Actuarial Science

ACTS 4301 Principles of Actuarial Models: Life Contingencies I (3 semester hours) The purpose of this class is to develop the student's knowledge of the theoretical basis of life contingent actuarial models and the application of those models to insurance and other financial risks. Life contingencies, survival models, life insurances, annuities and premiums will be studied. This class covers parts of CAS Exam 3L and SOA Exam MLC. Prerequisite: STAT 4351 or instructor consent required. (3-0) T

ACTS 4302 Principles of Actuarial Models: Financial Economics (3 semester hours) This 3 semester hour course develops the student's knowledge of the theoretical basis of certain actuarial models and the application of those models to insurance and other financial risks. The topics discussed include interest rate models, rational valuation of derivative securities, mathematical and probabilistic foundation of risk management. This class covers parts of CAS exam 3F and SOA exam MFE. Prerequisites: STAT 4351 and STAT 4382. Prerequisite or corequisite: FIN 4300 or instructor consent required. (3-0) T

ACTS 4304 Construction and Evaluation of Actuarial Models (3 semester hours) Introduction to useful frequency and severity models beyond those covered in Principles of Actuarial Models. Discussion of the steps involved in the modeling process and how to carry out these steps in solving business problems. At the end of the course the students should be able to: 1) analyze data from an application in a business context; 2) determine a suitable model including parameter values; and 3) provide measures of confidence for decisions based upon the model. This class also provides an introduction to a variety of tools for the calibration and evaluation of the models. This class covers parts of CAS Exam 4/SOA Exam C. Prerequisite: STAT 4352 or instructor consent required. (3-0) T

ACTS 4306 Actuarial Probability as Problem Solving (3 semester hours) Topics in actuarial probability via solving problems. This class covers topics of Exam 1/P. Prerequisite: STAT 4351 or instructor consent required. (3-0) R

ACTS 4308 Actuarial Financial Mathematics (3 semester hours) The purpose of this 3 semester hour course is to provide an understanding of the fundamental concepts of financial mathematics, and how those concepts are applied in calculating present and accumulated values for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, asset/liability management, investment income, capital budgeting, and valuing contingent cash flows. The students will also be given an introduction to financial instruments, including derivatives, and the concept of no-arbitrage as it relates to financial mathematics. This class covers topics of Exam 2/FM. Prerequisites: (MATH 2451 and MIS 3300), or instructor consent required. (3-0) R

Biology

BIOL 1300 Body Systems with Lab (3 semester hours) Examines the organ systems of mammals,

predominantly the human. Function in relation to structure is emphasized. The effects of one organ system on others are stressed. The overall objective of the course is an appreciation of the integration and control of all systems. There is a model-based human anatomy lab. This course is specifically designed for non-majors. (2-1) S

BIOL 1310 Basics of Biotechnology with Lab (3 semester hours) An introduction to basic biotechnology principles for those not majoring in the natural sciences. This course will introduce students to the general concepts and principles of the genetic revolution. The role of biotechnology in everyday life will be explored together with a discussion of the impact it presently plays (and will play) on our health, the environment, agriculture and industry. In the laboratory portion of the course students will purify and manipulate DNA and gene products, grow genetically modified organisms, and perform DNA fingerprinting. (2-1) T

BIOL 1318 (BIOL 2316) Human Genetics (3 semester hours) Elementary course in the fundamentals of human genetics. Topics include patterns of inheritance; DNA structure and replication; gene function; mutation and its role in genetic diseases, cancer, and the immune system; matters of sex; evolution; genetic engineering and gene therapy; forensics and bioethics. This course is specifically designed for non-majors. (3-0) Y

BIOL 1320 (BIOL 2320) The Microbial World with Lab (3 semester hours) Contributions of microorganisms to our world are explored. Topics include the involvement of microbes in many aspects of our daily lives, from helping to create the air we breathe to the production of foods (such as bread, cheese) and beverages (beer, wine). The laboratory component includes interactive experiments which complement the lecture topics. This course is specifically designed for non-majors. (2-2) Y

BIOL 1v00 Topics in Biological Sciences (1-6 semester hours) May be repeated as topics vary (6 hours maximum). ([1-6]-0) R

BIOL 1v01 Topics in Biological Sciences with Lab (1-6 semester hours) May be repeated as topics vary (6 hours maximum). ([1-5]-[1-5]) R

BIOL 1v95 Individual Instruction in Biology (1-6 semester hours) Individual study under a faculty member's direction. Topics may vary. May be repeated for credit. Instructor consent required. ([1-6]-0) S

BIOL 2111 Introduction to Modern Biology Workshop I (1 semester hour) Problem solving and discussion related to the subject matter in BIOL 2311. Corequisite: BIOL 2311. (1-0) S

BIOL 2112 Introduction to Modern Biology Workshop II (1 semester hour) Problem solving and discussion related to the subject matter in BIOL 2312. Corequisite: concurrent enrollment in BIOL 2312. (1-0) S

BIOL 2281 Introductory Biology Laboratory (2 semester hours) Introductory lectures discuss the theoretical and historical aspects of the experiments carried out in the laboratory. Laboratory experiments introduce the student to bioinformatics, basic cellular biology, and structure and

function of proteins and nucleic acids. Computer exercises in bioinformatics involve multiple alignment analyses, BLAST and literature searches, and construction of phylogenetic trees. Laboratory experiments include microscopy, microbial techniques, yeast genetics, and the electrophoretic behavior of normal and mutant proteins. DNA related experiments include isolation (nuclear and mtDNA), amplification, restriction digests, electrophoresis, plasmid mapping, and transformations. Students present posters of their long-term investigations at the end of the semester. Prerequisite: BIOL 2311 (also see prerequisites for BIOL 2311). ([0-1]-[1-2]) S

BIOL 2311 (BIOL 1306) Introduction to Modern Biology I (3 semester hours) Presentation of some of the fundamental concepts of modern biology, with an emphasis on the molecular and cellular basis of biological phenomena. Topics include the chemistry and metabolism of biological molecules, elementary classical and molecular genetics, and selected aspects of developmental biology, physiology (including hormone action), immunity, and neurophysiology. Prerequisites: CHEM 1311 and CHEM 1312 (General Chemistry I and II). Corequisite: BIOL 2111. (3-0) S

BIOL 2312 (BIOL 1307) Introduction to Modern Biology II (3 semester hours) Continuation of BIOL 2311. The overall emphasis will be on organ physiology and regulatory mechanisms involving individual organs and organ systems. Factors considered will be organ development and structure, evolutionary processes and biological diversity, and their effects on physiological mechanisms regulating the internal environment. Corequisite: BIOL 2112. (3-0) S

BIOL 2v00 Topics in Biological Sciences (1-6 semester hours) May be repeated as topics vary (6 hours maximum). ([1-6]-0) R

BIOL 2v01 Topics in Biological Sciences with Lab (1-6 semester hours) May be repeated as topics vary (6 hours maximum). ([1-5]-[1-5]) R

BIOL 2v95 Individual Instruction in Biology (1-6 semester hours) Individual study under a faculty member's direction. Topics may vary. May be repeated for credit. Instructor consent required. ([1-6]-0) S

BIOL 3101 Classical and Molecular Genetics Workshop (1 semester hour) Problem solving and discussion related to the subject matter in BIOL 3301. Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. Corequisite: BIOL 3301. (1-0) S

BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop (1 semester hour) Problem solving and discussion related to the subject matter in BIOL 3302. Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. Corequisite: BIOL 3302. (1-0) S

BIOL 3110 Nanomedicine Workshop (1 semester hour) Discussions and student presentations related to the subject matter in BIOL 3310. (1-0) Y

BIOL 3161 Biochemistry Workshop I (1 semester hour) Problem solving methodology in biochemistry; discussion of recent advances in areas related to the subject matter in BIOL 3361 or CHEM 3361. Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. Corequisite: BIOL 3361 or CHEM 3361. (1-0) S

BIOL 3162 Biochemistry Workshop II (1 semester hour) Problem-solving methodology in biochemistry; discussion of recent advances in areas related to the subject matter in BIOL 3362 or CHEM 3362. Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. Corequisite: BIOL 3362 or CHEM 3362. (1-0) Y

BIOL 3301 Classical and Molecular Genetics (3 semester hours) The phenomenon of heredity, its cytological and molecular basis; gene expression and transfer of genetic information, with major focus on bacterial and model eukaryotic systems; genetic recombination and chromosome mapping; tetrad analysis; mutations and mutagenesis; genetic interactions; application of recombinant DNA techniques to genetic analysis. Prerequisites: BIOL 2311 and CHEM 2323 (Organic Chemistry I). Corequisite: BIOL 3101. (3-0) S

BIOL 3302 Eukaryotic Molecular and Cell Biology (3 semester hours) Structural organization of eukaryotic cells; regulation of cellular activities; membranes and transport; cellular replication; examples of cell specialization such as blood (immunoglobulins) and muscle cells. Prerequisites: BIOL 3301 and (BIOL 3361 or CHEM 3361). Corequisite: BIOL 3102. (3-0) S

BIOL 3305 Evolutionary Analysis (3 semester hours) Molecular and fossil evidence for evolution. Darwinian natural selection, mechanisms of evolution, Mendelian genetics in populations, forms of adaptation, evolutionary trees, molecular phylogeny, theories on the origin of life. Prerequisite: BIOL 3301. (3-0) Y

BIOL 3310 Nanomedicine (3 semester hours) Nanomedicine is an emerging area where biology and nanotechnology converge, combining multidisciplinary fields such as biology, medicine, chemistry, physics and engineering. The rapid development of nanomedicine also has ethical and environmental implications. This course provides an introduction and overview of nanomedicine for undergraduate Curriculum V honors students. The course consists of a 3-hour lecture series one day a week, plus a workshop. The lectures begin with the basics of protein and lipid structure, providing a review for understanding how bio-macromolecules combine to form the structural and functional units of the intact cell that are important for nanomedicine applications. Guest lecturers from academia and industry will also present talks in their specialty areas, including a lecture on emerging ethical issues related to the practice of nanomedicine. The last part of the course consists of student presentations on topics of interest. Prerequisite or corequisite: BIOL 3361. (3-0) Y

BIOL 3318 Forensic Biology (3 semester hours) Role and methodology of biological testing in criminal investigation and forensic science. Analysis of the procedures and methodologies employed in the collection, preservation and screening of biological evidence, and protein and DNA testing. Population genetics employed during the statistical evaluation of data is covered. The course is structured to allow individuals with and without biological training to participate. The subject matter will be developed from the concept of "What is DNA?" through "What does a statistical estimate really mean?" (3-0) T

BIOL 3321 Microbial Genetics Laboratory (3 semester hours) Laboratory with introductory lecture that will focus on the genetic methods used for analysis of complex biological processes in bacteria. Includes the utilization of chemical and physical mutagens; transformation; transduction;

conjugation; transposons; gene fusions; molecular cloning; polymerase chain reaction; southern, northern and western blot analyses; and post-genomic genetics. The course will also emphasize how these sophisticated techniques can be used to dissect pathogenic mechanisms and enhance environmental remediation. Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. (1-2) T

BIOL 3335 Microbial Physiology (3 semester hours) Life processes of microbes: fermentations, N2 assimilation, and other biochemical pathways specific to bacteria; cellular structure and differentiation, among others. Substitutes for BIOL 3362 or CHEM 3362 for Biology majors. Prerequisites: BIOL 2311 and (BIOL 3361 or CHEM 3361). (3-0) T

BIOL 3336 Protein and Nucleic Acid Structure (3 semester hours) Examines the different types of protein motifs, protein and DNA folding and stability, and the relation of structure to function. Circular dichroism, NMR, and crystallographic methods of structural determination are presented. Types of proteins considered include transcription factors, proteinases, membrane proteins, proteins in signal transduction, proteins of the immune system, and engineered proteins. Students also receive instruction in the viewing and manipulation of protein and DNA structures using various modeling programs and data from national web sites. Prerequisite: BIOL 3361 or CHEM 3361. (3-0) T

BIOL 3350 Biological Basis of Health and Disease (3 semester hours) Fundamentals of pathophysiology, focusing on the dynamic processes that cause disease, give rise to symptoms, and signal the body's attempt to overcome disease. The course covers diseases which may affect dramatically the life of an individual and society in the modern age. Topics include 1) mechanisms of infectious disease, immunity, and inflammation and 2) alterations in structure and function of the reproductive, circulatory, respiratory, and urinary systems. Special emphasis is given to preventative aspects for each disease based on non-drug, wellness-promoting approaches. This course is designed as a science elective open to all majors. (3-0) S

BIOL 3351 Secrets of Cells (3 semester hours) Explores the biology of cells, from bacterial to human. Topics include the basic structure of cells, structure and inheritance of DNA, evolution of eukaryotic cells, functioning of different types of cells and tissues, including those of the immune and nervous system, and the study of several genetic diseases, such as cancer and cardiovascular disease. This course is specifically designed as a science elective open to all majors. (3-0) T

BIOL 3361 Biochemistry I (3 semester hours) Structures and chemical properties of amino acids; protein purification and characterization; protein structure and thermodynamics of polypeptide chain folding; catalytic mechanisms, kinetics and regulation of enzymes; energetics of biochemical reactions; generation and storage of metabolic energy associated with carbohydrates; oxidative phosphorylation and electron transport mechanisms; photosynthesis. Prerequisites: CHEM 2323 and CHEM 2325. Corequisite: BIOL 3161. (Same as CHEM 3361) (3-0) S

BIOL 3362 Biochemistry II (3 semester hours) Breakdown and synthesis of lipids; membrane structure and function; nitrogen metabolism and fixation; nucleotide metabolism; structure and properties of nucleic acids; sequencing and genetic engineering; replication, transcription, and translation; chromosome structure; hormone action; biochemical basis of certain pathological

processes. Prerequisite: (BIOL 3361 or CHEM 3361) or its equivalent, or instructor consent required. Corequisite: BIOL 3162. (Same as CHEM 3362) (3-0) S

BIOL 3370 Exercise Physiology (3 semester hours) Examines the operation and adaptation of human organ systems (cardiovascular, respiratory, renal, skeletal, and hormonal) during exercise. Clinical aspects of exercise, including the effects of training, nutrition, performance, and ergogenic aids, are also discussed. Prerequisite: BIOL 2312. Recommended: BIOL 3455 and BIOL 3456. (3-0) Y

BIOL 3371 Biology of the Brain (3 semester hours) Explores the structure and function of the brain. Includes discussions of the molecular and cell biology of neurons, organization of the nervous system and anatomy of the brain, basic electrophysiology of the neuron, function and action of neurotransmitters, operation of sensory and motor systems, and the molecular and cellular basis of neurodegenerative disorders. Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. (3-0) T

BIOL 3380 Biochemistry Laboratory (3 semester hours) Current techniques in the purification and characterization of enzymes to demonstrate fundamental principles that are utilized in modern biochemistry and molecular biology research laboratories. Practical skills taught include micropipetting, basic solution preparation, conducting pH measurements, isolating crude enzyme extracts, and performing standard activity assays. Advanced experiments with Green Fluorescent Protein and Lactate Dehydrogenase include Ni++-NTA affinity chromatography, ion chromatography, protein detection using Bradford, Lowry, and spectrophotometric assays, SDS-PAGE separation, Western Blot analysis, and enzyme kinetics. Prerequisite: BIOL 2281. Prerequisite or corequisite: BIOL 3361 or CHEM 3361. (1-2) S

BIOL 3455 Human Anatomy and Physiology with Lab I (4 semester hours) First of a two-course sequence providing a comprehensive study of the basic principles of human physiology in conjunction with a detailed, model-based human anatomy laboratory and computer-assisted physiology experiments. Examination of structure-function relationships includes a survey of human histology and skeletal, muscular, neural, and sensory organ systems. Prerequisite: BIOL 2312 or equivalent. (3-3) S

BIOL 3456 Human Anatomy and Physiology with Lab II (4 semester hours) Continuation of the comprehensive study of the basic principles of human physiology in conjunction with a detailed, model-based human anatomy laboratory and computer-assisted physiology experiments. Endocrine, cardiovascular, respiratory, digestive, renal, and reproductive systems are examined. May be taken before BIOL 3455. Prerequisite: BIOL 2312 or equivalent. (3-3) S

BIOL 3v00 Topics in Biological Sciences (1-6 semester hours) May be repeated as topics vary (9 hours maximum). Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. ([1-6]-0) S

BIOL 3v01 Topics in Biological Sciences with Lab (1-6 semester hours) May be repeated as topics vary (6 hours maximum). Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. ([1-5]-[1-5]) R

BIOL 3v20 General Microbiology with Lab (4-5 semester hours) Majors course in general microbiology. Lectures include topics recommended by the Education Division of the American Society for Microbiology: microbial structure, diversity, growth and growth control, metabolism, genetics, and gene regulation. Among additional topics covered are virology, immunology and microbial diseases (plant and animal) including epidemiology, transmission, and host-microbe interactions. The laboratory focuses on developing laboratory skills in classical microbiology by the individual student. Exercises include various staining and pure culture techniques, biochemical and other in vitro testing, as well as isolation and identification of unknown organisms. Prerequisites: (BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents) and CHEM 2323. (2-[2-3]) Y

BIOL 3v40 Topics in Molecular and Cell Biology (1-6 semester hours) May be repeated as topics vary (9 hours maximum). Prerequisites: BIOL 2281 and BIOL 2311 and BIOL 2312 or their equivalents. ([1-6]-[0-5]) S

BIOL 3v81 Clinical Medicine I (1-6 semester hours) Clinical Medicine is a component of the UT Partnership in Advancing Clinical Transition (UT PACT) program that addresses clinical competencies in the medical profession, including communication skills, professional identity formation, interprofessional teamwork, and medical ethics. Students participate in small group sessions, clinical preceptorships, and hospital rotations at UT Southwestern Medical Center. Enrollment is limited to students who have completed at least one year of the UT PACT Program. May be repeated for credit with permission of UT PACT advisor. ([1-6]-0) Y

BIOL 3v82 Clinical Medicine II (1-6 semester hours) Clinical Medicine II addresses clinical competencies in the medical profession, building on skills already addressed in Clinical Medicine I and other parts of the UT PACT curriculum. Topics to be addressed include the application of basic science to clinical practice, interpersonal skills in medicine, cultural competency, and professionalism and medical ethics in clinical settings. Students participate in small group sessions and clinical preceptorships and rotations at UT Southwestern Medical Center. Enrollment is limited to students who have completed their second year in the UT PACT Program. May be repeated for credit with permission of UT PACT advisor. Prerequisite: BIOL 3V81. ([1-6]-0) Y

BIOL 3v90 Undergraduate Readings in Biology (1-3 semester hours) Subject and scope to be determined on an individual basis. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([1-3]-0) S

BIOL 3v91 Undergraduate Research in Biology (1-3 semester hours) Subject and scope to be determined on an individual basis. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([1-3]-0) S

BIOL 3v92 Undergraduate Readings in Biochemistry (1-3 semester hours) Subject and scope to be determined on an individual basis. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([1-3]-0) S

BIOL 3v93 Undergraduate Research in Biochemistry (1-3 semester hours) Subject and scope to be determined on an individual basis. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([1-3]-0) S

BIOL 3v94 Topics in Biology (Individual Instruction) (1-6 semester hours) Individual study under a faculty member's direction. May be repeated for credit. Topics may vary. Prerequisite: Instructor consent required. ([1-6]-0) S

BIOL 3v95 Undergraduate Readings in Molecular and Cell Biology (1-3 semester hours) Subject and scope to be determined on an individual basis. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([1-3]-0) S

BIOL 3v96 Undergraduate Research in Molecular and Cell Biology (1-3 semester hours) Subject and scope to be determined on an individual basis. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([1-3]-0) S

BIOL 4261 Biomolecular Modeling (2 semester hours) Designed to provide some of the computational tools needed to study the large number of biomolecular structures now available in databanks. Molecular Simulations Insight II software will be used to visualize and manipulate protein and nucleic acid structures. Students will build examples of small 3-dimensional molecules from amino acid, nucleotide, and sugar residues. Procedures for energy minimization will be studied. Homologous protein structures will be compared, and mutated structures will be modeled. Other modeling approaches such as Monte Carlo and molecular or Brownian dynamics may be included. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (1-1) T

BIOL 4302 TA Apprenticeship (3 semester hours) Development and practice of teaching skills in the classroom and laboratory in the biological sciences. May be repeated only once for credit (6 hours maximum). Prerequisite: Instructor consent required. (3-0) S

BIOL 4308 Developmental Biology (3 semester hours) Molecular mechanisms controlling development in eukaryotes, with emphasis on the early stages of morphogenesis. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4310 Cellular Microbiology (3 semester hours) The course covers topics related to pathogenesis of infectious diseases in the context of host cell properties. It introduces various human pathogens and describes their virulence, and explores the evolutionary aspects of how pathogens interact with their host cells and how host cells defend themselves against invading microorganisms. Topics include bacterial toxins and secretion mechanisms, virus infections, microbial invasion and intracellular parasitism, manipulation of host cell functions and induction of cell death by pathogens, innate and acquired defense mechanisms of the host, inflammation, sepsis, and advances of microbial genomics involving human microbiome, vaccines, and anti-infectives. The course aims to complement the scientific knowledge and principles established in cell biology, medical microbiology and immunology with appropriate relevance to clinical applications involving parasitology and infectious disease control. (3-0) Y

BIOL 4316 Parasites and Symbionts (3 semester hours) A survey of microorganisms that live in close association with other organisms. From bacteriophages to trypanosomes, this course will cover a wide range of plant and animal parasites and symbionts and their interactions at the

molecular level. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4324 Field Ecology (3 semester hours) General ecological principles as related to productivity, population diversity, communities and ecosystem functions. Field data collection techniques included. Prerequisite: Upper-division standing. (3-0) Y

BIOL 4332 RNA Structure and Catalysis (3 semester hours) A survey of the determinants of RNA secondary and tertiary structure and their role in RNA processing and catalysis. The mechanisms of posttranscriptional RNA processing including base modifications, mRNA capping and poly A addition, 5' and 3' end maturation, intron excision, and RNA editing will be covered as well as the mechanisms of RNA catalysis. The mechanisms of large ribozymes such as Group I and Group II introns and RNAase of P RNA will be contrasted to the mechanisms of small ribozymes such as hairpins and hammerheads. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4333 Replication, Recombination, and Repair (3 semester hours) A fundamental unifying principle of molecular biology, genetics, molecular medicine, and evolution is DNA metabolism. This course will provide an extensive overview of the mechanisms that control the processes of DNA repair, replication, and recombination. The most recent publications in these fields will be discussed in order to provide the students with a strong working knowledge of these processes. The course structure will consist of a mixture of faculty lectures and student literature presentations. Student evaluations will be based upon examinations, class participation, and the written and oral presentations. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4336 Membrane Biology (3 semester hours) A survey of the structural components of biomembranes and the forces that dictate membrane structure. General membrane functions, such as compartmentalization and membrane transport, are analyzed in view of the principles of membrane structure. The structure, function, and biogenesis of the membrane organelles in cells are covered in detail. Diseases whose pathology originates with biomembranes, such as cystic fibrosis and heart disease, are discussed as examples illustrating membrane structure and function. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) and (BIOL 3362 or CHEM 3362) or their equivalents, or instructor consent required. (3-0) T

BIOL 4337 Seminal Papers in Biology (3 semester hours) Theoretical and experimental papers in selected areas of biology will be discussed in a senior seminar format. The historical and biographical context of the papers and their authors will also be explored. The areas to be covered in any semester will vary with the instructor. Each student is expected to make an oral presentation and to prepare a written paper. Satisfies the Advanced Writing Requirement for Biology majors. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) and (BIOL 3362 or CHEM 3362). (3-0) S

BIOL 4338 Cell Signaling (3 semester hours) How cells sense, interpret, and respond to various intra- and extracellular signals. Focus will be placed on signal transduction pathways controlling growth, development, and diseases. The course will consist of lectures and in-class discussion of

research articles. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4340 Proteomics (3 semester hours) Covers the modern techniques for analyzing the protein complement of cells, to understand cell development and physiology in healthy and diseased states. Topics include protein isolation techniques; IEF-SDS PAGE; protein structure determination by X-ray crystallography and NMR; techniques for identification of protein interactions; the use of mass spectrometry to quantitate, sequence, and identify post-translational modifications of proteins; the development of protein chips and how they can be used for protein identification and quantitation. Prerequisite: BIOL 3361 or CHEM 3361. (3-0) T

BIOL 4341 Genomics (3 semester hours) Fundamentals of how the human genome sequence was acquired and the impact of the human genome era on biomedical research, medical care and genetic testing. Also covered is the impact new tools such as DNA microarray, real time PCR, mass spectrometry and bioinformatics will have on approaches to how scientific questions are investigated. The class will be a mixture of didactic lectures and paper presentations on examples of applied genomics. There will be two computer-based labs where students will perform online bioinformatics and data mining using the NCBI public database. Prerequisite: BIOL 3301 with a grade of C or better. (3-0) T

BIOL 4342 Regulation of Gene Expression (3 semester hours) How genetic information is regulated in prokaryotic and eukaryotic systems. Topics include mechanisms of transcription, promoter architecture, function and regulation of transcription factors, organization of chromosomes, pathways that control gene expression during growth and development, genome organization and whole-genome expression analysis, and related areas. The course emphasizes presentation and critical discussion of techniques and results from the recent scientific literature. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4345 Immunobiology (3 semester hours) Interactions of antigens and antibodies. Fine structure of antibodies. Tissues and cells of the immune system. Response of B and T lymphocytes to antigens. Cellular interactions in humoral and cell-mediated immunity. Genetic basis of antibody diversity. Immunity and infectious diseases. Prerequisites: CHEM 2323 and CHEM 2325 (Organic Chemistry I and II). Suggested additional preparation: BIOL 3302. (3-0) T

BIOL 4350 Medical Microbiology (3 semester hours) This course will cover the methods used for identification of pathogenic organisms and the study of these organisms in relation to their disease process in humans. We will also cover at the molecular level important concepts such as microbial virulence, the control of bacterial growth, and host responses to infection. Prerequisite: BIOL 3301 or BIOL 3V20. (3-0) T

BIOL 4352 Medical Molecular and Cell Biology (3 semester hours) Topics related to health and disease will be examined from a molecular and cellular perspective. Topics will vary but will be selected from new and developing applications of cell biology to cancer, heart disease, fat metabolism, mitochondrial disorders, aging, Alzheimer's, etc. Students are expected to participate actively in discussions and make an oral presentation. Prerequisite: BIOL 3302. (3-0) T

BIOL 4353 Molecular Biology of HIV/AIDS (3 semester hours) Topics include a discussion of the history and epidemiology of AIDS, the likely origins of human immunodeficiency virus (HIV), and the molecular and cell biology of HIV replication. The cell biological basis of the immunodeficiency induced by HIV infection is examined, as well as that of common accompanying pathologies such as Kaposi's sarcoma. The molecular basis of a variety of existing and potential anti-viral therapies is considered. Suggested prerequisite: BIOL 3302. (3-0) T

BIOL 4355 Molecular Biology of Neurological and Hematological Diseases (3 semester hours) Neurological and hematological diseases affect millions of Americans each year, often fatally. The course will bring students up to date on current knowledge of the molecular biology of neurological diseases such as Alzheimer's, Parkinson's, Amyotropic lateral sclerosis and Huntington's disease. Hematological diseases such as hemolytic anemias including sickle cell disease and thalassemia, platelet disorders and clinical case studies will be covered, along with efforts towards gene therapy. The course comprises lectures, student presentations, and presentations by world experts in the field. . Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (3-0) T

BIOL 4365 Advanced Human Physiology (3 semester hours) Function and integration of human organ systems. The role of these systems in the adaptation of humans to, and their interaction with, the environment. Maintenance and perturbation of homeostasis. Pathophysiological basis of certain diseases. Prerequisite: BIOL 3302 or instructor consent required. (3-0) T

BIOL 4366 Molecular Biology of Cancer (3 semester hours) Subject matter includes a discussion of representative examples of the principal categories of dominantly acting oncogenes. The role in oncogenesis of tumor suppressor genes ("recessive oncogenes") is also considered, as are anti-apoptotic oncogenes such as Bcl. The roles that the proteins encoded by these genes play in growth hormone signal transduction, gene regulation, cell cycle regulation, and programmed cell death will be examined. Students will also read and discuss the primary literature in this field. Prerequisite: BIOL 3302. (3-0) T

BIOL 4370 Developmental Neurobiology (3 semester hours) Examines some of the remarkable progress made in recent years towards understanding how the nervous system develops. Among topics covered are signals regulating formation of neural tissue, patterning of the brain, differentiation and migration of neurons, formation of neural connections, neuronal survival, and elimination of superfluous cells. Course is designed to be interactive and will include lectures, student presentations, and discussion of important discoveries in the area. Prerequisites: BIOL 2311 and BIOL 3301. (3-0) T

BIOL 4375 Bioinformatics (3 semester hours) A practical approach to quantitative and statistical analysis of biological sequence and structural information. Classroom lectures are accompanied by practical demonstrations and computer lab exercises. Topics include genomic information content, data searches and sequence alignment, mutations and distance-based phylogenetic analysis, genomics and gene recognition, polymorphisms and forensic applications, nucleic-acid and protein array analysis, and structure prediction of biological macromolecules. Prerequisites: BIOL 3301 and (BIOL 3361 or CHEM 3361) and two semesters of calculus. Suggested additional preparation: one

semester of introductory statistics. (3-0) T

BIOL 4380 Cell and Molecular Biology Laboratory (3 semester hours) Current techniques that are utilized in a modern molecular biology research laboratory. Practical skills taught include monitoring bacterial growth, phenotype testing, plasmid isolation, restriction digest analysis, DNA cloning, and DNA fingerprinting using the polymerase chain reaction (PCR). Advanced techniques include fundamental microscopy, DNA transfection and general characterization of animal cell cultures, sub-cellular fractionation using differential centrifugation, basic immunological techniques, and chemical mutagen testing. Prerequisite: BIOL 3380. Prerequisite or corequisite: BIOL 3302. (1-2) S

BIOL 4382 Advanced Molecular Biology Laboratory (3 semester hours) Advanced techniques for the study of biological systems: spectroscopy, ultracentrifugation, radioactive labeling, and construction and screening of cDNA expression libraries. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. (1-2) Y

BIOL 4390 Senior Readings in Molecular and Cell Biology (Advanced Writing) (3 semester hours) For students conducting independent literature research and scientific writing in Biology or Molecular and Cell Biology. Subject and scope to be determined on an individual basis. Satisfies the Advanced Writing Requirement for Biology and Molecular Biology majors. Topics may vary. Prerequisite: Instructor consent required. (3-0) S

BIOL 4391 Senior Research in Molecular and Cell Biology (Advanced Writing) (3 semester hours) For students conducting laboratory research and scientific writing in Biology or Molecular and Cell Biology. Subject and scope to be determined on an individual basis. Satisfies the Advanced Writing Requirement for Biology and Molecular Biology majors. Topics may vary. Prerequisite: Instructor consent required. (3-0) S

BIOL 4398 Senior Honors Readings in Molecular and Cell Biology (Thesis/Advanced Writing) (3 semester hours) For students conducting independent literature research for honors in Biology or Molecular and Cell Biology. Besides the university specifications the student should contact the undergraduate advisor in biology for program requirements. Satisfies the Advanced Writing Requirement for Biology and Molecular Biology majors. Topics may vary. Prerequisite: Instructor consent required. (3-0) S

BIOL 4399 Senior Honors Research in Molecular and Cell Biology (Thesis/Advanced Writing) (3 semester hours) For students conducting independent laboratory research for honors in Biology or Molecular and Cell Biology. Besides the university specifications the student should contact the undergraduate advisor in biology for program requirements. Satisfies the Advanced Writing Requirement for Biology and Molecular Biology majors. Topics may vary. Prerequisite: Instructor consent required. (3-0) S

BIOL 4461 Biophysical Chemistry (4 semester hours) For students interested in the interface between biochemistry and structural biology. Provides an advanced treatment of the physical principles underlying modern molecular biology techniques. Topics include classical and statistical thermodynamics, biochemical kinetics, transport processes (e.g., diffusion, sedimentation,

viscosity), chemical bonding, and spectroscopy. Prerequisites: (MATH 2417 and MATH 2419) and (PHYS 2325 and PHYS 2326, or equivalent) and (BIOL 3361 or CHEM 3361). (4-0) Y

BIOL 4v00 Special Topics in Biology (1-6 semester hours) May be repeated as topics vary (9 hours maximum). Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. ([1-6]-0) S

BIOL 4v01 Topics in Biological Sciences with Lab (1-6 semester hours) May be repeated as topics vary (6 hours maximum). Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. ([1-5]-[1-5]) R

BIOL 4v04 Biology Seminar (1-6 semester hours) May be repeated as seminar topics vary (6 hours maximum). Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. ([1-6]-0) R

BIOL 4v40 Special Topics in Molecular and Cell Biology (1-6 semester hours) May be repeated as topics vary (9 hours maximum). Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or their equivalents, or instructor consent required. ([1-6]-[0-5]) S

BIOL 4v51 Techniques in Medical Microbiology (1-3 semester hours) This course will teach students to become proficient in laboratory techniques used in both basic and medical microbiology. The initial portion of the course will cover basic techniques such as safe handling of microorganisms, media preparation, pure culture techniques, and staining of microorganisms. The majority of the course will involve the theory and use of physical and biochemical methods to examine microbial physiology, and the use of these methods in organism identification. Microorganisms to be studied include bacterial (and their viruses), fungi, and protozoa. Students will demonstrate proficiency by identifying unknown organisms in pure and mixed cultures, and by the ability to distinguish potential pathogens from resident and normal flora in various clinical specimens. Prerequisite: BIOL 3301 or BIOL 3V20. (0-[2-6]) T

BIOL 4v95 Advanced Topics in Biology (Individual Instruction) (1-6 semester hours) Individual study under a faculty member's direction. May be repeated for credit as topics vary. Prerequisite: Instructor consent required. ([1-6]-0) S

BIOL 4v98 Senior Honors Readings in Molecular and Cell Biology (3-6 semester hours) For students conducting independent library research for honors theses or projects. Besides the university specifications, the student should contact the undergraduate advisor in biology for program requirements. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([3-6]-0) S

BIOL 4v99 Senior Honors Research in Molecular and Cell Biology (3-6 semester hours) For students conducting independent research for honors theses or projects. Besides the university specifications, the student should contact the undergraduate advisor in biology for program requirements. Topics may vary. May be repeated for credit. Prerequisite: Instructor consent required. ([3-6]-0) S

Chemistry

CHEM 1111 (CHEM 1111) General Chemistry Laboratory I (1 semester hour) Introduction to the chemistry laboratory. Experiments are designed to demonstrate concepts covered in CHEM 1311; including properties and reactions of inorganic substances and elementary qualitative and quantitative analysis. Corequisite: CHEM 1311. (0-3) S

CHEM 1112 (CHEM 1112) General Chemistry Laboratory II (1 semester hour) A continuation of CHEM 1111 demonstrating the concepts covered in CHEM 1312, including acid-base chemistry, reaction kinetics, electrochemistry, polymers, and organic synthesis. Prerequisite: CHEM 1111 or CHEM 1115. Corequisite: CHEM 1312. (0-3) S

CHEM 1115 Honors Freshman Chemistry Laboratory I (1 semester hour) This course and its follow-on (CHEM 1116) reinforce the concepts of Freshman Chemistry via experiments. Students are offered the opportunity to acquire basic laboratory skills and an appreciation for the presence of chemistry in daily living through a combination of laboratory and computer experiments and applied research modules. Corequisite: CHEM 1315. (0-6) Y

CHEM 1116 Honors Freshman Chemistry Laboratory II (1 semester hour) A continuation of CHEM 1115. This course reinforces concepts presented in CHEM 1316. Prerequisite: CHEM 1115. Corequisite: CHEM 1316. (0-6) Y

CHEM 1311 (CHEM 1311) General Chemistry I (3 semester hours) Introduction to elementary concepts of chemistry theory. The course emphasizes chemical reactions, the mole concept and its applications, and molecular structure and bonding. Students will also be registered for the exam section. Corequisite: CHEM 1111. (3-0) S

CHEM 1312 (CHEM 1312) General Chemistry II (3 semester hours) A continuation of CHEM 1311 treating metals; solids, liquids, and intermolecular forces; chemical equilibrium; electrochemistry; organic chemistry; rates of reactions; and environmental, polymer, nuclear, and biochemistry. Students will also be registered for the exam section. Prerequisite: CHEM 1311 or CHEM 1315. Corequisite: CHEM 1112. (3-0) S

CHEM 1315 Honors Freshman Chemistry I (3 semester hours) An advanced course dealing with the principles of structure and bonding and the physical laws that govern the interactions of molecules. The course is intended for students who have a solid background in chemistry at the secondary level and the desire to explore general chemistry concepts more deeply. Corequisite: CHEM 1115. (3-0) Y

CHEM 1316 Honors Freshman Chemistry II (3 semester hours) A continuation of the presentation of concepts begun in CHEM 1315. This course will present advanced topics including those in organic, biochemistry, and environmental chemistry. Prerequisite: CHEM 1315 or instructor consent required. Corequisite: CHEM 1116. (3-0) Y

CHEM 2123 (CHEM 2123) Introductory Organic Chemistry Laboratory I (1 semester hour) The experimental skills associated with organic functional group reactions. Corequisite: CHEM 2323.

(0-4) S

CHEM 2125 (CHEM 2125) Introductory Organic Chemistry Laboratory II (1 semester hour) Continuation of Introductory Organic Chemistry Laboratory I (CHEM 2123). Prerequisites: CHEM 2123 and CHEM 2323. Corequisite: CHEM 2325. (0-4) S

CHEM 2130 Introductory Organic Chemistry for Medical Science Laboratory (1 semester hour) The experimental skills associated with organic functional group reactions. Topics covered include fundamental skills, as well as selected experiments developed in a traditional two-semester Introductory Organic Chemistry Laboratory sequence (CHEM 2123 and CHEM 2125). Required course for students in the Partnership in Advancing Clinical Transition (UT-PACT) Program. Does not satisfy the basic organic chemistry laboratory requirements for pre-health profession students. Prerequisite: Instructor consent required. Corequisite: CHEM 2330. (0-4) Y

CHEM 2323 (CHEM 2323) Introductory Organic Chemistry I (3 semester hours) The covalent bond. Organic chemistry: aliphatic and aromatic compounds; covalent inorganic and organometallic compounds; a survey of the organic functional groups and their typical reactions; stereochemistry. The first course in organic chemistry. Satisfies the basic organic chemistry lecture requirements for pre-health profession students. Prerequisite: CHEM 1312 or CHEM 1316. Corequisite: CHEM 2123. (3-0) S

CHEM 2325 (CHEM 2325) Introductory Organic Chemistry II (3 semester hours) Continuation of CHEM 2323. Methods of structure determination. Synthesis, degradation, spectroscopy. Naturally occurring compounds: carbohydrates, amino acids and proteins, lipids, alkaloids. Prerequisite: CHEM 2323. Corequisite: CHEM 2125. (3-0) S

CHEM 2330 Introductory Organic Chemistry for Medical Science (3 semester hours) Covers fundamental concepts and selected material developed in a traditional two-semester Introductory Organic Chemistry lecture sequence (CHEM 2323 and CHEM 2325). Required course for students in the Partnership in Advancing Clinical Transition (UT-PACT) Program. Does not satisfy the basic organic chemistry lecture requirements for pre-health profession students. Prerequisites: (CHEM 1312 or CHEM 1316) and instructor consent required. Corequisite: CHEM 2130. (3-0) Y

CHEM 2401 (CHEM 2401) Introductory Quantitative Methods in Chemistry (4 semester hours) A study of the theory, applications, and calculations involved in the methods of analysis. Theory and practice of volumetric, gravimetric, and spectrophotometric methods. Prerequisites: CHEM 1112 and CHEM 1312. (2-6) Y

CHEM 2v01 Topics in Chemistry (1-3 semester hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 hours maximum). Prerequisite: Instructor consent required. ([1-3]-0) R

CHEM 3321 Physical Chemistry I (3 semester hours) Fundamental properties of macroscopic biophysical chemical systems are introduced and described in quantitative terms. A core of topics in thermodynamics, molecular motion, kinetics, molecular distributions and statistical thermodynamics is supplemented with topics germane to students taking physical chemistry with

biophysical applications. Prerequisites: CHEM 2325 and (MATH 2415 or MATH 2451) or instructor consent required. (CHEM 3361 is recommended). (3-0) Y

CHEM 3322 Physical Chemistry II (3 semester hours) Fundamental microscopic properties of matter and radiation are discussed. A core of topics including quantum chemistry, atomic and molecular structure and spectroscopy, non-bonded interactions, and computational chemistry is supplemented with topics germane to students taking physical chemistry with biophysical applications. Prerequisites: CHEM 3321 and (MATH 2415 or MATH 2451) or instructor consent required. (3-0) Y

CHEM 3341 Inorganic Chemistry I (3 semester hours) Survey of inorganic chemistry with emphasis on the modern concepts and theories of inorganic chemistry including electronic and geometric structure of inorganic compounds. Topics address contemporary physical and descriptive inorganic chemistry. Prerequisites: (CHEM 2323 and CHEM 2325) or equivalent. (3-0) Y

CHEM 3361 Biochemistry I (3 semester hours) Structures and chemical properties of amino acids; protein purification and characterization; protein structure and thermodynamics of polypeptide chain folding; catalytic mechanisms, kinetics and regulation of enzymes; energetics of biochemical reactions; generation and storage of metabolic energy associated with carbohydrates; oxidative phosphorylation and electron transport mechanisms; photosynthesis. Prerequisites: CHEM 2323 and CHEM 2325. Corequisite: BIOL 3161. (Same as BIOL 3361) (3-0) S

CHEM 3362 Biochemistry II (3 semester hours) Breakdown and synthesis of lipids; membrane structure and function; nitrogen metabolism and fixation; nucleotide metabolism; structure and properties of nucleic acids; sequencing and genetic engineering; replication, transcription, and translation; chromosome structure; hormone action; biochemical basis of certain pathological processes. Prerequisite: (BIOL 3361 or CHEM 3361) or its equivalent, or instructor consent required. Corequisite: BIOL 3162. (Same as BIOL 3362) (3-0) S

CHEM 3471 Advanced Chemical Synthesis Laboratory (4 semester hours) Careful handling practices and controlled variation of reaction parameters to obtain high yield syntheses. Use of standard separation techniques and spectrophotometric methods to identify reaction products and assess their purity. Prerequisite: (CHEM 2125 and CHEM 2401) or instructor consent required. (1-7) Y

CHEM 3472 Instrumental Analysis (4 semester hours) Basic processes, instrumentation and applications of ultraviolet, visible, fluorescence, atomic and mass spectroscopy, electrochemistry, surface and microanalysis, and separations. Emphasis will be placed upon acquisition, treatment, and interpretation of data and report writing. Prerequisite: CHEM 2401. (2-6) Y

CHEM 3v92 Undergraduate Research in Biochemistry (2-6 semester hours) Students will pursue an independent project under the supervision of a member of the Chemistry, Biology, or UT Southwestern faculty. May be repeated for credit (9 hours maximum). Prerequisite: Instructor consent required. ([2-6]-0) S

CHEM 4335 Polymer Chemistry (3 semester hours) Macromolecules. Synthesis, structure, and

properties of polymers. Polymer-polymer and polymer-solvent interactions. Applications in industry and biochemistry. Prerequisite: CHEM 3321 or instructor consent required. (CHEM 3322 recommended). (3-0) Y

CHEM 4355 Computational Modeling (3 semester hours) This course will introduce students to computational modeling approaches commonly used to tackle chemical and biophysical problems. Prerequisites: (CHEM 3321 and MATH 2451) or instructor consent required. (3-0) Y

CHEM 4381 Green Chemistry & Green Fuels (3 semester hours) This course encompasses the study of the sources, reactions, transport, effects, and fates of chemical species in water, soil, and air environments and the effects of technology thereon. Prerequisite: CHEM 2325 or instructor consent required. (3-0) T

CHEM 4390 Research and Advanced Writing in Chemistry (3 semester hours) For students conducting independent research and scientific writing. Students will pursue an independent project under the supervision of a member of the Chemistry faculty. Subject and scope to be determined on an individual basis. This course satisfies the university advanced writing requirement. Prerequisites: at least 3 semester hours of undergraduate research (e.g. CHEM 4V91), and consent of supervising faculty and (filing a research plan approved by supervising faculty and the Undergraduate Committee in Chemistry prior to the 12th class day). (3-0) S

CHEM 4399 Research and Advanced Writing in Chemistry for Honors Students (3 semester hours) For students conducting independent research for honors theses or projects. Satisfies the university advanced writing requirement. Prerequisites: Senior level standing with at least 3 semester hours of undergraduate research (e.g. CHEM 4V91), and consent of supervising faculty and (filing a research plan approved by supervising faculty and the Undergraduate Committee in Chemistry prior to the 12th class day). (3-0) S

CHEM 4473 Physical Measurements Laboratory (4 semester hours) Modules may include topics in physical chemistry and biophysics such as bio-nanotechnology, calorimetry, centrifugation, computational methods, computer-instrument interfaces, electrochemistry, electronics, kinetics, literature skills, property of matter, spectroscopy, and statistical methods. Prerequisites: (CHEM 3321 and CHEM 3472) or instructor consent required. (1-7) Y

CHEM 4v01 Topics in Chemistry (1-9 semester hours) Subject matter will vary from semester to semester. Examples would include, as required, bioorganic chemistry, industrial processes, applied spectroscopy, drugs and people, practical analysis, or other topics that span several subdisciplines. May be repeated for credit (9 hours maximum). Prerequisite: Instructor consent required. ([1-9]-0) R

CHEM 4v91 Research in Chemistry (2-6 semester hours) Students will pursue an independent project under the supervision of a member of the Chemistry faculty. May be repeated for credit (12 hours maximum). Prerequisite: Instructor consent required. ([2-6]-0) S

Geosciences

GEOS 1103 (GEOL 1103) Physical Geology Laboratory (1 semester hour) A laboratory to accompany GEOS 1303. The exercises include mineral and rock identification. Topographic maps, geologic maps, and aerial photographs are used to study surface landforms, geologic phenomena and tectonic processes. Prerequisite or corequisite: GEOS 1303. (0-3) S

GEOS 1104 (GEOL 1104) History of Earth and Life Laboratory (1 semester hour) A laboratory to accompany GEOS 1304. Exercises include fossil identification, stratigraphy, and correlation, the geologic time scale, age-determination techniques, and maps. Prerequisite or corequisite: GEOS 1304. (0-3) Y

GEOS 1303 (GEOL 1303) Physical Geology (3 semester hours) Introduction to the Earth as a unique planet. The course investigates minerals and rocks which make up the Earth. The structure of the Earth and dynamics of its internal mechanisms are explored. Plate tectonics and surface processes which sculpt the Earth are the topics of the second half of the course. Other planets and celestial bodies within the solar system are contrasted with Earth. Field trip. (3-0) S

GEOS 1304 (GEOL 1304) History of Earth and Life (3 semester hours) Introduction to the history of the Earth. The history of life and an introduction to the principles of paleontology, stratigraphy and global change will be discussed. All topics will be discussed in the context of the tectonic evolution of North America. Field trip. Prerequisites: GEOS 1303 and GEOS 1103. (Same as GEOG 1304) (3-0) Y

GEOS 2301 Introduction to Geospatial Information Science (3 semester hours) A broad introduction to geospatial information science, including GIS, remote sensing, GPS, spatial data analysis, cartography, and other topics. (Same as GISC 2301) (2-2) Y

GEOS 2302 (GEOL 1305) The Global Environment (3 semester hours) An introduction to the physical aspects of the world's geography emphasizing the interrelationships between the earth and its climate, vegetations, soils, and landforms. Provides a global perspective on the physical environment and the interactions between global systems to produce regional differences. (Same as ENVR 2302 and GEOG 2302) (3-0) T

GEOS 2306 Geodesy and Geospatial Analysis (3 semester hours) Introduction to the basic concepts of geodetic datums (horizontal and vertical), coordinate systems, and map projections. Applications in the Earth Sciences will be discussed to reinforce concepts. (Same as GISC 2302) (3-0) Y

GEOS 2406 Geospatial Science and Methods (4 semester hours) Remote sensing and Geographic Information System (GIS) science and methods as applied to geospatial aspects of geosciences. Introduction to geospatial software in geosciences. Prerequisites: GEOS 1303 and GEOS 1103. Recommended prerequisite: GEOS 2409. (4-0) Y

GEOS 2409 (GEOL 2409) Rocks and Minerals (4 semester hours) Introduction to crystallography, mineralogy, and petrography. Laboratory course. Prerequisites or corequisites: GEOS 1103 and

GEOS 1303. (3-3) Y

GEOS 2v08 Special Topics in Geology or Geophysics I (1-4 semester hours) Subject matter will vary from semester to semester. Instructor consent required. May be repeated for credit as topics vary (9 hours maximum). ([1-4]-0) R

GEOS 3110 Environmental Geology Lab (1 semester hour) Field observation and measurement of processes and phenomena in environmental geology. Activities include stream and groundwater flow and chemistry measurements, hydrogeologic mapping, and environmental site assessment. Most class meetings are outdoors. (0-3) Y

GEOS 3121 The Biosphere: Origin, Evolution and Mass Extinctions (1 semester hour) This course presents an overview of the significant events in the history of life on Earth, how the presence of life has modified the Earth's environment, and the catastrophic events that have caused mass extinctions of organisms. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3122 Coal in Our Society (1 semester hour) Coal plays an important role in the U.S. energy mix and a critical role in Texas society. Yet it may be the most misunderstood natural resource. It is the objective of this course to familiarize the students with the origin, properties, and uses of coal and examine how coal use may impact the environment and human health. This will be accomplished by exploring the facts and fallacies surrounding coal in our society. There will be a field trip to a coal mine and/or a coal-burning power plant. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3123 Coral Reefs (1 semester hour) This course examines the biology, chemistry, and geology associated with modern and ancient reef building corals. Human impact on this fragile ecosystem and the role that coral reefs play in global warming are explored. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3124 Geology and Human Health (1 semester hour) Introduction to the impacts of geologic materials and geologic processes on animal and human health. Examples will focus primarily on how geologic materials (rocks, minerals, soil, natural dust, and uncontaminated water) and geologic processes, such as volcanoes and earthquakes, are impacting human health. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3125 Global Climate Change (1 semester hour) This course focuses on the present climate system of Earth, glacial cycles of the past and potential problems, such as ozone depletion and greenhouse warming. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3126 The Evolution Debate (1 semester hour) The theory of evolution and the origin of life problem. Supporting evidence from the fossil record, molecular biology, and DNA. Creationism, intelligent design and pseudoscience. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3127 Forensic Geology (1 semester hour) Police and forensic scientists have long used mineralogical and geochemical analytical information and techniques, geologic databases, maps,

and insights to solve a wide range of crimes and mysteries. This course will provide the students with fundamental knowledge of how geosciences can be used to augment the tools available to criminal investigators. Case studies will be used to illustrate how geoscience tools and techniques have been used to solve crimes. (0-1) Y

GEOS 3128 Geologic Time (1 semester hour) Notions of immortality and concepts of eternity--the struggle to understand human existence and the physical world. The geocentric universe--a Graeco-Christian compromise. The Renaissance and the slow acceptance of the Copernican universe. James Hutton's Earth machine and William Smith's strata--the progeny of the Enlightenment and the Industrial Revolution. Biostratigraphy, the great stratigraphers, and Victorian reaction to the realization of Earth's antiquity. Lord Kelvin's arguments for a young Earth. Discovery of radioactivity and the refutation of Kelvin. Patterson and the age of the solar system. Modern rock dating techniques. A walk through geologic time. (0-1) Y

GEOS 3300 Field Geology I (Summer Field Camp I) (3 semester hours) A three-week, early summer field based course designed to provide practical introductory field geological experience. Course emphasizes mapping in sedimentary and igneous terrains and will also cover techniques for mapping geomorphic features. Reports on each project in professional form are required. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304, and GEOS 2406. NOTE: A field trip fee, which covers the cost of food, lodging, and transportation, is charged for this course. Students are responsible for any other personal expenses related to camp. (3-0) Y

GEOS 3304 Tools for Spatial Analysis (3 semester hours) An introduction to the primary methods used in geographic analysis. Topics include spatial statistics, cartography, and geographic information systems (GIS). This course is designed to provide a foundation for all other upper level Geography courses. Prerequisite: EPPS 3405 or STAT 1342. (Same as GEOG 3304 and GISC 3304) (3-0) Y

GEOS 3310 Environmental Geology (3 semester hours) A course examining the interactions of people and our physical environment. Natural hazards, including landslides, flooding, tsunamis, volcanoes, earthquakes, erosion, and sea-level change. Air, soil, fresh and ocean water pollution problems and solutions including greenhouse gases, ozone depletion, acid rain, aquifer depletion, toxic wastes, and contamination. Energy supplies and the environment, including radioactive waste problems, and human impacts on climate. (3-0) Y

GEOS 3321 Geology, Resources, and Environment of Latin America (3 semester hours) An overview of the physical environment of Mexico, Central America, and South America. Topics include evolution of Latin American crust and continent; location and formation of major geologic resources and physiographic features; resource exploitation and present environmental problems with an historic perspective. (3-0) R

GEOS 3332 Age of Dinosaurs (3 semester hours) Introductory survey of the origin, evolution, anatomy, physiology, life-styles, population dynamics, and extinction of dinosaurs and marine and flying reptiles, as well as Mesozoic climates and basic Earth history of the "Age of Dinosaurs." Extensive use of fossils is a component of this course that is taught in a Problem Based Learning format. (3-0) Y

GEOS 3401 Oceanography (4 semester hours) Fundamentals of oceanography, with discussions on the effects of the oceans and people on the Earth's climate and biological communities. Topics include the formation of ocean currents, waves and tides, the greenhouse effect, El Nio, marine pollution, the exploitation of marine resources, wetlands preservation, coral reefs, life in the deep sea, and other marine ecological systems. Laboratory course. Credit cannot be received for both courses, GEOS 3401 or ISNS 3367. (3-3) R

GEOS 3421 Stratigraphy and Sedimentology (4 semester hours) Principles and evolution of modern stratigraphic nomenclature; concepts of space and time in the rock record and methods of stratigraphic correlation; factors controlling stratigraphic architecture of sedimentary basins; integrated stratigraphic techniques. Origin, transportation, and deposition of carbonate and siliciclastic sediments; weathering, textural analysis, and depositional environments. Laboratory course. Field trips. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-3) Y

GEOS 3432 Introduction to Fossils (4 semester hours) Introduction to the study of invertebrate fossils occurring in Cretaceous sedimentary strata in North Texas. Hands on approach to the study of invertebrate macrofossils and microfossils includes learning how to (1) collect fossils at selected outcrops in the field; (2) process samples for fossils in the laboratory; (3) illustrate microfossils using the scanning electron microscope; and (4) identify fossils using the available paleontological literature. Both lectures and laboratory exercises will focus on the invertebrate phyla occurring in selected North Texas Cretaceous outcrops. Laboratory and field trip course. (3-3) Y

GEOS 3434 Paleobiology (4 semester hours) History of life as documented by the fossil record. Basic concepts of paleontology and biostratigraphy followed by a review of major fossil groups and major events in the evolution of life, speciation, mass extinction, evolution of communities and ecosystems through geologic time. Paleontological methods to paleoenvironmental reconstruction. Field trip. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-3) Y

GEOS 3464 Igneous and Metamorphic Petrography (4 semester hours) Introduction to the petrographic microscope and its use for study of igneous and metamorphic minerals and rocks. Identification and classification of volcanic and plutonic igneous rocks and metamorphic rocks and their identification in thin sections. Introduction to igneous and metamorphic petrogenesis. Prerequisites: GEOS 1303 and GEOS 1103 and GEOS 1304 and GEOS 1104 and GEOS 2409. (3-3) Y

GEOS 3470 Structural Geology (4 semester hours) Modern tectonic concepts, survey of major structural provinces, examination of material behavior, stress-strain concepts, failure criteria, soil mechanics, fault analysis, rheology, fold analysis and applications of structural concepts to neotectonics and environmental problems. Training in graphical techniques, use of stereographic projections, and geological map interpretation. Laboratory course. Field trip. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409 and GEOS 2406. Recommended prerequisites: PHYS 2325 and PHYS 2125. (3-3) Y

GEOS 4300 Field Geology II (Summer Field Camp II) (3 semester hours) A three-week, early summer field based course designed to provide practical advanced field geological experience. Course

emphasizes mapping in sedimentary, metamorphic, and igneous terrains and will also cover techniques used in imaging and analyzing geomorphic features. Reports on each project in professional form are required. Prerequisites: GEOS 3300 and GEOS 3421 and GEOS 3464 and GEOS 3470. NOTE: A field trip fee, which covers the cost of food, lodging, and transportation, is charged for this course. Students are responsible for all personal expenses related to camp. (3-0) Y

GEOS 4320 The Physics and Chemistry of the Solid Earth (3 semester hours) The study of the structure and evolution of the Earth through petrology, geochemistry and geophysics. Plate tectonics will be emphasized as a framework for crust and mantle dynamics. The roles of gravity, thermal processes and the mechanical behavior of rocks are investigated. Tectonic settings of igneous and metamorphic rocks will be explored. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409 and GEOS 3464. Recommended prerequisites: PHYS 2125 and PHYS 2325. (3-0) Y

GEOS 4322 The Earth System (3 semester hours) Planet Earth comprises a system of interacting spheres: atmosphere, hydrosphere, lithosphere and biosphere, all of which have played an important role in Earth processes and Earth history. This course examines these Earth systems and how their interactions over time have affected their evolving compositions, the evolution of life and Earth's climate. The short-term and long-term parts of the carbon cycle provide the underlying theme for the study of the Earth System. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-0) Y

GEOS 4325 Introduction to Remote Sensing (3 semester hours) Topics include principles of remote sensing and sensors, image visualization and statistics, radiometric and geometric correction, enhancement, classification, change detection, and innovative image processing approaches. (Same as GISC 4325) (3-0) Y

GEOS 4369 Volcanic Successions (3 semester hours) Terrestrial volcanism is considered from the perspective of volcanic processes, and the properties, products and deposits of volcanic eruptions, all in the context of definable facies models. The effects of subsequent sedimentological processes are also considered. Volcanic settings are explored in detail as they are related to their plate tectonic settings. Recognition of volcanically derived deposits are emphasized using the facies model concepts, and are considered with respect to their geological and economic significance. (3-0) T

GEOS 4390 Senior Research and Advanced Writing (3 semester hours) For students conducting independent research and scientific writing in Geosciences. Subject and scope to be determined on an individual basis. Satisfies the Advanced Writing Requirement for Geoscience majors. Prerequisites: Instructor consent required and senior level standing in Geosciences. (3-0) S

GEOS 4395 Satellite Geophysics and Applications (3 semester hours) This course concerns both the theory and application of observing geophysical fields from space-borne platforms. The observation procedures including orbital mechanics are introduced and signal propagation, errors and uncertainties will be addressed. Concepts of current satellite missions such as radar and laser altimetry, space gravimetry and magnetometry, and synthetic aperture radar will be discussed. Applications of satellite geophysical observations in tectonics, geodynamics, ocean and ice surface

monitoring, hydrology, and terrain modeling will be introduced through student projects and presentations. (3-0) Y

GEOS 4399 Senior Honors in Geosciences (3 semester hours) For students conducting independent research for honors theses or projects. Satisfies advanced writing requirement. (3-0) R

GEOS 4430 Hydrogeology and Aqueous Geochemistry (4 semester hours) An introduction to the principles of physical and chemical hydrogeology. Physical topics include the nature and quantification of the components of the hydrologic cycle, fundamentals of water supply and quality, overview of aquifer testing and environmental assessment. Chemical topics include behavior of low-temperature aqueous solutions, water-rock interaction and applications of chemistry to understand the Earth and its geochemical cycles. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. Recommended prerequisites: CHEM 1311 and CHEM 1312. (4-0) Y

GEOS 4v08 Special Topics in Geology or Geophysics II (1-4 semester hours) Subject matter will vary from semester to semester. Instructor consent required. May be repeated for credit as topics vary (9 hours maximum). ([1-4]-0) R

GEOS 4v09 Senior Research in Geology (1-6 semester hours) Topics may vary. May be repeated for credit. No more than 3 hours of senior research may be used to satisfy the upper-division course work requirement in the major unless approved in advance by the undergraduate advisor. Prerequisite: Instructor consent required. ([1-6]-0) S

GEOS 4v80 Senior Research in Geophysics (1-6 semester hours) Topics may vary. May be repeated for credit. No more than 3 hours of senior research may be used to satisfy the upper-division course work requirement in the major unless approved in advance by the undergraduate advisor. Prerequisite: Instructor consent required. ([1-6]-0) S

Interdisciplinary Studies-Natural Science and Mathematics

ISNS 3359 Earthquakes and Volcanoes (3 semester hours) Earthquakes and volcanoes appear capricious and devastating in human terms, but they are also a regular part of geological history. This course will integrate current geological thinking with elements of statistics, physics, chemistry, human history, sociology, psychology, and religion to develop an understanding and to provide pragmatic strategies for living with these events. (3-0) Y

ISNS 3367 The Oceans (3 semester hours) Physical, chemical, biological, and geological aspects of oceanography. Description and origin of features on sea floor; evolution of ocean basins; chemistry of sea water; influence of oceans on weather and climate; formation of waves, tides, currents; factors affecting biological productivity; economic resources and environmental problems. Can only receive credit for ISNS 3367 or GEOS 3401. (3-0) S

ISNS 3368 Weather and Climate (3 semester hours) An overview of the fields of meteorology and

climatology. The approach is scientific yet nonmathematical, and students will be exposed to a wide spectrum of ideas from folklore, history, law, economics, and environmental issues. (3-0) S

ISNS 3371 The Phenomena of Nature: Forces, Gases, Motion, Heat, Light and Electricity (3 semester hours) The purpose of the course is to cultivate in students an intuitive perception of the nature of observable physical reality through the presentation and analysis of striking experimental demonstrations. No substantial prior training in science is assumed, but students with a background in science may profit from this course. There will be considerable reference to the historical growth of scientific knowledge and to the aesthetic quality of the explanations offered by science. (3-0) Y

ISNS 3373 Our Nearest Neighbors in the Sky (3 semester hours) A description of the tools and principles the astronomer and space scientist use in exploration of the solar system; the earth, moon, the sun, planets, asteroids, meteors, and comets; the origin of the solar system; classroom demonstrations, multimedia presentations, and telescope observations. (3-0) Y

Mathematical Science

MATH 1306 College Algebra for the Non-Scientist (3 semester hours) This course is intended for students NOT continuing on to precalculus or calculus. The course is designed to develop both abstract thinking and a practical approach to problem solving. The emphasis is on understanding rather than purely computational skills. Topics include logic, sets, the real numbers, linear equations and their applications, functions, and graphs. Cannot be used to satisfy major requirements for majors in the Schools of Natural Sciences and Mathematics or Management, or degree requirements for the School of Engineering and Computer Science. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 20% on ALEKS math placement exam. (3-0) Y

MATH 1314 (MATH 1314) College Algebra (3 semester hours) Topics chosen from areas such as equations and inequalities, rational expressions, exponents, radicals and logarithms, functions, and graphs. Exam section required for MATH 1314. Cannot be used to satisfy major requirements for majors in the Schools of Natural Sciences and Mathematics or Management, or degree requirements for the School of Engineering and Computer Science. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 35% on ALEKS math placement exam. (3-0) S

MATH 1316 (MATH 1316) Trigonometry (3 semester hours) Angular measure, trigonometric functions, their properties; trigonometric identities, equations, and applications; trigonometric form of complex number and related topics. Cannot be used to satisfy major requirements for majors in the School of Natural Sciences and Mathematics or Management, or degree requirements for the School of Engineering and Computer Science. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 35% on ALEKS math

placement exam, a grade of at least a C- in MATH 1314, or concurrent enrollment in MATH 1314. (3-0) S

MATH 1325 (MATH 1325) Applied Calculus I (3 semester hours) Functions and graphs, differentiation, maxima and minima, exponential and logarithmic functions, integration, applications of integrals. Cannot be used to satisfy degree requirements for majors in the School of Engineering and Computer Science or major requirements in the School of Natural Sciences and Mathematics. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Cannot be used to replace MATH 2417 or MATH 2413. Prerequisite: A score of 55% on ALEKS math placement exam or a grade of at least a C- in MATH 1314. (3-0) S

MATH 1326 Applied Calculus II (3 semester hours) Applications of differential equations, functions of several variables, least squares modeling, multiple integrals, infinite series. Cannot be used to satisfy degree requirements for B.S. majors in Schools of Engineering and Computer Science or Natural Sciences and Mathematics. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Cannot be used to replace MATH 2414 or MATH 2419. Prerequisite: A grade of at least a C- in MATH 1325. (3-0) S

MATH 2312 (MATH 2312) Precalculus (3 semester hours) Real numbers, subsets of real line, absolute value; algebra of functions, domain, range, composition, inverse; elements of analytical geometry including vectors in plane, conics, polar coordinates, translation and rotation of axes and related topics. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 55% on ALEKS math placement exam or a grade of at least a C- in MATH 1314 and MATH 1316. (3-0) S

MATH 2333 Matrices, Vectors, and Their Application (3 semester hours) Matrices, vectors, determinants, inverses, systems of linear equations, and applications. Cannot be used to satisfy degree requirements for majors in the School of Engineering and Computer Science or major requirements in the School of Natural Sciences and Mathematics. Cannot be used to replace MATH 2418. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: MATH 1314 or equivalent. (3-0) S

MATH 2413 (MATH 2413) Differential Calculus (4 semester hours) Course covers topics in differential calculus of functions of one variable; topics include limits, continuity, derivative, chain rule, implicit differentiation, mean value theorem, maxima and minima, curve sketching, derivatives of inverse trigonometric functions, antiderivative, substitution method, and applications. Three lecture hours and two discussion hours a week; problem section required with MATH 2413, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A score of 70% on ALEKS math placement exam or a grade of at least a C- in MATH 2312. (3-2) S

MATH 2414 (MATH 2414) Integral Calculus (4 semester hours) Course covers topics in integral calculus, sequences and series. Topics include the fundamental theorem of calculus, methods of integration, improper integrals, and applications. Sequences, series convergency tests, power series. Introduction to the multivariable calculus, partial differentiation, double and iterated integrals. Three lecture hours and two discussion hours a week; problem section required with MATH 2414, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Cannot be used to replace MATH 2419. Prerequisite: A grade of C- or better in either MATH 2417 or in MATH 2413 or equivalent. (3-2) S

MATH 2415 (MATH 2415) Calculus of Several Variables (4 semester hours) The course covers differential and integral calculus of functions of several variables. Topics include vector valued and scalar functions, partial derivatives, directional derivatives, chain rule, Lagrange multipliers, multiple integrals, double and triple integrals, the line integral, Green's theorem, Stokes' theorem, Divergence theorem. Three lecture hours and two discussion hours a week; problem section required with MATH 2415, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of C- or better in MATH 2414. (3-2) S

MATH 2417 (MATH 2417) Calculus I (4 semester hours) Functions, limits, continuity, differentiation; integration of function of one variable; logarithmic, exponential, and inverse trigonometric functions; techniques of integration, and applications. Three lecture hours and two discussion hours a week; problem section required with MATH 2417, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A minimal placement score 75% on ALEKS math placement exam or a grade of at least a C- in MATH 2312 or an equivalent course. (3-2) S

MATH 2418 (MATH 2418) Linear Algebra (4 semester hours) Systems of linear equations, determinants, vectors and vector spaces, linear transformations, eigenvalues and eigenvectors, quadratic forms. Three lecture hours and two discussion hours a week; problem section required with MATH 2418, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in either MATH 2417 or in MATH 2413. (3-2) S

MATH 2419 (MATH 2419) Calculus II (4 semester hours) Continuation of MATH 2417. Improper integrals, sequences, infinite series, power series, parametric equations and polar coordinates, vectors, vector valued functions, functions of several variables, partial derivatives and applications, multiple integration. Three lecture hours and two discussion hours a week; problem section required with MATH 2419, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in MATH 2417. (3-2) S

MATH 2420 (MATH 2420) Differential Equations with Applications (4 semester hours) Topics covered will be drawn from the following list: First order differential equations, system of linear differential equations, stability, series solutions, special functions, Sturm-Liouville problem, Laplace transforms and linear differential equations and applications in physical sciences and engineering using computers. Three lecture hours and two discussion hours a week; problem section required with MATH 2420, and will also be registered for exam section. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419, and a grade of at least a C- in MATH 2418 or equivalent. (3-2) S

MATH 2451 Multivariable Calculus with Applications (4 semester hours) Vectors, matrices, vector functions, partial derivatives, divergence, curl, Laplacian, multiple integrals, line and surface integrals, Green's, Stokes', and Gauss' theorems, and applications in physical sciences and engineering. Topics drawn from implicit function theorem, differential forms and vector fields. Three lecture hours and two discussion hours per week; problem section required with MATH 2451. Not all MATH/STAT courses may be counted toward various degree plans. Please consult your degree plan to determine the appropriate MATH/STAT course requirements. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419, and a grade of at least C- in MATH 2418 or equivalent. (3-2) S

MATH 2v90 Topics in Mathematics - Level 2 (1-6 semester hours) Special topics in mathematics outside the normal course of offerings. May be repeated for credit as topics vary (9 hours maximum). Instructor consent required. ([1-6]-0) S

MATH 3301 Mathematics for Elementary and Middle School Teachers (3 semester hours) This course is intended to develop future teachers' depth of mathematical understanding by examining concepts in school mathematics from an advanced perspective. Topics include: numeration systems; arithmetic algorithms, prime factorization and other properties of the integers; proportional reasoning involving fractions and decimals; counting methods; and basic ideas of geometry and measurement. Problem solving is stressed. Cannot be used to satisfy: [1] undergraduate mathematics core requirement, [2] degree requirements by students in Mathematics, [3] electives, or [4] certification requirements in 8-12 mathematics. Prerequisite: MATH 1306 or MATH 1314 or equivalent. (3-0) S

MATH 3303 Introduction to Mathematical Modeling (3 semester hours) An introduction to construction, use, and analysis of empirical and analytical mathematical models. Emphasis on using appropriate technology with tools such as curve fitting, probability and simulation, difference and differential equations, and dimensional analysis. Cannot be used to satisfy mathematics requirements by students in Mathematics and cannot be used to satisfy electives. Prerequisites: MATH 2418 and a grade of at least a C- in either MATH 2415 or in MATH 2419. (3-0) Y

MATH 3305 Foundations of Measurement and Informal Geometry (3 semester hours) An analysis, from an advanced perspective, of the basic concepts and methods of geometry and measurement. Topics include visualization, geometric figures and their properties; transformations and symmetry; congruence and similarity; coordinate systems; measurement (especially length, area,

and volume); and geometry as an axiomatic system. Emphasis on problem solving and logical reasoning. Cannot be used to satisfy: [1] undergraduate mathematics core requirement, [2] degree requirements by students in Mathematics, [3] electives, or [4] certification requirements in 8-12 mathematics. Prerequisites: (MATH 2312 and MATH 3301) or equivalent. (3-0) Y

MATH 3307 Mathematical Problem Solving for Teachers (3 semester hours) Development of the ability to solve mathematical problems and communicate their solutions through the study of strategies and heuristics. Practice in solving problems involving ideas from number theory, algebra, combinatorics and probability, etc. Communicating mathematics, logical reasoning, and connections between mathematical topics will be emphasized. Cannot be used to satisfy degree requirements by students in Mathematics or electives. Prerequisites: MATH 2312 and (MATH 3305 or MATH 3321). (3-0) Y

MATH 3310 Theoretical Concepts of Calculus (3 semester hours) Mathematical theory of calculus. Limits, types of convergence, power series, differentiation, and Riemann integration. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419. (3-0) S

MATH 3311 Abstract Algebra I (3 semester hours) Groups, rings, fields, vector spaces modules, linear transformations, and Galois theory. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419, and a grade of at least C- in MATH 2418 or equivalent. (3-0) S

MATH 3312 Abstract Algebra II (3 semester hours) Continuation of MATH 3311. Prerequisite: MATH 3311. (3-0) Y

MATH 3321 Geometry (3 semester hours) Elements of Euclidean, non-Euclidean, and projective geometry. Topics covered will be drawn from the following list: triangles and their distinguishing points, Euler line, nine point circle, extremum problems, circles and spheres, inversions, the circles of Apollonius, projective geometry, axioms of the projective plane, Desargues' theorem, conics, elementary facts of the non-Euclidean geometries. Prerequisite: A grade of at least a C- in either MATH 2415 or in MATH 2419. (3-0) Y

MATH 3379 Complex Variables (3 semester hours) Geometry and algebra of complex numbers, functions of a complex variable, power series, integration, calculus of residues, conformal mapping. Prerequisites: MATH 2451 and MATH 3310. (3-0) S

MATH 3380 Differential Geometry (3 semester hours) Curves and surfaces, multilinear algebra, alternating tensors, tangent vectors, tangent space, vector fields, differential forms; Curvature and torsion of curves, Riemannian metrics, curvature of surfaces, isometries, geodesics, Gauss map, First and Second Fundamental Forms, area on surfaces, Gauss-Bonnet Theorem, surfaces with constant negative curvature and elements of hyperbolic geometry. Prerequisites: MATH 2451 and MATH 2418 and MATH 2420 or equivalent courses. (3-0) Y

MATH 4301 Mathematical Analysis I (3 semester hours) Sets, real number system, metric spaces, real functions of several variables. Riemann-Stieltjes integration and other selected topics. Prerequisites: MATH 2451 and MATH 3310. (3-0) S

MATH 4302 Mathematical Analysis II (3 semester hours) Continuation of MATH 4301. Prerequisite: MATH 4301. (3-0) S

MATH 4332 Scientific Math Computing (3 semester hours) Topics covered include introduction to Unix shells, basic and advanced use of Matlab for mathematical and scientific problem solving. Course is conducted in a computer classroom and assignments include applications in numerical and statistical analysis, image processing, and signal processing. Prerequisites: MATH 2418 and a grade of at least a C- in either MATH 2415 or in MATH 2419. (3-0) S

MATH 4334 Numerical Analysis (3 semester hours) Solution of linear equations, roots of polynomial equations, interpolation and approximation, numerical differentiation and integration, solution of ordinary differential equations, computer arithmetic, and error analysis. Students cannot receive credit for both MATH 4334 and ENGR 4334. Prerequisites: (CE 1337 or CS 1337 or TE 1337) and (MATH 2418 and MATH 2451). (Same as CS 4334) (3-0) Y

MATH 4341 Topology (3 semester hours) Elements of general topology, topological spaces, continuous functions, connectedness, compactness, completeness, separation axioms, and metric spaces. Prerequisites: MATH 2451 and MATH 3310. (3-0) S

MATH 4355 Methods of Applied Mathematics (3 semester hours) Topics include some frequently used tools in applied mathematics: Laplace and Fourier transforms, special functions, systems, signals, and their applications in physical sciences and engineering. Prerequisites: MATH 2418 and MATH 2420. (3-0) T

MATH 4362 Partial Differential Equations (3 semester hours) This course presents a survey of classical and numerical methods for the solution of linear and nonlinear boundary value problems governed by partial differential equations. Modeling and application-related issues are included throughout. Prerequisites: MATH 2420 and MATH 2451. (3-0) Y

MATH 4381 Structure of Modern Geometry (3 semester hours) The course is designed to familiarize students with the geometrical concepts which relate to two and three dimensional geometry and the mathematical techniques used in the study of geometry. The emphasis is both on the development of understanding of the concepts and the ability to use the concepts in proving theorems. The course includes study of axiom systems, transformational geometry, and an introduction to non-Euclidean geometries, supplemented by other topics as determined by the instructor. Prerequisite: A grade of at least a C- in MATH 2418 or equivalent. (3-0) Y

MATH 4390 Senior Research and Advanced Writing (3 semester hours) For students conducting independent research and scientific writing. Individual instruction course designed to develop skills for research and clear, precise and accurate scientific writing. Topics will vary from section to section depending upon the interests of the student, but will be selected from a specific area of mathematics. Subject and scope to be determined on an individual basis. Satisfies the Advanced Writing Requirement. Prerequisite: Senior level standing in Mathematics. (3-0) S

MATH 4399 Senior Honors in Mathematics (3 semester hours) For students conducting independent research for honors theses or projects. Satisfies advanced writing requirement. (3-0)

S

MATH 4v03 Independent Study in Mathematics (1-6 semester hours) Independent study under a faculty member's direction. Student must obtain approval from participating math sciences faculty member and the undergraduate advisor. Can satisfy Communication elective (3 hours) if it has a major writing/report component. May be repeated for credit (9 hours maximum). Prerequisite: Instructor consent required. ([1-6]-0) S

MATH 4v91 Undergraduate Topics in Mathematics (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 hours maximum). Prerequisite: Instructor consent required. ([1-9]-0) S

Natural Sciences

NATS 1101 Natural Sciences & Mathematics Freshman Seminar (1 semester hour) This course is designed to introduce incoming freshmen to the intellectual and cultural environment of the School of Natural Sciences and Mathematics (NS&M). Students will learn about plans of study and career paths for majors in Biology, Chemistry, Physics, Mathematics, Geosciences, and Science and Mathematics Education. Basic study, problem solving and other skills needed to succeed as an NSM major will be covered. An overview of the connections within the disciplines of Natural Sciences & Mathematics will be presented, as well as their relationship to engineering, medicine and health, and other fields. Required for all first time in college freshmen in NS&M. Corequisite: UNIV 1010. (1-0) Y

NATS 1111 From the Cosmos to Earth Laboratory (1 semester hour) A laboratory to accompany NATS 1311. Corequisite: NATS 1311. (0-3) Y

NATS 1141 UTeach STEP 1 (1 semester hour) Introduction to mathematics and science teaching as a career. Master teachers introduce students to examples of high quality inquiry-based lesson design as well as model various pedagogical concepts and behavior management strategies. Students are also introduced to the portfolio project. Fieldwork consists of two classroom observations plus planning and teaching three inquiry-based lessons to students in grades four to six in local elementary schools. One and one-half class hours a week for one semester; at least ten hours of fieldwork a semester are also required. Prerequisites: A university grade point average of at least 2.750 and admission to the UTeach Dallas program by consent of the UTeach advisor. (1-0) S

NATS 1143 UTeach STEP 2 (1 semester hour) Continued exploration into mathematics and science teaching as a career. Topics include various teaching methods that are designed to meet instructional goals; use of various technologies; and learner outcomes. Fieldwork consists of classroom observations and teaching three inquiry-based math or science lessons in a middle school classroom. One and one-half class hours a week for one semester; at least twenty hours of fieldwork a semester are also required. Prerequisites: A university grade point average of at least 2.750, a grade of B- or better in NATS 1141, and consent of the UTeach advisor. (1-0) S

NATS 1311 From the Cosmos to Earth (3 semester hours) A multidisciplinary study of nature

expressly designed for those who have chosen not to major in the natural sciences or engineering. Early models of the solar system and the transformation to current models are examined, as are order in the universe, the nature of matter and the planets, sun, and life cycle of stars. The course will be enhanced by frequent demonstrations of the principles underlying the origin and evolution of the universe. Corequisite: NATS 1111. (3-0) Y

NATS 2333 Energy, Water, and the Environment (3 semester hours) An introduction to the impacts that humans have on the environment, with emphasis on impacts resulting from energy and water use. The course is designed for students who are not seeking a technical major and who wish to enhance their use of science and engineering principles and techniques in making decisions affecting both their own use of energy and water and use by the United States and the world. The course includes discussions of ways to ameliorate and/or adapt to the impacts. (3-0) Y

NATS 2v10 Special Topics in Natural Sciences (1-6 semester hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 hours maximum). Prerequisite: Instructor consent required. ([1-6]-0) S

NATS 3330 The Basis of Evolution (3 semester hours) Wide-ranging discussions of the unifying theory of the origin and modification through time of all organisms. Pertinent history, the fossil record, evolution as concerns the human experience, processes and mechanisms and a look at the future are major topics. This course is specifically designed for non-majors and may not be used for credit by Natural Science and Mathematics students. (3-0) S

NATS 3331 The Clash of Cosmologies (3 semester hours) Science and revelation in the nineteenth century. A study of the 19th-century rise of scientific inquiry into the origins of life, and the reaction and response to its discoveries by the Victorian culture that both maintained biblical authority and celebrated man's achievements. A study abroad component supplements this course. (3-0) Y

NATS 3341 Knowing and Learning in Mathematics and Science (3 semester hours) This course expands the prospective teacher's understanding of current theories of learning and conceptual development. Students examine their own assumptions about learning. Topics include psychological foundations of learning; problem solving in mathematics and science education utilizing technology; principles of expertise and novice understanding of subject matter; implications of high-stakes testing; and foundations of formative and summative assessment. Three lecture hours a week for one semester; additional hours may be required. Restricted to students in the UTeach Dallas program. Prerequisites: A university grade point average of at least 2.750, a GPA of 3.000 or better in UTeach coursework, and consent of the UTeach advisor. (3-0) S

NATS 3343 Classroom Interactions (3 semester hours) This course moves from a focus on thinking and learning to a focus on teaching and learning. Topics include principles of delivering effective instruction in various formats (lecture, lab activity, collaborative settings); examination of gender, class, race, and culture in mathematics and science education; overview of policy related to mathematics and science education. Students participate in an intensive, highly coached high school field experience comprised of 3 observations and 2 co-teaching events, including a multiple-period or day, connected lesson. Three lecture hours a week for one semester; at least twenty hours of fieldwork a semester are also required. Students should also expect to dedicate out-of-

class time to video transfer, lesson planning, and working on the portfolio project. Restricted to students in the UTeach Dallas program. Prerequisites: A university grade point average of at least 2.750, credit or registration for NATS 3341, a GPA of 3.000 or better in UTeach coursework, and consent of the UTeach advisor. (3-0) S

NATS 4141 UTeach Apprentice Teaching Seminar (1 semester hour) Discussions include student teaching experiences, and contemporary critical issues in education. Time is also allocated for completion of the portfolio project. One class hour a week for one semester. Prerequisites: (NATS 3343 and NATS 4390 and NATS 4341), a university grade point average of at least 2.750, a GPA of 3.000 or better in UTeach coursework, and consent of the UTeach advisor. Corequisite: NATS 4694 or NATS 4696. (1-0) S

NATS 4310 Advanced Writing in the Natural Sciences and Mathematics (3 semester hours) A writing-intensive course on questions or problems in natural sciences and mathematics; satisfies the advanced writing requirement for graduation. (3-0) S

NATS 4341 Project-Based Instruction (3 semester hours) Students explore topics including foundations of project-based, case-based, and problem-based learning environments; principles of project-based curriculum development in mathematics and science education; and, classroom management and organization of project-based learning classrooms are covered. Fieldwork usually includes 2 observation days and 3 teaching days. Three lecture hours a week for one semester with additional fieldwork hours to be arranged. Prerequisites: NATS 3343, a university grade point average of at least 2.750, a GPA of 3.000 or better in UTeach coursework, and consent of the UTeach advisor. Prerequisite or corequisite: NATS 4390. (3-0) Y

NATS 4390 Research Methods (3 semester hours) Independent research and advanced writing content course in the UTeach sequence. Satisfies the advanced writing requirement for UTeach student majoring in Biology, Chemistry, Physics or Geosciences. Prerequisites: NATS 3341, a university grade point average of at least 2.750, a GPA of 3.000 or better in UTeach coursework, upper-level standing, and consent of the UTeach advisor. Prerequisite or corequisite: NATS 3343. (3-0) S

NATS 4694 UTeach Apprentice Teaching, 8-12 Science and Mathematics (6 semester hours) Closely supervised observation and teaching in a science or mathematics classroom for Grades 8-12. Experience includes carrying out the duties of a high school teacher and requires a minimum of four hours of fieldwork a day for 12 weeks. Students must apply for Apprentice Teaching the semester prior to enrollment. Prerequisites: (NATS 4341 and NATS 4390), a university grade point average of at least 2.750, a GPA of 3.000 or better in UTeach coursework, and consent of the UTeach advisor. Admission to the university's teacher certification program by the Teacher Development Center. Corequisite: NATS 4141. Additional fee attached to course. (6-0) S

NATS 4696 UTeach Apprentice Teaching, 4-8 Science and Mathematics (6 semester hours) Closely supervised observation and teaching in a science or mathematics classroom for Grades 4-8. Experience includes carrying out the duties of a middle grades teacher and requires a minimum of four hours of fieldwork a day for 12 weeks. Students must apply for Apprentice Teaching the semester prior to enrollment. Prerequisites: (NATS 4341 and NATS 4390), a university grade point

average of at least 2.750, a GPA of 3.000 or better in UTeach coursework, and consent of the UTeach advisor. Admission to the university's teacher certification program by the Teacher Development Center. Corequisite: NATS 4141. Additional fee attached to course. (6-0) S

NATS 4v41 Independent Study in Science and Math Education (1-6 semester hours) Independent study under a faculty member's direction. Student must obtain approval from participating SME faculty member and the undergraduate advisor. May be repeated for credit (6 hours maximum). Prerequisite: Instructor consent required. ([1-6]-0) S

NATS 4v90 Special Topics in Natural Sciences (1-6 semester hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 hours maximum). Prerequisite: Instructor consent required. ([1-6]-0) S

Physics

PHYS 1100 The Fun of Physics (1 semester hour) An introductory course in physics in the modern world. Focuses on the work of a physicist. What does a physicist do? What are some of the exciting topics on which physicists are working today? The faculty discusses their favorite concepts and the opportunities for student participation in research. Must be taken on a credit/no credit basis only. (1-0) Y

PHYS 1101 (PHYS 1101) College Physics Laboratory I (1 semester hour) A laboratory course to accompany PHYS 1301 and PHYS 2325. May not be used to satisfy degree requirements for majors in the School of Engineering and Computer Science. (0-3) R

PHYS 1102 (PHYS 1102) College Physics Laboratory II (1 semester hour) A laboratory course to accompany PHYS 1302 and PHYS 2326. May not be used to satisfy degree requirements for majors in the School of Engineering and Computer Science. (0-3) R

PHYS 1301 (PHYS 1301) College Physics I (3 semester hours) Algebra and trigonometry based basic physics. Topics include mechanics, heat and thermodynamics. Students will also be registered for an exam section. May not be used to satisfy degree requirements for majors in the School of Engineering and Computer Science. Check with your program advisor. Prerequisite: MATH 1314. Corequisite: PHYS 2125. (3-0) S

PHYS 1302 (PHYS 1302) College Physics II (3 semester hours) Continuation of PHYS 1301. Topics include electricity, magnetism and optics. Students will also be registered for an exam section. May not be used to satisfy degree requirements for majors in the School of Engineering and Computer Science. Check with your program advisor. Prerequisite: PHYS 1301. Corequisite: PHYS 2126. (3-0) S

PHYS 2125 (PHYS 2125) Physics Laboratory I (1 semester hour) Laboratory course to accompany any Physics I or Mechanics course. Personal computer-based data presentation and curve fitting. Basic measurement concepts such as experimental uncertainty, mean, standard deviation, standard error, and error propagation will be covered. Corequisite: PHYS 1301 or PHYS 2325 or PHYS 2421. (0-3) S

PHYS 2126 (PHYS 2126) Physics Laboratory II (1 semester hour) Laboratory course to accompany any Physics II or Electricity and Magnetism course. Experiments investigate Coulomb's Law, electric fields, Ohm's and Kirchoff's laws, RC circuits, magnetic forces between conductors, motors, and transformers. Corequisite: PHYS 1302 or PHYS 2326 or PHYS 2422. (0-3) S

PHYS 2303 Contemporary Physics (3 semester hours) Topics include the fundamentals of geometric optics, interference, diffraction, special relativity, structure of the atom, nuclear physics, radioactivity, and elementary particles. (3-0) Y

PHYS 2325 (PHYS 2325) Mechanics (3 semester hours) Calculus based. Basic physics including a study of space and time, kinematics, forces, energy and momentum, conservation laws, rotational motion, torques, and harmonic oscillation. Two lectures per week. Students will also be registered for an exam section. Prerequisite: MATH 2413 or MATH 2417. Corequisites: (MATH 2414 or MATH 2419) and PHYS 2125. (3-0) S

PHYS 2326 (PHYS 2326) Electromagnetism and Waves (3 semester hours) Continuation of PHYS 2325. Topics include electrostatics and electromagnetics, electric field and potential, electric currents, magnetic fields, laws of Coulomb, Ampere, and Faraday, Maxwell's theory of wave propagation. Two lectures per week. Students will also be registered for an exam section. Prerequisites: PHYS 2325 and (MATH 2414 or MATH 2419). Corequisite: PHYS 2126. (3-0) S

PHYS 2421 Honors Physics I - Mechanics and Heat (4 semester hours) Calculus-based physics. This class is a more rigorous version of PHYS 2325 with additional topics in thermal physics. Derivations are more general and rely more heavily on calculus and the use of vectors. More challenging problems and applications. Two lectures plus a required recitation session per week. Students will also be registered for an exam section. Prerequisite: MATH 2413 or MATH 2417 with a minimum grade of B+ in either course. Corequisite: (MATH 2414 or MATH 2419) and PHYS 2125. (4-0) Y

PHYS 2422 Honors Physics II - Electromagnetism and Waves (4 semester hours) Calculus-based basic physics. This class is a more rigorous version of PHYS 2326. Derivations are more general and rely more heavily on multi-dimensional calculus concepts such as divergence, gradient, curl, and the theorems of Green, Stokes, and Gauss. More challenging problems and applications. Two lectures plus a required recitation session per week. Students will also be registered for an exam section. Prerequisites: (PHYS 2325 or PHYS 2421) and (MATH 2414 or MATH 2419). Corequisites: MATH 2415 and PHYS 2126. (4-0) Y

PHYS 3312 Classical Mechanics (3 semester hours) Newton's laws; collisions; two body problems and trajectories; Lagrangian formulation; rotational dynamics and the inertia tensor; rotating coordinate systems; gravitation. Prerequisite: PHYS 3311 or PHYS 3411 or equivalent. (3-0) Y

PHYS 3317 Physics of the Human Body (3 semester hours) This course would be an introduction to basic biophysics of the human body. Topics include body motion and the forces which cause it, properties of the body like elasticity and how it affects things like muscles and bones, energy conservation of the body and how it affects metabolism, fluid flow and the circulatory system, waves and how they affect hearing and sight. Prerequisites: (PHYS 1301 or PHYS 2325) and MATH 2413. (3-0) R

PHYS 3327 Electronics with Laboratory (3 semester hours) Topics include direct and alternating current circuits, diodes and transistors, feedback, passive and active filters, simple amplifiers, and combinatorial and sequential digital electronics. Includes laboratory where students learn to build circuits and to diagnose and troubleshoot problems inherent in the circuits using typical laboratory instruments. Prerequisite: PHYS 2326 or PHYS 2422. (2-3) Y

PHYS 3330 Numerical Methods in Physics and Computational Techniques (3 semester hours) The course covers concepts and computational techniques in numerical methods for solving physics problems. Topics typically include probability, statistics, data analysis, fits, numerical solutions, and interpretation of the experimental data. Prerequisites: (MATH 2415 or MATH 2419) and MATH 2418. (3-0) Y

PHYS 3380 Astronomy (3 semester hours) An essentially descriptive course outlining the current views of the universe and the sources of data supporting those views. The solar system and its origin, stars, galaxies, pulsars, quasars, black holes, nebulae, and the evolution of the universe. Opportunity to use a UT Dallas telescope is provided. Prerequisite: PHYS 2326 or PHYS 2422. (3-0) Y

PHYS 3411 Theoretical Physics (4 semester hours) Complex numbers; Vector spaces and linear operators; Line integrals; surface and volume integrals; Gradient, divergence and curl; vector integral theorems; Fourier series; Product solutions of PDEs. Corequisite: MATH 2420 or equivalent. Prerequisites: (MATH 2418 or equivalent), and (MATH 2415 or MATH 2419) and (PHYS 2326 or PHYS 2422). (4-0) S

PHYS 3416 Electricity and Magnetism (4 semester hours) Coulomb's and Gauss' laws; potentials, methods for solving electric field distributions near conductors; potentials due to clusters of charges; polarization of dielectric materials; electric displacement. Magnetic fields in a vacuum and in matter; time varying electric and magnetic fields; Maxwell's equations; electromagnetic waves. Prerequisite: PHYS 3311 or PHYS 3411 or equivalent. (4-0) Y

PHYS 4301 Quantum Mechanics I (3 semester hours) Fundamental concepts: the Stern Gerlach experiment; the Dirac formalism; kets; bras and operators; base kets and matrix representations. Measurements, observables and the uncertainty relations. Position, momentum, and translation. Wave functions in position and momentum space. Time evolution and Schrodinger's equation, Heisenberg picture. Orbital angular momentum, spin, and angular momentum addition. Applications include simple harmonic oscillator and the Hydrogen atom. Prerequisites: (PHYS 3311 or PHYS 3411) and MATH 2418. (3-0) Y

PHYS 4302 Quantum Mechanics II (3 semester hours) Fermions and bosons, perturbation theory, WKB approximation, scattering. Prerequisite: PHYS 4301. (3-0) Y

PHYS 4311 Thermodynamics and Statistical Mechanics (3 semester hours) Study of the elements of thermodynamics, kinetic theory, and statistical mechanics; the concepts of temperature, entropy, phase transitions, transport phenomena, partition functions, statistical ensembles; the Maxwell Boltzmann, Fermi-Dirac, and Bose-Einstein distributions; and the equipartition theorem. Applications of the theories will be considered. Corequisite: PHYS 3311 or PHYS 3411. Prerequisite: PHYS 2326 or PHYS 2422. (3-0) Y

PHYS 4328 Optics (3 semester hours) Topics include electromagnetic waves and radiation, the interaction of light and matter, geometric optics, polarization, interference, and diffraction. Prerequisite: PHYS 3416. (3-0) Y

PHYS 4335 Remote Sensing of the Earth (3 semester hours) This course covers the basic physical principles and applications of remote sensing of the earth system (air, land and sea), covering the types of platforms (satellites and aerial vehicles) and sensors used (UV/Visible, IR, Microwave, Radio) (3-0) R

PHYS 4352 Concepts of Modern Physics (3 semester hours) Quantum mechanics at an advanced undergraduate level will be applied to the discussion of applications such as lasers, semiconductors, superconductors, solid state devices, and elementary particle physics. Selection of topics may vary by semester. Prerequisite: PHYS 4302. (3-0) Y

PHYS 4371 Solid State Physics (3 semester hours) This course provides a basic but detailed picture of important concepts in solid state physics. Material covered includes crystal structure, x-ray crystallography, reciprocal space, lattice vibrations, thermal properties of solids, free electron gas, Bloch functions, metals, insulators, and semiconductors. The course concludes with a description of basic semiconductor devices. Prerequisite: PHYS 3416. (3-0) Y

PHYS 4373 Physical Measurements Laboratory (3 semester hours) Experiments illustrating concepts in thermodynamics and physical properties of matter, vacuum technology, gas phase kinetics, mass spectroscopy and optical spectroscopy, basic operations in electronics, literature skills, and use of computers. Prerequisite: PHYS 3416. (0-6) Y

PHYS 4381 Space Science (3 semester hours) A survey of the structure and dynamics of the atmospheres of planets, including ionospheres and magnetospheres, as influenced by the sun's radiation and the solar wind. Topics include aurora and airglow, photochemistry, and atmospheric electricity. Prerequisite: PHYS 2422 or PHYS 2326 or equivalent. (3-0) T

PHYS 4383 Plasma Physics (3 semester hours) Plasmas are the fourth state of matter, in which some or all of the neutral particles in a gas are ionized. A working knowledge of plasma physics is important in nuclear physics, semiconductor processing, space science, astronomy, and many other areas. This course will examine the fundamental treatment of plasmas as embodied in the fluid equations, magneto-hydrodynamics, and simple kinetic theory. Specific topics include plasma waves and instabilities, diffusion, guiding center motion and drifts, currents in plasmas, and particle collisions. Prerequisite: PHYS 3311 or PHYS 3411. Prerequisite or corequisite: PHYS 3416. (3-0) R

PHYS 4386 Elementary Particle Physics (3 semester hours) The course will cover current knowledge and understanding of elementary particle physics, the kinematics of productions and decays of particles, the Quark Model and the Standard Model, particle compositions, and the principles of modern particle detectors. Prerequisites: PHYS 4301 and PHYS 4311. (3-0) T

PHYS 4390 Senior Research and Advanced Writing (3 semester hours) Individual instruction course designed to develop skills for research and clear, precise and accurate scientific writing. Research

may be either scientific experimentation or critical analysis of scientific literature. Topics will vary from section to section depending upon the interests of the student, but will be selected from a specific area of physics. Satisfies the Advanced writing requirement. (3-0) S

PHYS 4395 Cosmology (3 semester hours) The course is a simplified overview of contemporary cosmology including: cosmological principle; scale of distance and expansion law of the universe; redshift; Friedmann equations and cosmological models of the universe; cosmological probes and techniques; baryonic matter; dark matter; dark energy and cosmic acceleration. Prerequisites: (PHYS 3311 or PHYS 3411) or (ENGR 3300 or MATH 2420) and MATH 2415. (3-0) T

PHYS 4399 Senior Honors Research in Physics (3 semester hours) Individual instruction course designed to develop skills for research and clear, precise and accurate scientific writing. Research may be either scientific experimentation or critical analysis of scientific literature. Topics will vary from section to section depending on the interests of the student, but will be selected from a specific area of physics. Satisfies the Advanced writing requirement. Topics may vary. (3-0) S

PHYS 4v07 Senior Research Projects (1-6 semester hours) Intended as an introduction to research, this course involves independent research activities under the guidance of a faculty member on advanced topics in physics. May be repeated for credit (9 hours maximum). Prerequisite: Instructor consent required. ([1-6]-0) R

PHYS 4v10 Special Topics in Physics (1-9 semester hours) Topics may vary from semester to semester. May be repeated for credit (9 hours maximum). Prerequisite: Instructor consent required. ([1-9]-0) S

Statistics

STAT 1342 (MATH 1342) Statistical Decision Making (3 semester hours) Principles of quantitative decision making: summarizing data, modeling uncertainty, loss functions, probability, conditional probability, random variables. Introduction to statistics: estimation, confidence intervals, hypothesis testing, regression. Introduction to statistical packages. Cannot be used to satisfy degree requirements for majors in the School of Engineering and Computer Science, or major requirements in the Schools of Management or Natural Sciences and Mathematics. Prerequisite: MATH 1306 or MATH 1314 or equivalent. (3-0) S

STAT 3103 Statistical Computer Packages (1 semester hour) An introduction to the use of statistics packages, such as SAS, BMD, SPSS, Minitab, and S, for the analysis of data. Based primarily on self-study materials. Cannot be used to satisfy degree requirements for mathematics majors. Prerequisite: one semester of statistics. (1-0) S

STAT 3332 Statistics for Life Sciences (3 semester hours) Graphs, histograms, mean, median, standard deviation, Chebyshev's inequality, standardized scores, simple linear regression and correlation; basic rules of probability, Bayes theorem; Normal t, chi squared, F, binomial and Poisson distributions; point estimation; hypothesis tests and confidence intervals for means, proportions regression coefficients, and correlation; one way ANOVA; contingency tables. Applications in life sciences will be emphasized throughout the course. Cannot be used by

mathematics, engineering, or computer science majors to satisfy degree requirements. Prerequisite: MATH 2312 or MATH 1325 or equivalent. (3-0) S

STAT 3341 Probability and Statistics in Computer Science and Software Engineering (3 semester hours) Axiomatic probability theory, independence, conditional probability. Discrete and continuous random variables, special distributions of importance to CS/SE, and expectation. Simulation of random variables and Monte Carlo methods. Central limit theorem. Basic statistical inference, parameter estimation, hypothesis testing, and linear regression. Introduction to stochastic processes. Illustrative examples and simulation exercises from queuing, reliability, and other CS/SE applications. Students cannot get credit for both (CS 3341 or SE 3341 or STAT 3341) and ENGR 3341. Prerequisites: (MATH 1326 or MATH 2414 or MATH 2419), and (CE 2305 or CS 2305 or TE 2305). (Same as CS 3341 and SE 3341) (3-0) S

STAT 3355 Data Analysis for Statisticians and Actuaries (3 semester hours) Methods of data analysis used in different areas of Statistics and Actuarial Science. Sampling, fitting and testing models, regression, and comparison of populations. A statistical computer package will be used. Prerequisite: MATH 2415 or MATH 2419. (3-0) Y

STAT 3360 Probability and Statistics for Management and Economics (3 semester hours) Probability theory including independence, conditioning, density functions, frequently used families of distributions, random variables, expectation, moments, and the central limit theorem; statistical inference including sampling, estimation, hypothesis testing, and regression. Cannot be used by mathematics, engineering, or computer science majors to satisfy degree requirements. Prerequisite: MATH 1326. (3-0) S

STAT 4351 Probability (3 semester hours) Sample spaces, probability of events, Kolmogorov's axioms, independence and dependence, Bayesian methodology. Discrete and continuous random variables. Probability distributions, mass functions and densities of univariate and multivariate random variables. Expected values, variances, moment generating functions, covariances and related issues. Probability inequalities. Special probability distributions and special probability densities. Functions of random variables, distribution function techniques, transformation techniques for one and several variables, moment-generating techniques. The law of large numbers, the central limit theorem and classical sampling distributions. Proofs of all main results. Practical examples illustrating the theory. The course can be used as a preparation for the first (Probability) actuarial exam. Prerequisite: MATH 2451. (3-0) Y

STAT 4352 Mathematical Statistics (3 semester hours) Sampling distributions. Order statistics. Decision theory including minimax and Bayes criterion. Point estimation including unbiased estimators, efficiency, consistency, sufficiency, robustness, the method of moments, the method of maximum likelihood, Bayesian estimation. Interval estimation including the estimation of means, differences of means, proportions, differences between proportions, variances and ratios of variances. Hypothesis testing including Neyman-Pearson lemma, power function and likelihood ratio test. Special tests involving means, variances and proportions. Nonparametric tests. Foundations of regression, correlation, design and analysis of experiments. Proofs of all main results. Practical examples illustrating the theory. The course can be used as a preparation for the

statistical part of the fourth actuarial exam. Prerequisite: STAT 4351 or equivalent. (3-0) Y

STAT 4382 Stochastic Processes (3 semester hours) Stochastic models including Markov chains, random walks, Poisson processes, renewal processes, and an introduction to time series and forecasting. Prerequisite: STAT 4351 or equivalent. (3-0) Y

STAT 4v02 Independent Study in Statistics (1-6 semester hours) Independent study under a faculty member's direction. May be repeated for credit as topics vary (9 hours maximum). Prerequisite: Student must obtain approval from participating mathematics faculty member and the undergraduate advisor. Can satisfy Communication elective (3 hours) if it has a major writing/ report component. ([1-6]-0) S

STAT 4v97 Undergraduate Topics in Statistics (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated for credit as topics vary (9 hours maximum). ([1-9]-0) S