Biology

**BIOL 1300** Body Systems with Lab (3 semester credit 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. (2-2) S

**BIOL 1318** *(BIOL 2316)* Human Genetics (3 semester credit 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 1350** Body Systems (3 semester credit 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 is stressed. The overall objective of the course is an appreciation of the integration and control of all systems. This course is specifically designed for non-majors. (3-0) S

**BIOL 1V00** Topics in Biological Sciences (1-6 semester credit hours) May be repeated for credit as topics vary (6 semester credit hours maximum). ([1-6]-0) R

**BIOL 1V01** Topics in Biological Sciences with Lab (1-6 semester credit hours) May be repeated as topics vary (6 semester credit hours maximum). ([1-5]-[1-5]) R

**BIOL 1V95** Individual Instruction in Biology (1-6 semester credit hours) Individual study under a faculty member's direction. May be repeated for credit as topics vary (6 semester credit hours maximum). Instructor consent required. ([1-6]-0) S

**BIOL 2111** Introduction to Modern Biology Workshop I (1 semester credit hour) Problem solving and discussion related to the subject matter in **BIOL 2311**, Prerequisites: (CHEM 1311 or equivalent) and CHEM 1312. Corequisite: **BIOL 2311**. (1-0) S

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

**BIOL 2281** Introductory Biology Laboratory (2 semester credit 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 credit 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 or CHEM 1315) and (CHEM 1 312 or CHEM 1316)) or CHEM 1301. Corequisite: BIOL 2111. (3-0) S

BIOL 2312 (BIOL 1307) Introduction to Modern Biology II (3 semester credit hours) 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 2350 Biological Basis of Health and Disease (3 semester credit 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 2V00 Topics in Biological Sciences (1-6 semester credit hours) May be repeated as topics vary (6 semester credit hours maximum). Instructor consent required. ([1-6]-0) R

BIOL 2V01 Topics in Biological Sciences with Lab (1-6 semester credit hours) May be repeated as topics vary (6 semester credit hours maximum). ([1-5]-[1-5]) R

BIOL 2V95 Individual Instruction in Biology (1-6 semester credit hours) Individual study under a faculty member's direction. May be repeated for credit as topics vary (6 semester credit hours maximum). Instructor consent required. ([1-6]-0) S

BIOL 3101 Classical and Molecular Genetics Workshop (1 semester credit hour) Problem solving and discussion related to the subject matter in BIOL 3301. Prerequisites: BIOL 2311 and (BIOL 2281 or CHEM 2 401 or equivalent) and (CHEM 2323 or equivalent). Corequisite: BIOL 3301. (1-0) S

BIOL 3102 Eukaryotic Molecular and Cell Biology Workshop (1 semester credit hour) Problem solving and discussion related to the subject matter in BIOL 3302. Prerequisites: BIOL 3301 and (BIOL 3361 or CHEM 3 361) or equivalent. Corequisite: BIOL 3302. (1-0) S

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

BIOL 3161 Biochemistry Workshop I (1 semester credit hour) Problem solving methodology in biochemistry; discussion of recent advances in areas related to the subject matter in BIOL 3361 or CHEM 3 361. Prerequisites: (CHEM 2323 or equivalent) and CHEM 2325. Corequisite: BIOL 3361 or CHEM 3361. (1-0) S

BIOL 3162 Biochemistry Workshop II (1 semester credit hour) Problem-solving methodology in biochemistry; discussion of recent advances in areas related to the subject matter in BIOL 3362 or CHEM 3
BIOL 3301 Classical and Molecular Genetics (3 semester credit 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 (BIOL 2281 or CHEM 2401 or equivalent) and (CHEM 2323 or equivalent). Corequisite: BIOL 3101. (3-0) S

BIOL 3302 Eukaryotic Molecular and Cell Biology (3 semester credit 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) or equivalent. Corequisite: BIOL 3102. (3-0) S

BIOL 3303 Introduction to Microbiology (3 semester credit hours) Microbes contribute to major biogeochemical processes, live in environments inhospitable to other organisms, and may comprise the majority of biomass on Earth. They form beneficial symbioses with multicellular organisms and play critical roles in the development of those organisms. In contrast to these beneficial roles, certain microbes are global public health concerns. This course surveys the form and function of the microbial world. Prerequisites: (BIOL 2281 or equivalent) and BIOL 2311 and BIOL 2312. (3-0) S

BIOL 3305 Evolutionary Analysis (3 semester credit 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 credit 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 biomacromolecules 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 and instructor consent required. (3-0) Y

BIOL 3312 Introduction to Programming for Biological Sciences (3 semester credit hours) This course is an introduction to programming practices using C++ designed specifically for students in the biological sciences. Special emphasis will be put in particular features of C++ like object oriented programming, some data structures as well as applications to process, model and analyze biological data. One goal of this course is to provide a strong background on programming skills on a basic level while leaving more advanced techniques of software development and algorithms for other advanced courses. This course also covers an introduction to data analysis with R, a statistical platform used widely in the biological sciences community. Prerequisites: (BIOL 2281 or equivalent) and BIOL 2311 and BIOL 2312. (3-0) Y

BIOL 3315 Epigenetics (3 semester credit hours) Almost all cell types in our body share the same genetic
information, but they perform very different functions. For example, our nerve cells are morphologically and functionally distinct from our muscle cells. How can the same genome give rise to hundreds of distinct cell types in our body? How can different diseases affect identical twins sharing the same genetic information? Why our parents and grandparents diet and health may have lasting influences in our own health? The field of epigenetics emerged over the past decades to tackle these fundamental questions that intersect our genome, development, environment and disease. This course will provide a broad overview of epigenetic phenomena and epigenetic mechanisms with weekly lectures and small group discussion of primary literature. The course will introduce students to seminal works in epigenetics and recent developments with the goal of instilling critical knowledge of the field. Prerequisites: (BIOL 3101 and BIOL 3301) or equivalent or instructor consent required. (3-0) Y

BIOL 3318 Forensic Biology (3 semester credit 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 3320 Applied Genetics (3 semester credit hours) Genetic model organisms such as the flatworm (Planaria), fruit fly (Drosophila melanogaster), nematode (Caenorhabditis elegans), and the zebrafish (Danio rerio) are the cornerstones of biomedical research. These organisms known for their simplicity of structure and gene similarity to humans have been seminal in advancing our understanding of many biological processes and human diseases. In this inquiry-based course, learners will apply basic principles of genetic model systems, transmission genetics, and molecular genetics to investigate important biological concepts such as embryonic cell division, stem cells and regeneration, Mendelian inheritance, gene mutations, and phenotypes. Throughout this exploratory course, students will gain practical hands-on experience conducting basic culturing, genetic manipulation and phenotypic analysis necessary to utilize genetic model organisms in their investigation. Learners will engage in class discussions and activities to draw connections between the concepts learned in class and their real-time application(s) in biomedical sciences. Instructor consent required. Prerequisites: BIOL 2281 or equivalent and (BIOL 2311 and (BIOL 2111 or equivalent)) and (BIOL 2312 and (BIOL 2112 or equivalent)). (3-0) S

BIOL 3335 Microbial Physiology (3 semester credit 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 credit 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 3351 Medical Cell Biology (3 semester credit hours) Explores topics in cell biology and medicine. Topics include cellular organization, structure and inheritance of DNA, gene therapy, stem cells, regenerative medicine, cell to cell signaling, the functioning of different types of cells and tissues, including
those of the immune and endocrine system, and the study of several genetic diseases, such as cancer and cardiovascular disease. Prerequisites: BIOL 2311 and BIOL 2312 or equivalent. (3-0) S

**BIOL 3355** Pathophysiology (3 semester credit hours) The focus of this course is to meet the interests of the students who plan to become professionals working in the health-care field. The strategic goal of the course is to make students internalize the notion of the complexity of the processes leading to the onset and the development (pathogenesis) of a diseased condition, to emphasize the concept of the unbalanced homeostatic regulation underlying any pathology. To understand the idea of the involvement of all body systems in the seemingly "local" manifestations of a disease, and to realize the importance of the mind-body connections in the subjective and objective characteristics of an individual ailment and its influence on the process of sanogenesis (recovery). We will incorporate the most recent scientific data into the fundamentals of pathophysiology and discuss the classical typological problems like the etiology, diagnosis, clinical characteristics, treatment, and the prognosis of the condition. The pathological conditions that will be covered in this course include the infectious diseases and some immune disorders, the diseases of the reproductive, cardiovascular, respiratory, and urinary systems. Prerequisites: BIOL 2312 and BIOL 3456. ([1-3]-0) S

**BIOL 3357** Mammalian Physiology with Lab (3 semester credit hours) This course will focus on human body systems and physiological pathways related to organ system functions and control including, but not limited to, central nervous system control and feedback, cardiovascular, respiratory, and neuromuscular physiology as well as topics such as blood pressure regulation and exercise physiology. This course will use computer software and electronic instrumentation for performing electrocardiography, electromyography, electroencephalography, plethysmography, pulmonary function analysis, polygraph analysis, and biofeedback. Instructor consent required. Prerequisites: BIOL 3455 or equivalent and BIOL 3456 or equivalent. (3-1) S

**BIOL 3361** Biochemistry I (3 semester credit 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 or equivalent) and CHEM 2325. Corequisite: BIOL 3161. (Same as CHEM 3361) (3-0) S

**BIOL 3362** Biochemistry II (3 semester credit 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 credit 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. Prerequisites: BIOL 2312 and (BIOL 3455 or BIOL 3456). (3-0) Y

**BIOL 3380** Biochemistry Laboratory (3 semester credit 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 or CHEM 2401 or equivalent. Prerequisite or Corequisite: BIOL 3361 or CHEM 3361. (1-4) S

BIOL 3385 Medical Histology (3 semester credit hours) Medical histology will cover the microscopic structure and function of human cells and tissues that make up the organ systems in normal and pathological conditions. The lecture component will include understanding of relevant disease and pathophysiological conditions from a histological standpoint. The laboratory component of this course will involve the microscopic study of cells and tissues using the compound light microscope and prepared slides. Laboratory studies will complement and correlate with the study of cells and tissue organization. Prerequisites: BIOL 2311 and BIOL 2312. (1.5-3) S

BIOL 3388 Honey Bee Biology (3 semester credit hours) This survey course explores the biology of honey bees at the colony, organism, and molecular levels. Topics include honey bee anatomy, nest architecture, caste development and social organization, reproduction and genetic diversity, pheromones and communication, foraging behavior, colony reproduction, pest and disease management, and basic beekeeping. Optional hands on experience may be provided. Prerequisites: (BIOL 2281 or CHEM 2401 or equivalent) and BIOL 2311 and BIOL 2312. (3-0) Y

BIOL 3455 Human Anatomy and Physiology with Lab I (4 semester credit 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 credit 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. Prerequisite: BIOL 3455 or equivalent. (3-3) S

BIOL 3520 General Microbiology with Lab (5 semester credit 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 or CHEM 2401 or equivalent) and (BIOL 2311 and BIOL 2312) or equivalent and CHEM 2323. (2-3) Y

BIOL 3V00 Topics in Biological Sciences (1-6 semester credit hours) May be repeated as topics vary (9 semester credit hours maximum). Prerequisites: (BIOL 2281 or CHEM 2401 or equivalent) and BIOL 2311 and BIOL 2312 or equivalent. (1-6) S

BIOL 3V01 Topics in Biological Sciences with Lab (1-6 semester credit hours) May be repeated as topics
vary (6 semester credit hours maximum). Prerequisites: (**BIOL 2281** or **CHEM 2401** or equivalent) and **BIOL 2311** and **BIOL 2312** or equivalent. ([1-5]-[1-5]) R

**BIOL 3V15** Research Practicum for UT-PACT (1-6 semester credit hours) Students in the UT-PACT program participate in clinical or biomedical research projects under the joint supervision of UT Southwestern faculty and UT Dallas UT-PACT program coordinator. Students receive training in relevant research methodology and research ethics prior to placement in clinical settings. Consult with UT-PACT program coordinator prior to enrollment for information on prerequisites and minimum on-site hours. May be repeated for credit. (9 semester credit hours maximum). UT-PACT program coordinator consent required. ([1-6]-0) S

**BIOL 3V40** Topics in Molecular and Cell Biology (1-6 semester credit hours) May be repeated as topics vary (9 semester credit hours maximum). Prerequisites: (**BIOL 2281** or **CHEM 2401** or equivalent) and **BIOL 2311** and **BIOL 2312** or equivalent. ([1-6]-[0-5]) S

**BIOL 3V81** Clinical Medicine I (1-6 semester credit 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. Credit/No Credit only. UT PACT advisor consent required. ([1-6]-[1-9]) Y

**BIOL 3V82** Clinical Medicine II (1-6 semester credit 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 Partnership in Advancing Clinical Transition (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. Credit/No Credit only. UT PACT advisor consent required. Prerequisite: **BIOL 3V81**. ([1-6]-[1-9]) Y

**BIOL 3V83** Clinical Medicine III (1-6 semester credit hours) Clinical Medicine III is a continuation of Clinical Medicine I and II that is offered to students in the UT Partnership in Advancing Clinical Transition (UT PACT) program, to be taken during students' third academic year at UT Dallas. Enrollment is limited to students who have completed Clinical Medicine I and II, and at least two years of the UT PACT Program. UT PACT advisor consent required. ([1-6]-[1-9]) Y

**BIOL 3V84** Clinical Medicine IV (1-6 semester credit hours) Clinical Medicine IV is a continuation of Clinical Medicine I, II, and III that is offered to students in the UT Partnership in Advancing Clinical Transition (UT PACT) program to be taken during students' third academic year at UT Dallas. Enrollment is limited to students who have completed Clinical Medicine I, II, and III, and at least two years of the UT PACT Program. Credit/No Credit only. UT PACT advisor consent required. ([1-6]-[1-9]) Y

**BIOL 3V90** Undergraduate Readings in Biology (1-3 semester credit hours) Subject and scope to be determined on an individual basis. May be repeated for credit as topics vary. Instructor consent required. ([1-3]-0) S

**BIOL 3V91** Undergraduate Research in Biology (1-3 semester credit hours) Subject and scope to be
determined on an individual basis. May be repeated for credit as topics vary. Instructor consent required. ([1-3]-0) S

**BIOL 3V92** Undergraduate Readings in Biochemistry (1-3 semester credit hours) Subject and scope to be determined on an individual basis. May be repeated for credit as topics vary. Instructor consent required. ([1-3]-0) S

**BIOL 3V93** Undergraduate Research in Biochemistry (1-3 semester credit hours) Subject and scope to be determined on an individual basis. May be repeated for credit as topics vary. Instructor consent required. ([1-3]-0) S

**BIOL 3V94** Topics in Biology: Individual Instruction (1-6 semester credit hours) Individual study under a faculty member's direction. May be repeated for credit as topics vary. Instructor consent required. ([1-6]-0) S

**BIOL 3V95** Undergraduate Readings in Molecular and Cell Biology (1-3 semester credit hours) Subject and scope to be determined on an individual basis. May be repeated for credit as topics vary. Instructor consent required. ([1-3]-0) S

**BIOL 3V96** Undergraduate Research in Molecular and Cell Biology (1-3 semester credit hours) Subject and scope to be determined on an individual basis. May be repeated for credit as topics vary. Instructor consent required. ([1-3]-0) S

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

**BIOL 4305** Molecular Evolution (3 semester credit hours) This course describes principles and models of evolutionary theory at the molecular level. It focuses primarily on the evolution of nucleotide sequences including genes, pseudogenes, and genomes as well as amino acid sequences used to study the evolution of proteins, protein complexes, and interactions. Phylogenetics and current leading quantitative models of sequence evolution are discussed in detail. Recent methods on amino acid evolution and its connections to molecular structure and function are also studied. Relevant examples of molecular evolution presented in this course include protein interactions, signaling networks, and viral evolution. Students learn computational tools and algorithms used to study evolution at the molecular level and work on a proposal-like research project applying tools and concepts learned in class to investigate new research questions in their area of specialization. Prerequisites: **BIOL 3301** and **BIOL 3302**, (3-0) S

**BIOL 4310** Cellular Microbiology (3 semester credit 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. Prerequisite: **BIOL 2311**, (3-0) Y

https://catalog.utdallas.edu/2018/undergraduate/courses/biol
BIOL 4315 Genes, Disease and Therapeutics (3 semester credit hours) This course explores models of genetic disease beginning with the genetic basis and traveling through the clinical presentation. Therapeutic approaches as well as particular issues relevant to each disease are also covered. These issues include legal aspects, prenatal screening and ethical concerns. Prerequisites: BIOL 2311 and BIOL 2312 and (BIOL 2281 or CHEM 2401 or equivalent). (3-0) S

BIOL 4317 Cellular and Molecular Medicine of Human Diseases (3 semester credit hours) This course is designed to provide upper level undergraduate students with current understandings of and experimental approaches (e.g. animal models) to human diseases with emphasis on cellular and molecular basis of cancer, metabolic diseases, inflammation, and tissue injuries. Students will become aware of the most recent advancements in biomedical research and the contributions of various animal models to basic and clinical studies. Students are also expected to acquire the necessary skills to interpret and present recent landmark research articles. Sessions include lectures, seminars from invited guest lecturers, and journal article presentation. Prerequisites: (BIOL 3301 and BIOL 3302 and BIOL 3361) or instructor consent required. (3-0) S

BIOL 4320 Cell Migration in Health and Disease (3 semester credit hours) Cell adhesion and migration play important roles in normal development, immune responses, wound healing and regeneration. Dysregulated migration underlies many conditions including congenital disorders, chronic inflammation, and cancer invasion and metastasis. This course will examine the cellular and molecular mechanisms underlying cell adhesion and migration in normal, regenerative and diseased states. Model systems, tools, and technologies used to study and analyze cell migration will be discussed. The course will include didactic lectures, enquiry-based learning and student presentations. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or equivalent or instructor consent required. (3-0) S

BIOL 4325 Nutrition and Metabolism (3 semester credit hours) This course examines nutrient utilization and requirements with an emphasis on multifaceted links between diet, health, genetics, microbiome, and diseases. The course intends to support studies towards medicine, health professions, biomedical research, and biotechnology. Topics cover the basis of nutritional physiological phenomena and metabolic hemostasis in the context of human development, aging, exercise, health and diseases. Integration of energy metabolism and physiological requirements concerning macronutrients and major vitamins and minerals as well as benefits of potentially-protective compounds in food are reviewed. How unbalanced intake of nutrients contributes to the initiation, development and severity of various chronic diseases, including coronary heart disease, atherosclerosis, lipidemia, hypertension, diabetes, obesity, osteoporosis, thyroid disorders, immune dysfunction, inflammatory conditions, cancer, and dysbiosis are discussed with relevance to clinical nutrition and public health. The course also introduces the fields of microbiomics, nutrigenomics, nutrigenetics and chrononutrition to explore evolving concepts concerning the influence of diet on intestinal microbiota and the effect of foods and sleep on metabolism and genes. Instructor consent required. Prerequisites: (BIOL 3361 and BIOL 3161) or equivalent and (BIOL 3362 and BIOL 3162) or equivalent. (3-0) S

BIOL 4337 Seminal Papers in Biology (3 semester credit 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. Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) and (BIOL 3362 or CHEM 3362). (3-0) S
BIOL 4340 Proteomics (3 semester credit 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 credit 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 credit hours) How genetic information is regulated in prokaryotic and eukaryotic systems. Topics include mechanisms of transcription, promoter architecture, 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 4350 Medical Microbiology (3 semester credit 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 credit 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 credit 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 4356** Molecular Neuropathology (3 semester credit hours) Molecular Neuropathology course offers a 360 degree view on neurological diseases and the underlying molecular causes. In this course, we will be looking at the pathology of the brain and CNS in various diseases. Following a look at the pathology, we will dive into the molecular aspects of the same diseases looking at it from the genetic and protein structure-function point of view. We love an open class format and enjoy discussions on the various topics on the syllabus. Prerequisites: **BIOL 3301** and **BIOL 3302** and (**BIOL 3361** or **CHEM 3361**) or equivalent or instructor consent required. (3-0) S

**BIOL 4357** Molecular Neuropathology II (3 semester credit hours) Molecular Neuropathology course offers a 360 degree view on neurological diseases and the underlying molecular causes. In this course, we will be looking at the pathology of the brain and CNS in various diseases. Following a look at the pathology, we will dive into the molecular aspects of the same diseases looking at it from the genetic and protein structure-function point of view. We love an open class format and enjoy discussions on the various topics on the syllabus. Prerequisites: **BIOL 3301** and **BIOL 3302** and (**BIOL 3361** or **CHEM 3361**) or equivalent or instructor consent required. (3-0) Y

**BIOL 4360** Evolution and Development (3 semester credit hours) The objective of the course is to integrate evolutionary biology and developmental biology into a common framework, focusing on the evolution of developmental pathways as a basis for the evolution of animal morphology. This is a reading intensive course with a heavy focus on scientific research. Prerequisite or Corequisite: **BIOL 3301**. (3-0) S

**BIOL 4365** Advanced Human Physiology (3 semester credit 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 credit 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 4371** General and Molecular Virology (3 semester credit hours) What is a virus? What is the basis of virus/host specificity? How do viruses replicate? This course will cover virus structure, classification, gene expression, and replication. Once we have covered the basics using a few select model systems, we will consider selected groups of viruses from each of the three domains of life and discuss in detail virus replication from attachment to release of progeny virions (and/or alternative fates such as lysogeny, abortive infections and others). This course is designed for upper level undergraduate students who have a firm grasp on the basics of Central Dogma: transcription, translation, replication, as well as a background in bacteriology and eukaryotic cell biology. **BIOL 3301** is recommended but not required. Prerequisites: **BIOL 3301** and (**BIOL 3520** or **BIOL 3V20**) or instructor consent required. (3-0) Y

**BIOL 4375** Bioinformatics (3 semester credit 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. Recommended prerequisite: one semester of introductory statistics. Prerequisites: BIOL 3301 and (BIOL 3361 or CHEM 3361) and two semesters of calculus. (3-0) T

**BIOL 4380** Cell and Molecular Biology Laboratory (3 semester credit 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. (1-4) S

**BIOL 4385** Oral Histology and Embryology (3 semester credit hours) This course will provide exposure to and broad coverage of maxillofacial and oral histological structures and embryology of the face, neck, and teeth using lectures and electronic images of calcified and soft tissues cells. Prerequisites: (BIOL 3361 and (BIOL 3455 or BIOL 3456)) or instructor consent required. (3-0) S

**BIOL 4390** Senior Readings in Molecular and Cell Biology (3 semester credit 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. Topics may vary. Instructor consent required. (3-0) S

**BIOL 4391** Senior Research in Molecular and Cell Biology (3 semester credit 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. Topics may vary. Instructor consent required. (3-0) S

**BIOL 4398** Senior Honors Readings for Thesis in Molecular and Cell Biology (3 semester credit 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 academic advisor in biology for program requirements. Topics may vary. Instructor consent required. (3-0) S

**BIOL 4399** Senior Honors Research for Thesis in Molecular and Cell Biology (3 semester credit 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 academic advisor in biology for program requirements. Topics may vary. Instructor consent required. (3-0) S

**BIOL 4461** Biophysical Chemistry (4 semester credit 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 2413 and MATH 2414) or MATH 2417) and (PHYS 1301 or PHYS 2325 or equivalent) and (BIOL 3361 or CHEM 3361). (4-0) Y

**BIOL 4V00** Special Topics in Biology (1-6 semester credit hours) May be repeated as topics vary (9 semester credit hours maximum). Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or equivalent or instructor consent required. ((1-6)-0) S

**BIOL 4V01** Topics in Biological Sciences with Lab (1-6 semester credit hours) May be repeated as topics vary (6 semester credit hours maximum). Prerequisites: (BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361) or equivalent or instructor consent required. ((1-5)-(1-5)) R
**BIOL 4V40** Special Topics in Molecular and Cell Biology (1-6 semester credit hours) May be repeated as topics vary (9 semester credit hours maximum). Prerequisites: *(BIOL 3301 and BIOL 3302) and (BIOL 3361 or CHEM 3361)* or equivalent or instructor consent required. ([1-6]-[0-5]) S

**BIOL 4V95** Advanced Topics in Biology (Individual Instruction) (1-6 semester credit hours) Individual study under a faculty member's direction. May be repeated for credit as topics vary. Instructor consent required. ([1-6]-0) S

**BIOL 4V98** Senior Honors Readings in Molecular and Cell Biology (3-6 semester credit 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. May be repeated for credit as topics vary. Instructor consent required. ([3-6]-0) S

**BIOL 4V99** Senior Honors Research in Molecular and Cell Biology (3-6 semester credit 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. May be repeated for credit as topics vary. Instructor consent required. ([3-6]-0) S