal Club" format. The course will be interdisciplinary and will be of interest to graduate students in anatomy, biology, biochemistry, immunology, pharmacy, pharmacology, physiology, psychology and toxicology and to neurology and neurosurgery residents. Prereq: Introductory biochemistry course, or equivalent, and/or consent of instructor. (Same as ANA/NEU/PKY/PHA 605.)

BCH 610 BIOCHEMISTRY OF LIPIDS AND MEMBRANES. (3)
A lecture and seminar course devoted to intermediary metabolism of lipids and various biochemical aspects of the structure, assembly and functions of biological membrane systems. Prereq: CHE 232, CHE 444G, BCH 401G, 502 or 811. BCH 502 may be taken concurrently.

BCH 611 BIOCHEMISTRY AND CELL BIOLOGY OF NUCLEIC ACIDS. (3)
A lecture and seminar course devoted to a study of the principles of nucleic acid chemistry and to the role of nucleic acids in cellular function. Prereq: BCH 401G, 502 or 811.

BCH 612 STRUCTURE AND FUNCTION OF PROTEINS AND ENZYMES. (3)
Primarily a lecture course devoted to the relationship of the structure of protein molecules to their biological roles. Proteins will be discussed in terms of their size, shape, conformation, primary structure, catalytic mechanism and regulatory properties. Prereq: BCH 401G, 502 or 811; CHE 444G or consent of instructor. May be taken concurrently with BCH 502.

BCH 615 MOLECULAR BIOLOGY. (3)
An integrative and functional approach to the regulatory aspects of DNA, RNA and proteins in procaryotic and eucaryotic cells. Lectures and discussions with readings in original literature. Prereq: A course in genetics (e.g. BIO 404G) and a course in nucleic acids and elementary molecular biology (e.g. BCH 502) or consent of instructor. (Same as BIO/MI 615.)
**1997-1998 Course Descriptions – B**

**BCH 618 SEMINAR IN BIOCHEMISTRY.**  
A weekly seminar, required of all students majoring in biochemistry, devoted to discussions of areas not covered in other courses and to recent developments in the field. May be repeated to a maximum of five credits.

**BCH 619 SEMINAR IN BIOCHEMISTRY.**  
A weekly seminar, required of all students majoring in biochemistry, devoted to discussions of areas not covered in other courses and to recent developments in the field. May be repeated to a maximum of five credits.

**BCH 640 RESEARCH IN BIOCHEMISTRY.**  
Prereq: Consent of instructor.  
(1-9)

**BCH 749 DISSERTATION RESEARCH.**  
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.  
(0)

**BCH 769 RESIDENCE CREDIT FOR THE DOCTOR’S DEGREE.**  
May be repeated indefinitely.  
(0-12)

**BCH 779 MEMBRANE SCIENCES COLLOQUIUM.**  
Outstanding membrane scientists present their current research on biological and/or synthetic membranes. Students read a pertinent paper by the speaker prior to his/her talk and write a short paper on the talk; especially important is relevance of the main points of the talk to membrane science in general and the student’s own research in particular. May be repeated to a maximum of six credits. (Same as CHE/CME/PHA/PHR 779.)  
(1)

**BCH 780 TOPICS IN BIOCHEMISTRY.**  
A lecture and seminar course offered on topics of special interest to graduate students. May be repeated to a maximum of six credits.  
(1-3)

**BCH 812 DENTAL BIOCHEMISTRY.**  
This is a comprehensive course in biochemistry designed to fulfill the specific needs of student dentists. Course content is generally as outlined in the American Association of Dental Schools suggested curriculum guidelines for biochemistry. Part I acquaints students with the chemical constituents of prokaryotic and eukaryotic cells; topics include the chemistry of lipids, carbohydrates, proteins, vitamins and coenzymes, and the nature of enzyme action. Part II integrates the chemical principles learned from Part I with concepts of cell dynamics, structure, function, subcellular organization, and metabolism. Topics include intermediary metabolism, bioenergetics, DNA replication, protein synthesis, and cellular regulatory and control mechanisms. Course content, where possible, is related to current concepts concerning the etiology of oral diseases, their treatment, and prevention to assist student dentists in attaining institutional goals and objectives for clinical competency. Lecture: 90 hours. Prereq: Admission into the College of Dentistry or consent of the course director. (Same as DSI 812.)  
(6)

**BCH 815 FIRST-YEAR ELECTIVE, BIOCHEMISTRY.**  
With the advice and approval of her or his faculty advisor, the first year student may choose approved electives offered by the Department of Biochemistry. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or compliments required course work in the first-year curriculum. Pass/Fail only. Prereq: Admission to first year, College of Medicine.  
(1-3)

**BCH 825 SECOND-YEAR ELECTIVE, BIOCHEMISTRY.**  
With the advice and approval of her or his faculty advisor, the second year student may choose approved electives offered by the Department of Biochemistry. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the second-year curriculum. Pass/Fail only. Prereq: Admission to second year medical curriculum and approval of advisor.  
(1-4)

**BCH 850-899 FOURTH-YEAR ELECTIVE FOR MEDICAL STUDENTS.**  
With the advice and approval of the faculty adviser and the Student Progress and Promotions Committee, the fourth-year student may choose approved electives offered by the various departments in the College of Medicine. The intent is to provide the student an opportunity to develop his fund of knowledge and clinical competence. Prereq: Admission to the fourth year, College of Medicine and/or permission of the Student Progress and Promotions Committee.  
(1-6)

**Approved elective:**  
**BCH 850 ELECTIVE IN BIOCHEMISTRY**

**BIO 101 WAYS OF DOING BIOLOGY.**  
Through a series of lectures and discussion freshman students will gain a better understanding of the various academic programs in the life sciences across campus. Information will also be provided about research opportunities and career possibilities. Pass/fail only.  
(1)

**BIO 102 HUMAN ECOLOGY.**  
A study of the interrelationships of man, populations, space, energy, food, mineral resources and other life on earth. Not for life science majors.  
(3)

**BIO 103 BASIC IDEAS OF BIOLOGY.**  
Introductory biology. Discussion topics are those relevant to both plants and animals - cell structure and function, molecules important to living things, metabolism, heredity, environment. Not for life science majors.  
(3)

**BIO 104 ANIMAL BIOLOGY.**  
An introduction to the major areas of interest in animal biology, e.g., life processes, the cell, development, heredity, body systems, evolution, taxonomy, phylogeny, ecology. Prereq: High school chemistry recommended.  
(3)

**BIO 105 ANIMAL BIOLOGY LABORATORY.**  
Laboratory to be taken concurrently with BIO 104. Laboratory, two hours per week. Prereq: One unit of chemistry or consent of instructor; BIO 104 should be taken concurrently.  
(1)

**BIO 106 PRINCIPLES OF PLANT BIOLOGY.**  
The principles underlying the structure, physiology and reproduction of flowering plants. Prereq: High school chemistry recommended.  
(3)

**BIO 107 PLANT BIOLOGY LABORATORY.**  
Laboratory studies of the morphology, physiology and reproduction of plants with emphasis on the flowering plants. Laboratory, two hours per week. Prereq: One unit of chemistry or consent of instructor. BIO 106 should be taken concurrently.  
(1)

**BIO 110 INTRODUCTION TO HUMAN BIOLOGY AND HEALTH.**  
A course describing basic anatomical and physiological functions of various body cells, tissues, and organs and their interrelationships as a functioning whole. It also deals with basic information as to maintenance of health; brief description of the major and common diseases affecting man—their control and prevention.  
(3)

**BIO 111 GENERAL BIOLOGY LABORATORY.**  
Laboratory studies in the structure and function of cells, plants, and animals; ecology; heredity, and evolution.  
(1)

**BIO 114 MAJOR DISCOVERIES IN BIOLOGY.**  
This course considers important experiments and observations (e.g., the basic principles of genetics, the origin of species, the discovery of penicillin, DNA as genetic material, the conditioned reflex, etc.) that will serve to acquaint students with the excitement of conducting research in biology, while familiarizing them with some of the major advances in this science. The course is designed for students who do not intend to major in biology. Prereq: BIO 103, 104, 106, or equivalent.  
(3)

**BIO 150 PRINCIPLES OF BIOLOGY I.**  
The first semester of an integrated one-year sequence (BIO 150 and BIO 152) that is designed to develop an appreciation of biological principles necessary to explore life at the cellular and molecular levels. Similarities and differences in structure and function of simple and complex cells will be covered along with theories on the origin and evolution of biological systems. Prereq: CHE 105, or Math ACTE score of 26 or above plus concurrent enrollment in CHE 105, or chemistry placement test passed plus concurrent enrollment in CHE 105.  
(3)

**BIO 151 PRINCIPLES OF BIOLOGY LABORATORY I.**  
An introductory laboratory in which biological systems are investigated at the cellular and molecular levels. Laboratory, four hours per week. Prereq: This course is a companion to the BIO 150 lecture course, but it need not be taken concurrently.  
(2)

**BIO 152 PRINCIPLES OF BIOLOGY II.**  
The second semester of an integrated one-year sequence (BIO 150 and BIO 152) that is designed to develop understanding and appreciation for the diverse forms of plant and animal life, and their relationships to each other and to their environment. Structure and function relationships will be explored at many levels of organization: cell, tissue, organ, organism, population and community. Prereq: CHE 105, or Math ACTE of 26 or above plus concurrent enrollment in CHE 105, or chemistry placement test passed plus concurrent enrollment in CHE 105.
\textbf{BIO 153 PRINCIPLES OF BIOLOGY LABORATORY II.} (2)
An introductory laboratory course in which biological systems are investigated at the organismal, population and community levels. Laboratory, four hours per week. Prereq: CHE 105, or Math ACTE of 26 or above plus concurrent enrollment in CHE 105, or chemistry placement test passed plus concurrent enrollment in CHE 105.

\textbf{BIO 204 THE GENETIC PERSPECTIVE.} (3)
An introductory genetics course for nonscience majors examining how heredity affects humans and the remainder of the living world and providing some insights into other fields of science from the geneticist’s perspective. Prereq: Courses in high school biology and chemistry or an introductory college biology course.

\textbf{BIO 205 HONORS BIOLOGY: STRUCTURE AND FUNCTION OF BIOLOGICAL MOLECULES.} (4)
The prime objectives of this course are to provide honors students with a basic understanding of the structural and functional properties and interrelationships of the molecules that are common to all living systems, and to elucidate the fundamental principles upon which all life is predicated. Lecture, three hours; laboratory, three hours per week. Prereq: Enrollment in Honors Program. High school chemistry is strongly recommended.

\textbf{BIO 208 PRINCIPLES OF MICROBIOLOGY.} (3)
This course will introduce biology and nonbiology students to fundamental microbiological principles and techniques. Emphasis is placed upon structural, functional, ecological and evolutionary relationships among microorganisms, principally viruses, rickettsiae bacteria, and fungi and algae. Course open to freshmen with a strong background in sciences. Prereq: High school chemistry recommended.

\textbf{BIO 209 INTRODUCTORY MICROBIOLOGY LABORATORY.} (2)
Laboratory exercises in general microbiology. Laboratory, four hours per week. Prereq: One unit of chemistry or consent of instructor; BIO 208 should be taken concurrently.

\textbf{BIO 210 THE LIFE PROCESSES OF PLANTS.} (3)
This course is intended to provide a basic understanding of the natural products and processes that shape the nature of modern plants, and govern their interactions with the environment and characteristics unique to plants, and develop a basic understanding of how these plant attributes relate to organismic function. Emphasis will be placed on exploring the nature of the major plant biomes of the Earth, their community dynamics, and how member plants compete for space and other resources. Development of optimal plant strategies for reproductive success, plant interaction with other living systems as well as abiotic factors and their defense from predation and attack will also be considered. (Same as PLS 210.)

\textbf{BIO 261 FIELD BOTANY.} (3)
A study of the local flora with emphasis on the Bluegrass and the Appalachian regions of Kentucky, with the use of identification keys and herbarium collections. Laboratory, two hours; field trip, four hours per week. Prereq: An introductory course in biology.

\textbf{BIO 300 GENERAL ENTOMOLOGY.} (3)
Fundamentals of insect biology and relationships among insects, plants, and other organisms; identification of commonly encountered insects. Beneficial and detrimental effects of insects are discussed. Lecture, two hours; laboratory, two hours per week. Prereq: One course in introductory biology. (Same as ENT 100.)

\textbf{BIO 304 PRINCIPLES OF GENETICS.} (4)
A study of the physical and chemical aspects of the genetic material and their relationship to the expression and inheritance of the phenotype. Lecture, three hours; recitation, two hours per week. Prereq: BIO 150 and BIO 152.

\textbf{BIO 315 INTRODUCTION TO CELL BIOLOGY.} (3)
The structure and function of the cells will be considered. Emphasis will be placed on the ultrastructure of cell organelles in plants and animals as a framework for understanding the compartmentalized nature of cell activity. Prereq: BIO 150, 151, 152, 153 (or equivalent). Coreq: CHE 230 or equivalent.

\textbf{BIO 325 INTRODUCTORY ECOLOGY.} (4)
This course introduces students to the basic concepts in ecology. Topics covered include: adaptations of organisms to the environment; factors that influence the distribution and abundance of species; population structure, dynamics, and regulation; community development (succession), structure and function; food webs, energy flow, and nutrient cycling. Lecture, three hours; recitation, two hours per week. Prereq: BIO 150 and BIO 152 or consent of instructor.

\textbf{BIO 340 COMPARATIVE ANATOMY.} (5)
Comparative study of the anatomy of vertebrates with emphasis on evolutionary change, adaptive and functional significance of structural organization and basic concepts of the comparative approach. Laboratory studies on representative vertebrates involving dissections, models, and demonstrations. Lecture, three hours; laboratory, four hours per week. Prereq: BIO 150, 151, 152, 153 or BIO 104, 105 or equivalent course in animal biology.

\textbf{BIO 350 ANIMAL PHYSIOLOGY.} (4)
An introduction to the basic principles of animal physiology. An elementary discussion of the major vertebrate organ systems including nutrition, metabolism, respiration, circulation, excretion, muscle contraction, peripheral and central nervous system, and endocrine function emphasizing homeostasis. Lecture, three hours; demonstration, two hours. Prereq: BIO 150-153 or equivalent; CHE 105, 107.

\textbf{BIO 351 PLANT KINGDOM.} (3)
An evolutionary survey of the morphology, taxonomy, life histories and biological relationships of all plant groups comprising the plant kingdom. Lecture, two hours; laboratory, two hours. Prereq: An introductory course in biology.

\textbf{BIO 375 BEHAVIORAL ECOLOGY AND SOCIOBIOLOGY.} (3)
This course will explore the selective forces influencing animal behavior, such as foraging, predator avoidance, mate choice, parental care, and social interaction. Specific phenomena to be explored include the evolution of optimal foraging and search images, extravagant male characteristics, female preferences, conflicts between the sexes, infanticide, parent-offspring conflict, dominance hierarchies, optimal group size, altruism, and eusociality. The study of these behaviors integrates ideas and approaches from ecology, genetics, physiology, and psychology. Students will be encouraged to read outside material, to think carefully, logically, and critically about ideas, and to ask questions and defend their views in class. Lecture, one hour; laboratory, four hours per week. Prereq: A year of introductory biology (BIO 150/152).

\textbf{BIO 395 RESEARCH IN BIOLOGY.} (1-3)
An independent research project in an area of biology under the direction of a faculty mentor. The research may be conducted in the School of Biological Sciences or in other biological units on campus. A research contract signed by the student and the faculty research mentor must be approved by the Director of Undergraduate Studies in Biology. May be repeated to a maximum of 12 credits, but a maximum of only 6 credits may be used the satisfy the requirements of a BS or BA in Biology. Prereq: Completion of at least one of the Biology core courses (Cell Biology, Genetics, Physiology, Ecology) is strongly recommended.

\textbf{BIO 410 LABORATORY IN GENETICS AND CELL BIOLOGY.} (3)
A laboratory course for students of genetics and cell biology to provide practical experience in contemporary experimental analysis. Prereq: BIO 315 and BIO 304, or equivalent (may be taken concurrently).

\textbf{BIO 425 BIOLOGY SEMINAR.} (1)
Readings and reports on special topics in the biological sciences. Satisfies the seminar requirement for majors in botany, zoology, and biology. May be repeated for a maximum of two credits. Prereq: One year college biology.

\textbf{BIO 430G PLANT PHYSIOLOGY.} (3)
Basic principles of plant physiology; the physiological processes of green plants and the effect of the environment on these processes. Prereq: BIO 150, 151, 152, 153 (or equivalent); CHE 230/231 (or equivalent).

\textbf{BIO 452G LABORATORY IN ECOLOGY.} (2)
An introduction to laboratory and field experimentation and computer simulation in ecology. Exercises and demonstrations will be performed to familiarize students with (1) particular populations and ecosystems, (2) some important research problems in ecology, and (3) current research techniques for dealing with them. One or two Saturday field trips will be required. Laboratory, four hours. Prereq or coreq: BIO 451G or equivalent and consent of instructor.

\textbf{BIO 461 INTRODUCTION TO POPULATION GENETICS.} (2)
This survey course examines the population dynamics and equilibria of genes in nuclei, chloroplasts and mitochondria. Emphasis will be on biological relevance (in plants, animals, and micro-organisms), but some theoretical derivations will also be introduced. Prereq: AGR 360 (or equivalent) and one course in probability/statistics. (Same as AGR/ENT/FOR 461.)

\textbf{BIO 476G GENERAL MICROBIAL PHYSIOLOGY.} (4)
Microorganisms: their physiology, morphology, fine structure, genetics and metabolism in relationship to bacterial growth and division. Lecture, two hours; laboratory, four hours. Prereq: CHE 230 and BIO 150, 151, 152, 153 (or equivalent).
BIO 494G IMMUNOBIOLOGY. (3)
A survey of theories and mechanisms of immunity including: nature of antigens and antibodies, antigen-antibody reactions, immunocompetent cells, immunogenetics, allergic reactions, tumor immunology and transplantation immunology. Prereq: BCH 401G (may be taken concurrently) and BIO 108 or BIO 276, or BIO 476G, or consent of instructor. (Same as MI 494G.)

BIO 502 PRINCIPLES OF SYSTEMS, CELLULAR AND MOLECULAR PHYSIOLOGY. (5)
Advanced survey of major mammalian physiological systems at the systems, cellular and molecular level; lectures, assigned reading, advanced texts or monographs, demonstrations and problem oriented study questions. Prereq: One year each, physics, general chemistry; PGY 206 or its equivalent. (Same as PGY 502.)

BIO 508 EVOLUTION. (3)
Mechanisms of evolutionary change, with a brief summary of historical evolution, especially of the Metazoa. Prereq: BIO 404G or ASC/AGR 360.

BIO 510 RECOMBINANT DNA TECHNIQUES LABORATORY. (4)
An introduction to the construction, isolation, and analysis of recombinant DNA clones, with emphasis on practical experience in basic techniques. Graduate students will be given first preference in course enrollment. Lecture, one hour; laboratory, six hours per week. Prereq: BIO 404G and BIO 276 or equivalent and BCH 401G, or BCH 501 or BCH 502 or equivalent.

BIO 515 GENERAL CELL BIOLOGY. (3)
An integrative, analytical study of the cell as the basic unit of biological structure and function, with emphasis on eukaryotes. Lecture, discussions with readings in some original literature. Prereq: BIO 315 or BCH 401G or equivalent and consent of instructor. (Same as MI 515.)

#BIO 520 BIOINFORMATICS. (3)
An introduction to computer analysis of macromolecular structure information. This course describes how to access, process, and interpret structural information regarding biological macromolecules as a guide to experiments in biology. Lecture, two hours; laboratory, two hours per week. Prereq: BIO 315 or BIO 404G or BCH 401 or BCH 501 or BCH 502 or BIO 510 or consent of instructor.

BIO 529 DEVELOPMENTAL BIOLOGY. (3)
A review of theories of differentiation, a consideration of the genetic environment, and intensive study of correlative factors in development and differentiation at the tissue, cell and molecule levels. Lectures and assigned readings. Prereq: Any introductory biology course dealing with plants or animals.

BIO 535 COMPARATIVE NEUROBIOLOGY AND BEHAVIOR. (3)
The course consists of an introduction to neanophysiology and study of the neural basis of sensory processing and motor patterns. A comparative analysis of the neurobiological basis of behavioral responses will be made, utilizing a broad range of vertebrates and invertebrates. Prereq: BIO 350 or consent of instructor. (Same as PGY 535.)

BIO 540 FUNDAMENTALS OF RADIATION BIOLOGY. (2)
Fundamental aspects of radiation biology. Radiation effects on macromolecules, cells, tissues, organs, and organisms. Prereq: One year of biological sciences, one year of chemistry, one year of physics, and MA 113, or equivalent. (Same as RAS 540.)

BIO 541 RADIOISOTOPE METHODOLOGY. (2)
Radioisotope techniques and their application in the biological and medical sciences. Radiation safety, calibration and use of radiation detectors, counting statistics, uptake and assay methods, and applications. Laboratory, five hours per week. Prereq: CHE 115, PHY 213, and MA 113, or equivalent. (Same as RAS 541.)

BIO 542 HISTOLOGY. (5)
An intensive study of vertebrate histology at the tissue, cell and subcell levels with emphasis on human tissues. Some knowledge of cell biology, biochemistry, physiology and anatomy is desirable. The laboratory involves study of prepared microscope slides. Lecture, three hours per week; laboratory, four hours per week. Prereq: BIO 152 or BIO 315 or BIO 340 or consent of instructor.

BIO 544 EMBRYOLOGY. (5)
A comparative study of chordate development, stressing morphogenesis and reproduction of vertebrate species and evolutionary changes in ontogeny. Laboratory devoted principally to development of the frog, chick and pg. Three lectures and two-two-hour laboratories per week. Prereq: BIO 340.

BIO 549 COMPARATIVE ENDOCRINOLOGY. (3)
An introductory and comparative survey of invertebrate and vertebrate endocrine organs and neuroendocrine mechanisms with emphasis on the evolution, chemistry, actions and functions of hormones. Prereq: BIO 350 or consent of instructor. (Same as PGY 549.)

BIO 550 COMPARATIVE PHYSIOLOGY. (5)
Physiological mechanisms by which animals cope with different environmental stresses. Osmoregulation, respiration, temperature regulation and tolerance, sensory reception, circulation, etc. Prereq: One year college chemistry, BIO 350 or equivalent, one year college physics or consent of instructor.

BIO 551 PLANT AUTECOLOGY. (4)
The effect of physical and biotic factors on plants and environment. Physiological, morphological and anatomical adaptations of plants to the physical factors of the environment are emphasized. Some of the laboratory exercises are carried out in the field. Lecture, three hours; laboratory, two hours. Prereq: BIO 451G or consent of instructor.

BIO 554 MAMMALOGY. (3)
A study of the mammals of the world and their evolution, classification, adaptations and life history, with emphasis on the mammals of Kentucky. Lecture, two hours; laboratory, three hours per week.

BIO 555 VERTEBRATE ZOOLOGY. (4)
An intensive survey of the vertebrate classes with emphasis on morphology, classification, phylogeny, trends in evolution, and adaptations. Lecture, two hours; laboratory, two hours. Prereq: BIO 104, 105 or BIO 150, 151, 152, 153 or consent of instructor.

BIO 559 ORNITHOLOGY. (4)
A study of the life histories, habits, identification, structure, adaptations, and physiology of birds. Special emphasis upon migrations, songs, nests and economic importance of our native birds. Lecture, field excursions, laboratory studies. Prereq: BIO 104, 105 or BIO 150, 152, 153 or consent of instructor.

BIO 561 MEDICAL ENTOMOLOGY. (4)
Study of arthropod vectors of disease. Structure, collection, identification, control measures and life history studies. Prereq: one year of biology. (Same as ENT 561.)

BIO 563 PARASITOLOGY. (4)
Protozoan, helminth and arthropod parasites of man and domestic animals, emphasis on etiology, epidemiology, methods of diagnosis, control measures, and life histories. Techniques for host examination and preparation of material for study. Prereq: BIO 150, 151, 152 or consent of instructor. (Same as ENT 562.)

BIO 564 INSECT TAXONOMY. (4)
A study of insect taxonomy including the collection, preparation, and identification of adult insect specimens. Prereq: Consent of instructor. (Same as ENT 564.)

BIO 565 LIMNOLOGY. (4)
Analysis of fresh-water systems, with special emphasis on aquatic ecology. Lecture, three hours; laboratory, three hours per week. Prereq: CHE 115, PHY 213, and BIO 150-153; or consent of instructor.

BIO 568 INSECT BEHAVIOR. (3)
The principles of animal behavior will be stressed using insects as examples. Physiology, mechanisms, behavioral ecology and evolution of insect behavior will be covered. Prereq: One year of biology. (Same as ENT 568.)

BIO 570 INVERTEBRATE ZOOLOGY. (4)
An intensive survey of the invertebrate phyla, including morphology, classification, phylogeny, general trends in the evolution of organ systems, and adaptations to varied modes of existence. Lecture, two hours; laboratory, four hours. Prereq: BIO 104, 105 or BIO 152, 153 or consent of instructor.

BIO 571 ALGOLOGY. (4)
A survey of the physiology, morphology, life histories, taxonomy and evolutionary relationships of the various groups comprising the algae, with the main emphasis upon the freshwater algae. Lecture, two hours; laboratory, four hours. Prereq: Six credits in biology.

BIO 573 MYCOLOGY. (4)
A survey of the physiology, morphology, life histories, taxonomy and evolutionary relationships of the various groups comprising the fungi. Lecture, three hours; laboratory, two hours. Prereq: BIO 106, 107 or BIO 152, 153.

BIO 575 PLANT ANATOMY AND MORPHOLOGY. (4)
A survey of the diverse structural features of plants and their functional and phylogenetic significance. Emphasis will be on the adaptive design of modern vascular plants as a response to natural and artificial selection. Lecture, three hours; laboratory, two hours per week. Prereq: Introductory biology sequence (six hours) or consent of instructor.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 580</td>
<td>METABOLISM OF MICROORGANISMS.</td>
<td>(4)</td>
<td>An intensive study of the physiology and biochemistry of microorganisms with special emphasis on anaerobic fermentations, anaerobic and aerobic respiration, oxidation-reduction pathways involving organic and inorganic compounds, and the comparative aspects of procaryotic and eucaryotic energy transducing and utilization mechanisms. Lecture or course, two hours; laboratory, four hours per week. Prereq: CHE 230, CHE 231, BCH 401G (or equivalent), and an introductory course, with laboratory, in microbiology.</td>
</tr>
<tr>
<td>BIO 582</td>
<td>VIROLOGY.</td>
<td>(3)</td>
<td>Physical, chemical and biological properties of viruses. Modes of replication and control of gene product formation displayed by representative plant, animal, and bacterial viruses. Prereq: One year of biology and one semester of introductory microbiology or equivalent. BIO 404G and biochemistry or equivalent strongly recommended, or consent of instructor.</td>
</tr>
<tr>
<td>BIO 585</td>
<td>PATHOGENIC MICROBIOLOGY.</td>
<td>(3)</td>
<td>Human and animal pathogenic microorganisms, especially their morphological, cultural, and pathogenic properties. Prereq: BIO 208 or 276 or 476G, and CHE 107. (Same as MI 585.)</td>
</tr>
<tr>
<td>BIO 586</td>
<td>LABORATORY IN PATHOGENIC MICROBIOLOGY.</td>
<td>(2)</td>
<td>Laboratory studies on human and animal pathogenic bacteria, especially their morphological, cultural, and pathogenic properties. Laboratory, four hours per week. Prereq or concur: BIO 585. (Same as MI 586.)</td>
</tr>
<tr>
<td>BIO 595</td>
<td>IMMUNOBIOLOGY.</td>
<td>(2)</td>
<td>Laboratory in immunology and serology. Preparation, standardization, and uses of biological products; serology. Laboratory, four hours. Prereq: BIO/MI 494G or concurrently; or consent of instructor. (Same as MI 595.)</td>
</tr>
<tr>
<td>BIO 601</td>
<td>SPECIAL TOPICS IN MOLECULAR AND CELLULAR GENETICS.</td>
<td>(1)</td>
<td>Each semester five distinguished scientists visit the UK campus to deliver a series of three formal lectures each and participate in numerous informal contacts with graduate students. The emphasis is on the presentation of the most current advances (often unpublished) in selected topics in molecular and cellular genetics. May be repeated to a maximum of six credits. (Same as AGR/BCH/MIPPA 601.)</td>
</tr>
<tr>
<td>BIO 605</td>
<td>EMPIRICAL METHODS IN ECOLOGY AND EVOLUTION.</td>
<td>(2)</td>
<td>This course provides students with hands-on experience in a diverse array of modern research methods used by ecologists and evolutionary biologists, including techniques used in: molecular genetics, chemical ecology, behavioral studies, motion analyses, using high-speed video, image analyses for morphometrics and color, and field techniques in both aquatic and terrestrial systems. Lecture, one hour; laboratory, three hours per week. Prereq: BIO 451G or FOR 340 or ENT 665 or consent of instructor. (Same as ENT/FOR 605.)</td>
</tr>
<tr>
<td>BIO 606</td>
<td>CONCEPTUAL METHODS IN ECOLOGY AND EVOLUTION.</td>
<td>(2)</td>
<td>This course provides students with hands-on experience in a diverse array of conceptual research techniques used by ecologists and evolutionary biologists. The focus will be on optimization methods used for predicting animal and plant behaviors and life histories, and on methods for assessing population trends and dynamics. Mathematical techniques used will include graphical analyses, matrix algebra, calculus, and computer simulations. Prereq: One year of calculus and BIO 451G or FOR 340 or ENT 665, or consent of instructor. (Same as ENT/FOR 606.)</td>
</tr>
<tr>
<td>BIO 607</td>
<td>ADVANCED EVOLUTION.</td>
<td>(2)</td>
<td>This course covers advanced topics in evolution, concentrating on questions central to the understanding of general evolutionary processes. Phenomena occurring both within populations (e.g., selection, inheritance, population subdivision) and between populations (e.g., gene flow, competition) will be addressed. Special attention will be given to modern research approaches and techniques including quantitative genetics, measurement of selection, phylogenetic analyses of comparative data and molecular systematics. Prereq: One year of calculus, genetics (BIO 404G or BIO 461) and BIO 508 or consent of instructor. (Same as ENT/FOR 607.)</td>
</tr>
<tr>
<td>BIO 608</td>
<td>BEHAVIORAL ECOLOGY AND LIFE HISTORIES.</td>
<td>(2)</td>
<td>This course uses an evolutionary approach to examine behavior and life histories. Topics addressed include: the optimality approach, constraints on optimality, kin and group selection, predator and prey behaviors, social and mating behaviors, and life history evolution. Prereq: BIO 451G and one semester of calculus; or consent of instructor. (Same as ENT/FOR 608.)</td>
</tr>
<tr>
<td>BIO 609</td>
<td>POPULATION AND COMMUNITY ECOLOGY.</td>
<td>(2)</td>
<td>This course discusses the processes that determine population distributions and dynamics and community structure for both plants and animals. Topics addressed include: population regulation and population stability, community diversity and stability, ecological succession, population interactions (competition, predation, mutualism), coevolution, and the effects of spatial and temporal heterogeneity on population and community patterns. Prereq: BIO 451G or FOR 340 or consent of instructor. (Same as ENT/FOR 609.)</td>
</tr>
<tr>
<td>BIO 611</td>
<td>BIOPATHOLOGY.</td>
<td>(3)</td>
<td>The course will examine the mechanisms by which various biological, chemical and physical agents injure susceptible hosts and the complex biochemical and immunological reactions which occur in response to injury. The host defense mechanisms will be illustrated by an analysis of selected human diseases and animal model systems with particular emphasis on the events at the molecular and cellular level. Prereq: BCH 502 or concurrent, BIO/MI 494G or equivalent and consent of instructor. (Same as MI 611.)</td>
</tr>
<tr>
<td>BIO 612</td>
<td>BIOLOGY OF AGING.</td>
<td>(3)</td>
<td>A multidisciplinary discussion of how the process of aging affects biological systems. Coverage will be quite broad and includes topics such as subcellular and cellular aging, genetics, immunology, anatomy and physiology, animal model of aging, etc. Prereq: Enrollment in a graduate program of a biomedical science department or consent of instructor. (Same as ANA/GRN 612.)</td>
</tr>
<tr>
<td>BIO 615</td>
<td>MOLECULAR BIOLOGY.</td>
<td>(3)</td>
<td>An integrative and functional approach to the regulatory aspects of DNA, RNA and proteins in procaryotic and eucaryotic cells. Lectures and discussions with readings in original literature. Prereq: A course in genetics (e.g. BIO 404G) and a course in nucleic acids and elementary molecular biology (e.g. BCH 502) or consent of instructor. (Same as BCH/MI 615.)</td>
</tr>
<tr>
<td>BIO 618</td>
<td>MOLECULAR NEUROBIOLOGY.</td>
<td>(4)</td>
<td>This course provides knowledge base and analytical skills in the field of molecular neurobiology. An in-depth introduction to current technologies, their rationale and limitations, will be the focus to address normal brain function and neuropathological conditions. Prereq: BCH 501, 502, NEU 605, or consent of instructor. (Same as ANA/MI/PGY 618.)</td>
</tr>
<tr>
<td>BIO 619</td>
<td>CYTOGENETICS.</td>
<td>(4)</td>
<td>Classical, biochemical and molecular studies of the structure and function of eukaryotic chromosomes. Emphasis is placed on the effects of variation in chromosome type, structure and number on Mendelian genetics and in plant and animal breeding. Lecture, three hours; laboratory, two hours. Prereq: AGR/ASC 360 or BIO 404G. (Same as AGR 619.)</td>
</tr>
<tr>
<td>BIO 620</td>
<td>PLANT MOLECULAR BIOLOGY.</td>
<td>(3)</td>
<td>This course is intended to be a treatment of current concepts of plant molecular biology. It will be a literature-based course, supplemented by handouts and reading lists. The course will deal as much as is possible with topics that are unique to plants. Current aspects of molecular biology that are relevant to the course content will be covered in the first part of the course; however, these lectures will not be a review of topics that should have been retained from introductory genetics and biochemistry courses. Also, they will not be a substitute for a molecular biology course. Prereq: One semester of undergraduate genetics and biochemistry or consent of instructor. (Same as AGR 620.)</td>
</tr>
<tr>
<td>BIO 621</td>
<td>TOPICS IN MODERN BIOLOGY (Subtitle required)</td>
<td>(1-3)</td>
<td>A course for students in the biological and related sciences to be taught on various topics by specialists in their fields. Designed to give the student the most up-to-date information on the various topics. May be repeated to a maximum of nine credits under different subtitles. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>BIO 622</td>
<td>PHYSIOLOGY OF PLANTS I.</td>
<td>(3)</td>
<td>A physiological/biochemical treatment of central topics in modern plant physiology. Topics will include: plant-cell biology, ion transport, water and translocation, respiration and photosynthesis. Prereq: BIO 430G or equivalent or consent of coordinator. Prereq or concur: BCH 501. (Same as AGR/FOR/HOR 622.)</td>
</tr>
<tr>
<td>BIO 623</td>
<td>PHYSIOLOGY OF PLANTS II.</td>
<td>(3)</td>
<td>A physiological/biochemical treatment of central topics in modern plant physiology. Topics will include: plant hormones, an introduction to plant biotechnology, senescence and abscission, stress physiology, phytochrome-photomorphogenesis-phototropism nitrogen and sulfur metabolism. Prereq: BIO 430G or equivalent, and BCH 501 or consent of coordinator. (Same as AGR/FOR/HOR 623.)</td>
</tr>
</tbody>
</table>
**BIO 625 INSECT-PLANT RELATIONSHIPS.**
This course examines the natural history, ecology, and evolution of insect/plant relationships. Topics include mechanisms and theory of plant defense, behavioral and physiological adaptations of herbivorous insects, pollination biology, multilevel interactions, causes of insect outbreaks, and applications to managed ecosystems. Critical reading and discussion of current literature is emphasized. Prereq: Two years of college-level biology. (Same as ENT 625.)

**BIO 630 EXPERIMENTAL TECHNIQUES IN PLANT PHYSIOLOGY.**
Presentation of theory and experimental application of methods for studying plant metabolism and cell biology. Techniques presented include: UV/Vis spectrophotometry, gel electrophoresis, TLC, GLC, HPLC, use of radioisotopes, gel filtration, isolation and characterization of organelles, mRNA isolation. Prereq: BIO 430G or equivalent or consent of instructor. (Same as AGR 630.)

**BIO 632 ADVANCED CELL BIOLOGY I.**
A molecular level treatment of cell structure and function derived from current experimental approaches. Eukaryotes will be stressed. Topics will usually include membrane structure and function, the cytoskeleton and the extracellular matrix, and bioenergetics. Lectures and discussions with reading in the original literature. Prereq: BIO 404G or equivalent; coreq: BCH 501 or equivalent, or consent of instructor.

**BIO 633 ADVANCED CELL BIOLOGY II.**
This course is a companion to BIO 632. Topics will usually include a molecular level discussion of gene structure, gene expression, and gene regulation, followed by the cell and molecular biology of cell proliferation, development, and differentiation. Lectures and discussions with reading in the original literature. Prereq: BIO 404G or equivalent, BCH 501 or equivalent, or consent of instructor.

**BIO 635 INSECT PHYSIOLOGY AND INTERNAL MORPHOLOGY.**
Principles of insect physiology, function of organs, circulation, reproduction, respiration, neurophysiology, endocrinology, and digestion. Internal morphology will be studied as it relates to function. Lecture, three hours; laboratory, two hours. Prereq: Consent of instructor. (Same as ENT 635.)

**BIO 638 DEVELOPMENTAL NEUROBIOLOGY.**
An explanation of the processes which contribute to the development of the nervous system. Neurophysiological, cell biological and molecular approaches to cell differentiation, neuronal pathfinding and synapse formation and stabilization will be explored and discussed. Examples will be drawn from both vertebrate and invertebrate preparations. Prereq: BIO 535 or consent of instructor. (Same as ANA/PGY/PSY 638.)

**BIO 665 INSECT ECOLOGY.**
The biotic and physical factors influencing the distribution and abundance of insects and insect populations. Prereq: Consent of instructor. (Same as ENT 665.)

**BIO 685 ADVANCED IMMUNOBIOLOGY.**
An introductory level graduate course surveying current trends in immunology including the organization and structure of cells relevant to immunity, immunocomplexes, types of immune responses, cellular immunology, immunogenetics and immunopathology. Prereq: BCH 401G, or BCH 501 or 502 or equivalent or consent of instructor. (Same as MI 685.)

**BIO 707 CONTEMPORARY TOPICS IN IMMUNOLOGY.**
This course will deal with controversial and evolving areas in immunology. Lectures in a given topic will be accompanied by student discussion of contemporary literature. Prereq: MI 665 or equivalent or consent of instructor. (Same as MI 707.)

**BIO 720 MICROBIAL STRUCTURE AND FUNCTION.**
Molecular basis of structure and function in unicellular microbes. Molecular genetic and structural approaches to the analysis of bacterial architecture growth, division, and differentiation. Prereq: Consent of instructor, BCH 501, BCH 502, and BIO 476G or equivalent. (Same as MI 720 and OBI 720.)

**BIO 723 MINERAL NUTRITION OF PLANTS.**
Discussion of accumulation, translocation, and utilization of mineral elements by higher plants. Emphasis will be placed on the relationships between these processes and plant metabolism. Prereq: BIO 430G or equivalent; BCH 501 or consent of instructor. (Same as AGR/ORH 723.)

**BIO 740 MAMMALIAN RADIATION BIOLOGY.**
The physical and biological sequelae of radiation effects will be discussed emphasizing human and mammalian responses and radiation health. Emphasis will be for health and medical workers. Prereq: Must have consent of instructor, BIO/RM 540 or RM 546 or equivalent background. (Same as RM 740.)

**BIO 748 MASTER’S THESIS RESEARCH.**
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

**BIO 749 DISSERTATION RESEARCH.**
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

**BIO 768 RESIDENCE CREDIT FOR MASTER’S DEGREE.**
May be repeated to a maximum of 12 hours.

**BIO 769 RESIDENCE CREDIT FOR DOCTOR’S DEGREE.**
May be repeated indefinitely.

**BIO 770 SEMINAR IN BIOLOGY.**
Reports and discussions of current research and literature in biology. Required of all graduate students. May be repeated to a maximum of 8 credits. Prereq: Graduate standing in biological sciences.

**BIO 772 SEMINAR IN MICROBIOLOGY.**
Reports and discussions on various topics in plant physiology. May be repeated for a maximum of eight credits. (Same as AGR 773.)

**BIO 782 ADVANCED VIROLOGY.**
Current trends in virology. Typical topics include DNA tumor viruses, RNA tumor viruses, persistent virus infections, and interference. Emphases of molecular mechanisms. Prereq: BIO 582. Adequate biochemistry and genetics strongly recommended, or consent of instructor.

**BIO 795 RESEARCH IN BIOLOGY.**
Independent research work in biology. May be repeated to a maximum of 24 credits. Prereq: Graduate standing in biological sciences.

**BIO 798 RESEARCH IN MICROBIOLOGY.**
May be repeated to a maximum of 24 credits. Prereq: Consent of instructor. (Same as MI 798.)

**BME Biomedical Engineering**

**BME 481G TOPICS IN BIOMEDICAL ENGINEERING.**
Detailed investigation of a topic of current significance in biomedical engineering such as: biomaterials, hard or soft tissue biomechanics, rehabilitation engineering, cardiopulmonary systems analysis, biomedical imaging. Prereq: Consent of instructor.

**BME 501 FOUNDATIONS OF BIOMEDICAL ENGINEERING.**
This course demonstrates the application of diverse engineering principles to analysis and understanding of the structure, function, and control of biological systems. Quantitative measurements and analysis of homeostatic, regulatory, transport, biochemical, and biomechanical processes of the human body. Prereq: Engineering standing or consent of instructor.

**BME 530 BIOMEDICAL INSTRUMENTATION.**
Transducers, amplifiers for physiological measurements, biopotential measurements, and selected topics in biomedical instrumentation. Some of the topics include pressure, flow, ultrasonic and optical instrumentation and scanning and imaging devices. Lecture, two hours; laboratory, three hours per week. Prereq: EE 305 or equivalent.

**BME 605 BIOMEDICAL SIGNAL PROCESSING I.**
Continuous and discrete signals, sampling, Fourier Transform, Laplace Transform, Z-Transform, correlation and spectral analysis, digital filters. Prereq: EE 305 or equivalent, BME 501 or PGY 502.

**BME 610 BIOMEDICAL CONTROL SYSTEMS I.**
Homeostatic mechanisms, input-output analysis, steady state and transient response, feedback concepts, system identification and simulation from actual operating data. Prereq: PGY 502 and ME 440 or equivalent.
BME 615 BIOMEDICAL SIGNAL PROCESSING II. (3)
Stochastic processes, Fourier-based spectral analysis and linear system identification, modern spectral estimation (AR, MA, ARMA), parametric transfer function estimation, time-frequency analysis of nonstationary signals. Prereq: BME 605, BME 610, EE 640 recommended.

BME 620 BIOMEDICAL CONTROL SYSTEMS II. (3)
Biomedical Systems Models, dynamic programming, variational approach to optimal control problems, real-time parameter estimation, adaptive control methods and biomedical applications. Prereq: BME 605, BME 610.

BME 625 ANALYSIS OF NONLINEAR BIOMEDICAL SYSTEMS. (3)
Basic concepts of nonlinear systems: iterated maps, dynamical flows, bifurcations, chaos. Modelling and analysis of nonlinear systems: Wiener kernels, white-noise identification, polyspectra, nonlinear time-series models. Extensive discussion of selected biomedical applications. Prereq: BME 610, BME 615 or EE 650 recommended.

BME 630 MAGNETIC RESONANCE IN BIOMEDICINE. (3)
Introductory course on the fundamental principles of magnetic resonance imaging and spectroscopy, and its uses in biomedical engineering. Topics include: quantum mechanical and classical descriptions of nuclear magnetic resonance, relaxation theory, signal detection, the Bloch equations and solutions, signal processing and encoding. Imaging and spectroscopy applications will be introduced. Several practical demonstrations will be given. Strong engineering/physics and mathematics background is necessary. Prereq: Undergraduate degree in engineering or physics.

BME 635 MAGNETIC RESONANCE INSTRUMENTATION AND MEASUREMENT. (3)
Laboratory course on the fundamentals of magnetic resonance, instrumentation, measurement, and its biomedical applications. Begins with the nuclear induction experiment and ends with design and implementation of experiments to address engineering and physics problems that relate to the medical field. Instrumentation hardware and software will be taught. Strong engineering/physics and mathematics background is necessary. Prereq: BME 630 or permission of instructor.

BME 641 PRACTICES OF BIOMEDICAL ENGINEERING. (1)
Survey of the regulatory, legal, managerial, financial and medical environment in which the biomedical engineering profession is practiced. This course attempts to provide the interface between the theoretical course material taught in the BME curriculum and the realities of the diverse multidisciplinary world that is unique to the biomedical engineer. Outside guest speakers, in class lectures, and case history analyses will be used. Group term project is mandatory. Prereq: Engineering baccalaureate receive preference.

BME 650 MUSCULOSKELETAL BIODYNAMICS. (3)

BME 661 BIOMATERIALS SCIENCE AND ENGINEERING. (3)
Study of biological and man-made materials that perform, improve, or restore natural functions. Structure and properties of connective tissue and commonly implanted metals, ceramics, and polymers; biocompatibility of materials used in orthopedic, soft tissue, and cardiovascular applications. Prereq: Undergraduate engineering degree or consent of instructor.

BME 662 TISSUE-IMPLANT INTERFACE. (3)
Study of the interface between implants and host tissues from both the materials and biological perspective. Structure of the tissue-implant interface; surface characterization of biomaterials; protein adsorption; mechanisms of cell responses; and methods for controlling the tissue-implant interface, with emphasis on orthopedic and cardiovascular applications. Prereq: BME 661.

BME 670 BIOMECHANICS I. (3)
Application of laws of mechanics to study the behavior of human organ systems. Stress-strain analysis of soft and hard body tissues with emphasis on pulmonary and musculoskeletal systems. Viscoelastic properties. Prereq: PGY 502, EM 302 or consent of instructor.

BME 672 BIOMECHANICS II. (3)
Application of laws of mechanics to study the behavior of human organ systems. Whole body biomechanics: analysis of gait. Fluid mechanics of circulation. Steady and pulsatile flow in large blood vessels and microcirculation. Rheology of blood and other biological fluids. Prereq: PGY 502, ME 330 or consent of instructor.

BME 680 ADVANCED TOPICS IN BIOMECHANICS. (3)

BME 682 ADVANCED TOPICS IN ORTHOPAEDIC BIOMECHANICS. (1)
Seminars in Orthopaedic Biomechanics Research exploring current clinical problems and engineering solutions. Lecture, three hours per week. Prereq: BME 670 and BME 672.

BME 685 BIOFLUID MECHANICS. (3)
Review of the rheology of circulatory processes in the body. Special emphasis on cardiovascular dynamics: pulsatile pressure and flow, vascular impedance, wave propagation/reflection, cardiac dynamics. Special topics. Lecture, three hours with periodic lab demonstrations. Prereq: PGY 502 or equivalent, BME 672, or consent of instructor.

BME 690 RESEARCH IN BIOMEDICAL ENGINEERING (Subtitled required). (1-3)
Individual study related to a special research project. Intended for M.S. candidates who want a research project experience independent of their M.S. thesis work. This course cannot be used to satisfy residency credit requirements. Lecture, 1-3 hours; laboratory, 3-6 hours per week. May be repeated to a maximum of six credits. Prereq: Consent of instructor and graduate standing in BME.

BME 699 SPECIAL TOPICS IN BIOMEDICAL ENGINEERING (Subtitled required). (1-3)
Special topics in biomedical engineering, addressed primarily in a lecture/discussion format. Presentation of focused or specialized topics that are not available in standard courses. Lecture, three hours; laboratory 0-2 hours per week. May be repeated to a maximum of nine credits. Prereq: Consent of instructor and graduate standing in BME.

BME 748 MASTER'S THESIS RESEARCH. (0)
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

BME 749 DISSERTATION RESEARCH. (0)
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

BME 768 RESIDENCE CREDIT FOR THE MASTER’S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

BME 769 RESIDENCE CREDIT FOR THE DOCTOR’S DEGREE. (0-12)
May be repeated indefinetely.

BME 772 SEMINAR. (0)
Review of current literature in the field of biomedical engineering, general discussion and presentation of papers on research in biomedical engineering. Lecture, one hour per week. Required for all graduate students in biomedical engineering.

BME 781 SPECIAL PROBLEMS IN BIOMEDICAL ENGINEERING (Subtitled required). (1-3)
Discussion of advanced and current topics in biomedical engineering. Individual work on research problems of current interest. May be repeated to a maximum of nine credits. Lecture/laboratory hours, variable. Prereq: Approval of instructor.

BSC Behavioral Science

BSC 331 BEHAVIORAL FACTORS IN HEALTH AND DISEASE. (3)
The study of human behavior relating to health and disease and the organization of health care as a social system. Selected concepts from the psychological and social sciences are presented in a biobehavioral frame of reference and applied to the consideration of specific problems.

BSC 527 SOCIETY AND HEALTH. (3)
The study of human behavior in illness and of medicine as a complex form of social organization from historical, cross-cultural and contemporary perspectives. Prereq: Consent of instructor. (Same as SOC 527.)
BSC 520 SURVEY OF MEDICAL ANTHROPOLOGY. (3)
Cross-cultural survey of health, disease, and healing in folk, primitive, and modern pluralistic societies. Biocultural and ethnomedical approaches in medical anthropology. Prereq: Nine hours of anthropology or consent of instructor. (Same as ANT 529.)

BSC 546 SOCIAL FACTORS IN MENTAL HEALTH. (3)
The significance of social, psychological, and cultural factors in the recognition and course of mental health problems; the organization of mental health services in society. Prereq: Consent of instructor. (Same as SOC 546.)

BSC 620 ORIENTATION TO MEDICAL BEHAVIORAL SCIENCE. (1)
This course offers a structural exposure of students to the varieties of basic and clinical science research and current issues in health care policy under discussion at the University Medical Center. Following weekly attendance at research seminars and clinical rounds, students will present their observations in follow-up discussion groups. May be repeated to a maximum of three credits.

BSC 626 SURVEY OF HEALTH PSYCHOLOGY. (3)
A survey of the field of health psychology. It will explore the ways in which social and psychological research contribute to an understanding of health and illness behavior. Prereq: Graduate or professional standing and consent of instructor. (Same as PSY 626.)

BSC 664 CULTURAL ISSUES IN MENTAL ILLNESS. (3)
An in-depth discussion of theory and method of the various approaches to cultural and social factors in the etiology, distribution, and treatment of mental illness. Data from non-Western and Western cultures are examined. Prereq: Enrollment in graduate program in anthropology, sociology, psychology, educational and counseling psychology, or consent of instructor. (Same as ANT/PSY 664.)

BSC 745 RESEARCH METHODS IN MEDICAL BEHAVIORAL SCIENCE. (3)
This is an applied methods course which will review the various aspects of research and apply them to current medical behavioral studies. The different approaches used by the behavioral and clinical sciences will be reviewed and demonstrated. Prereq: Any methods courses required for a Ph.D. in the department major.

BSC 765 RESEARCH PROBLEMS IN MEDICAL ANTHROPOLOGY. (3)
(1) Advanced history and theory of medical anthropology; (2) research design, field work, analysis of data in medical anthropology. Prereq: ANT 529 or equivalent, or consent of instructor. (Same as ANT 765.)

BSC 766 CONCEPTS IN MEDICAL SOCIOLOGY. (3)
A review of sociological concepts and methods which have been applied to the study of health and medicine; the contributions of medical sociology to general sociological theory and to concepts and research on health-related problems of society. Prereq: Consent of instructor. (Same as SOC 766.)

BSC 770 PSYCHOSOCIAL ISSUES IN HEALTH AND AGING. (3)
This course will focus on psychosocial issues related to the physical health and functioning of older adults. Topic areas include: theories of aging; age-appropriate research designs; age-related cognitive personality, social and family changes which influence physical health; health behavior and education of older adults; and selected chronic conditions, e.g. Alzheimer’s disease, arthritis, depression, diabetes and stroke.

BSC 772 TOPICAL SEMINAR IN MEDICAL BEHAVIORAL SCIENCE. (1-3)
Advanced study of selected topics of current importance in medical behavioral science. May be repeated to a maximum of six credits. Prereq: Consent of instructor.

BSC 773 PSYCHOSOCIAL ONCOLOGY. (3)
This course will introduce the student to the field of psychosocial oncology. Historical and recent developments in the application of behavioral science knowledge and methodology to the understanding and treatment of cancer and the cancer patient will be examined. The role of psychosocial factors in the etiology, prevention, and treatment of cancer will be explored. Emphasis will be placed upon the interaction of biological, psychological, and social factors throughout the course of cancer. Prereq: Graduate standing.

BSC 774 BEHAVIORAL AND ECOLOGICAL ASPECTS OF HUMAN NUTRITION. (3)
This course will examine the social ecology of human nutrition using the evolutionary perspective. It will apply the concepts and principles of social science to the study of human nutrition. The course serves also as an introduction to nutritional anthropology. Discussions will focus on the origins of the human diet; human dietary adaptation to diverse ecological and technological situations; social, cultural, behavioral and ecological factors that influence dietary choices in primitive, peasant, modernizing and contemporary societies; and methodological issues in studying food habits and assessing nutritional status. Among the topics that may be addressed are: social, cultural, and psychological factors involved in eating disorders; infant feeding cross-culturally; causes of malnutrition in the Third World as well as in developed countries; ethnic variation in food ideology and food habits; issues in the applicability of anthropometric measures to diverse populations and culturally appropriate approaches to nutritional change. Prereq: Consent of instructor. (Same as ANT 774.)

BSC 775 HUMAN RESPONSE TO STRESS. (3)
Human Response to Stress provides an overview of current models and theories of stress, a review of multi-disciplinary approaches to the study of stress in applied settings, and a reading knowledge of selected research findings in the field of stress. Prereq: Consent of instructor.

BSC 776 SEMINAR IN DEPENDENCY BEHAVIOR. (3)
The course is designed to explore theories of dependency behavior by examining the concept of dependency as it can be applied to the study of various phenomena including alcohol use and abuse; dependence on other psychoactive substances; institutional dependency, dependency in work settings; and poverty and welfare. Prereq: Consent of instructor. (Same as ANT/PSY/SOC 776.)

BSC 777 SEMINAR IN MENTAL ILLNESS CONCEPTS, RESEARCH AND POLICY. (3)
Advanced study of contemporary concepts of mental health and mental illness, and their historical development; major forms of response to mental illness. Prereq: Consent of instructor. (Same as SOC 777.)

BSC 778 BEHAVIORAL FACTORS IN SELECTED DISEASES. (3)
An exploration of behavioral science concepts which bear on various physical illnesses. The perspective of the course is interdisciplinary, using concepts from the various behavioral science disciplines. Prereq: Consent of instructor.

BSC 779 BEHAVIORAL FACTORS IN DEATH AND DYING. (3)
Behavioral concepts are examined which explain reactions of individuals, collectivities and social institutions to the phenomenon of death. Prereq: Consent of instructor.

BSC 785 COMPARATIVE HEALTH CARE SYSTEMS. (3)
This seminar will focus on concepts, issues, and research pertaining to health care systems in comparative perspective. It will deal with the following questions: (1) What are the core analytical dimensions of a health care system? (2) How do health care systems connect with the other institutional domains of a society, with its value-system, and with its major cultural and historical trends? and (3) Within the health care system, how are the main constituents of modern medicine related to each other? Prereq: Consent of instructor. (Same as SOC 785.)

BSC 790 RESEARCH IN MEDICAL BEHAVIORAL SCIENCE. (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. May be repeated to a maximum of 12 hours. Prereq: Consent of instructor.

BSC 815 FIRST-YEAR ELECTIVE, BEHAVIORAL SCIENCE. (1-3)
With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Behavioral Science. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

*BSC 820 PATIENTS, PHYSICIANS, AND SOCIETY II. (3)
In this course, students will approach written clinical scenarios with initiative by fail only. Prereq: Admission to first year, College of Medicine.

BSC 799 RESEARCH IN MEDICAL BEHAVIORAL SCIENCE. (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. May be repeated to a maximum of 12 hours. Prereq: Consent of instructor.

BSC 815 FIRST-YEAR ELECTIVE, BEHAVIORAL SCIENCE. (1-3)
With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Behavioral Science. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

*BSC 820 PATIENTS, PHYSICIANS, AND SOCIETY II. (3)
In this course, students will approach written clinical scenarios with initiative by fail only. Prereq: Admission to first year, College of Medicine.

BSC 799 RESEARCH IN MEDICAL BEHAVIORAL SCIENCE. (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. May be repeated to a maximum of 12 hours. Prereq: Consent of instructor.

BSC 815 FIRST-YEAR ELECTIVE, BEHAVIORAL SCIENCE. (1-3)
With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Behavioral Science. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

*BSC 820 PATIENTS, PHYSICIANS, AND SOCIETY II. (3)
In this course, students will approach written clinical scenarios with initiative by fail only. Prereq: Admission to first year, College of Medicine.

BSC 799 RESEARCH IN MEDICAL BEHAVIORAL SCIENCE. (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. May be repeated to a maximum of 12 hours. Prereq: Consent of instructor.

BSC 815 FIRST-YEAR ELECTIVE, BEHAVIORAL SCIENCE. (1-3)
With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Behavioral Science. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

*BSC 820 PATIENTS, PHYSICIANS, AND SOCIETY II. (3)
In this course, students will approach written clinical scenarios with initiative by fail only. Prereq: Admission to first year, College of Medicine.

BSC 799 RESEARCH IN MEDICAL BEHAVIORAL SCIENCE. (1-6)
Individually directed research and reading in particular aspects of medical behavioral science under the supervision of one or more members of the faculty. May be repeated to a maximum of 12 hours. Prereq: Consent of instructor.

BSC 815 FIRST-YEAR ELECTIVE, BEHAVIORAL SCIENCE. (1-3)
With the advice and approval of his or her faculty adviser, the first-year student may choose approved electives offered by the Department of Behavioral Science. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the first-year curriculum. Pass-fail only. Prereq: Admission to first year, College of Medicine.

*BSC 820 PATIENTS, PHYSICIANS, AND SOCIETY II. (3)
In this course, students will approach written clinical scenarios with initiative by fail only. Prereq: Admission to first year, College of Medicine.
**BSC 825 SECOND-YEAR ELECTIVE, BEHAVIORAL SCIENCE.** (1-4)
With the advice and approval of his or her faculty adviser, the second-year student may choose approved electives offered by the Department of Behavioral Science. The intent is to provide the student an opportunity for exploration and study in an area which supplements and/or complements required course work in the second-year curriculum. Pass-fail only. Prereq: Admission to second-year medical curriculum and approval of adviser.

**BSC 850-899 FOURTH-YEAR ELECTIVE FOR MEDICAL STUDENTS.** (1-6)
With the advice and approval of the faculty adviser and the Student Progress and Promotions Committee, the fourth-year student may choose approved electives offered by the various departments in the College of Medicine. The intent is to provide the student an opportunity to develop his fund of knowledge and clinical competence. Prereq: Admission to the fourth year, College of Medicine and/or permission of the Student Progress and Promotions Committee.

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**BUS Business and Office Technology**

See also Vocational Education.

**BUS 116 KEYBOARDING.** (1)
Development of keyboarding skills for operating typewriters, CRT’s, and equipment with keyboards; emphasis on touch system for accuracy and control of alphabetic, numeric, symbol, and command keys. (No credit for those with previous typewriting instruction.)

**BUS 117 TYPEWRITING.** (2)
Principles and techniques of typewriting are integrated with a thorough study of form, style, and arrangement of typewritten materials. Prereq: BUS 116 or equivalent.

**BUS 118 ADVANCED KEYBOARDING AND WORD PROCESSING.** (3)
A study of advanced principles and techniques of keyboarding and word processing with emphasis upon planning and organizing a wide range of business communications media and upon meeting production standards essential to the operation of modern offices.

**BUS 160 BASIC BUSINESS CONCEPTS FOR OFFICE PERSONNEL.** (3)
Introduces the terminology of business and orients the student to other business and office education courses; provides an understanding of the interrelationships which exist between consumers and businesses and the impact of the activities of both groups on the economy. Major emphasis is upon interpreting and using this understanding in an office career.

**BUS 204 OFFICE FINANCIAL APPLICATIONS.** (3)
Basic financial applications required for office procedures and planning. Applications include banking, pricing, interest and installment credit, taxes, insurance, capital financing, and annuities. Touch 10-key keyboarding utilizing computer software will be taught. Lecture, three hours; laboratory, one-half hour per week.

**BUS 209 OFFICE ACCOUNTING PRINCIPLES AND APPLICATIONS.** (4)
A study of accounting systems of the professions, small businesses, and institutions. Special applications and practice sets will be utilized on automated equipment.

**BUS 212 ACCELERATED SHORTHAND.** (3)
Reinforcement of shorthand principles and theory; development of dictation speeds and transcription skills. Prereq: BUS 112 and 117, or consent of instructor.

**BUS 519 RECORDS MANAGEMENT.** (3)
The underlying principles and procedures of records management; information storage and retrieval systems; integration and control of records systems and programs. Prereq: BUS 118.

**BUS 556 BUSINESS REPORTS AND COMMUNICATIONS.** (3)
Written and oral communication relating to current problems in business investigated by various research procedures with major emphasis placed upon sources of data, compilation and arrangement of data, documentation, bibliography, and effective presentation. Prereq: BUS 315.