Chemistry B.S. with a Pre-Medical Concentration : BS-CHEM-PREMED

Core Curriculum Courses		
See the Core Curriculum Requirements (https://coursecatalog.tamuc.edu/undergrad/core-curriculum-requirements/)		42
Required courses in the major		
CHEM 101	General Chemistry Tutorial I	1
CHEM 102	General Chemistry Tutorial II	1
CHEM 1111	General and Quantitative Chemistry Laboratory I *	
CHEM 1112	General and Quantitative Chemistry Laboratory II *	
CHEM 1311	General and Quantitative Chemistry I *	
CHEM 1312	General and Quantitative Chemistry II *	
CHEM 201	Organic Chemistry Tutorial I	1
CHEM 202	Organic Chemistry Tutorial II	1
CHEM 2123	Organic Chemistry Laboratory I	1
CHEM 2125	Organic Chemistry Laboratory II	1
CHEM 2323	Organic Chemistry I	3
CHEM 2325	Organic Chemistry II	3
CHEM 340	Quantitative & Instrumental Analysis	4
CHEM 351	Physical Chemistry	4
CHEM 352	Physical Chemistry	4
CHEM 401	Chemical Sci & Profession	2
CHEM 414	Biochemistry	4
CHEM 415	Advanced Inorganic Chemistry	4
CHEM 418	Undergraduate Research (also satisfied by CHEM 490 and CHEM 491)	6
CHEM 441	Instrumental Analysis	4
Advanced CHEM Course (excluding CHEM 371, CHEM 397, CHEM 490, CHEM 491 & CHEM 497, unless departmental approval granted)		3-4
Required support courses		
BSC 1406	Introductory Biology I	4
BSC 1407	Introductory Biology II	4
BSC 303	Cell Biology	4
Advanced BSC Courses		8
MATH 2413	Calculus I *	
MATH 2414	Calculus II	4
MATH 2415	Calculus III	4
PHYS 2425	University Physics I	4
PHYS 2426	University Physics II	4
Total Hours		**125-126**

* These courses will satisfy the Core Curriculum Requirements in Natural Sciences and Mathematics.

** A grade of “C” or higher must be earned in all courses in this Major.

BSC 1406 - Introductory Biology I

Hours: 4

This course is the first half of the Introductory Biology series. It is designed for the following majors: Broadfield Biology, Pre-Med, Pre-Allied Health, and Pre-Vet. Topics covered include biological evolution, biochemistry, cellular and molecular biology, genetics, and microbiology. Note All courses carrying four semester hours have labs. Students must register for both lecture and lab sections

BSC 1407 - Introductory Biology II
Hours: 4
This course is designed for students in Agricultural Science, Plant and Soil Science, Animal Science, Wildlife and Conservation Science, and in Environmental Science. Students are introduced to animal cellular biology and physiology, animal diversity and classification, and the biogeography and ecology of animal populations. Topics covered include cellular metabolism, animal physiology and genetics, developmental biology and architectural patterns, evolution, and the diversity of animal life. Students must register for both lecture and lab sections. Prerequisite BSC 1406 with a minimum grade of C.

BSC 1411 - Botany
Hours: 4
This course is designed for students majoring in Agricultural Science, Plant and Soil Science, Wildlife and Conservation Science, and in Environmental Science. Students are introduced to the structure and function of plants as well as their diversity and ecology. Topics covered include plant cellular and gross anatomy, plant physiology and biochemistry, genetics, evolution, classification, and biogeography. Students must register for both lecture and lab sections.

BSC 1413 - Zoology
Hours: 4
This course is designed for students in Agricultural Science, Plant and Soil Science, Animal Science, Wildlife and Conservation Science, and in Environmental Science. Students are introduced to animal cellular biology and physiology, animal diversity and classification, and the biogeography and ecology of animal populations. Topics covered include cellular metabolism, animal physiology and genetics, developmental biology and architectural patterns, evolution, and the diversity of animal life. Students must register for both lecture and lab sections.

BSC 2401 - Hum Anatomy/Physiology I
Hours: 0-4
Study of the structure and functions of human organ systems. Students must register for both lecture and lab sections.

BSC 2402 - Hum Anatomy/Physiology II
Hours: 4
Study of the structure and function of human organ systems (continuation of BSc 251). Students must register for both lecture and lab sections. Pre-requisite: BSC 2401

BSC 256 - Medical Terminology
Hours: 3
This course will study the basic structure of medical words. Included will be prefixes, suffixes, roots, combining forms, and plurals. Emphasis will be placed on pronunciation and spelling. This course cannot be used or substituted for any course in any degree program in Biological Sciences.

BSC 297 - Special Topics
Hours: 1-4

BSC 303 - Cell Biology
Hours: 4
This course is intended for biology and pre-professional majors with a solid understanding of general biology and general chemistry. This course covers the chemical nature of the cell. It deals with the variety of chemicals found in cells as well as the subcellular structures and components. It includes an extensive review of enzymes, cell membranes and transport, cell signalling, motility of cells and within cells, and extracellular adhesion and signals. The regulation, chemical synthesis, and transport of both RNA and proteins are also covered. Students must register for both lecture and lab sections. Prerequisites: A minimum grade of C is required in the following prerequisite courses: BSC 1407, and CHEM 1312, a grade of "C" or more must be earned in the course.

BSC 304 - Genetics
Hours: 4
This course is intended for biology and pre-professional majors with a solid understanding of general biology and general chemistry. Cell Biology is very helpful, and may be taken concurrently. This course covers essentially DNA, studying it at the molecular, organismal, and population levels. Students will cover the mechanisms of inheritance, including Mendelian and non-Mendelian inheritance and genetic recombination in viruses through humans. At the molecular level, topics include the structure and organization of DNA, DNA replication, techniques of DNA analysis (including recombinant DNA and DNA sequencing), and transgenic organisms. The final section of the course covers an introduction to population genetics with a thorough treatment of the Hardy-Weinberg equilibrium and evolution. Students must register for both lecture and lab sections. Prerequisites: BSC 303 with a minimum grade of C or concurrent registration in BSC 303.

BSC 305 - General Physiology
Hours: 4
This course is designed for majors with a well-rounded background in biology. It provides students with an understanding of basic physiological principles and the functional organization of living systems. Emphasis will be placed on human physiology and the integrated functions of organ systems. Students are expected to learn the basic principles and concepts of human physiology both at the molecular and cellular levels, to learn to reason scientifically, and to understand and describe the cooperative function of multiple organ systems in the human body. Students must register for both lecture and lab sections. Prerequisite BSC 303 Cell Biology with a minimum grade of C.

BSC 306 - Applied Microbiology
Hours: 4
This course is for biology undergraduate students designed to provide important key principles of microbial life. The important key principles will then be applied to real-life examples to better understand dynamics of microbial world as a part of global ecosystem. Although relatively simple and primitive, microorganisms are considered as the most successful form of life. They are virtually everywhere and they are in tight relationship with other forms of life on earth. Unlike macroorganisms (i.e. animals, plants, insects, etc), microorganisms carry out their life processes such as energy metabolism, growth, and reproduction independently from other cells. This unique feature makes microorganisms a great tool to study the nature of life. Students must register for both lecture and lab sections. Prerequisites: BSC 1407 Min Grade C and CHEM 1312 Min Grade C.

BSC 307 - Ecology
Hours: 3
Ecology is the study of living things and their interaction with their environment. This class takes a hierarchical look at ecological processes from ecosystems to populations. Specific topics include the flow of energy and matter through global and local ecosystems, factors affecting production and biodiversity, zones of tolerance, ecological succession, ecotones and ecoclines, community ecology, niche theory, population models, and evolutionary arms races. Prerequisites: BSC 1407 or BSC 1413 or ENVS 303.

BSC 310 - Animal Behavior
Hours: 3
An introduction to the principles of animal behavior with an emphasis on Methods of Observation and the proximate and ultimate causes of behavior. Aspects of physiology and development of behavior, instinct and learning and modern cognitive ethology will be addressed. Prerequisites: BSC 1407 or BSC 1413.

BSC 314 - Comparative Vertebrate Physiology
Hours: 3
The course is a comparative study of basic physiological principles and functional organization with emphasis on the functioning of organ systems in various vertebrate classes and their adaptation to the environment leading to an understanding of evolutionary relationships. The course evaluates i) the mechanisms by which animals perform their life-sustaining functions, ii) the ways in which diverse phylogenetic groups of animals both resemble each other and differ, iii) the ways in which physiology and ecology interact, and iv) the importance of all levels of organization, from genes to proteins and tissues to organs, for the full understanding of physiological systems. Crosslisted with: ANS 314.

BSC 315 - Ecological Genetics
Hours: 3
Ecological genetics is about how environmental and population-level processes affect the genetic structure of populations. The course begins with a basic overview Mendelian genetics followed by an in-depth study of population genetics and the intrinsic and extrinsic processes that influence the genetic composition of populations and metapopulations. Because the interaction between genes and the environment fundamentally affect the viability of populations, ecological genetics has broad relevance for understanding population stability and maintenance healthy populations. Prerequisites: BSC 1407 or BSC 1413 with a minimum grade of C. Crosslisted with: AG 315.

BSC 316 - Becoming a Wildlife Professional
Hours: 3
Working with wildlife can be a thrilling adventure steeped in the wonders of the natural world, but entering the field demands a strong personal commitment. Students will gain knowledge in the proper training and guidance needed to transform themselves into competitive applicants for wildlife jobs and forge successful careers. Student will learn about many entry-level jobs available for the next generation of wildlife biologists and conservationists. Over 100 diverse career options for aspiring wildlife workers will be presented, including work in biological field research, forestry, rehabilitation, ranching, photography, and refuge management. Students will learn the best ways to prepare for a vocation in the wildlife profession while obtaining pragmatic advice about applying for and obt

BSC 335 - Wildlife Management I
Hours: 3
The purpose of this course is to introduce students to the many aspects of wildlife and conservation science. It will provide an introduction to the history of wildlife management and conservation, ecosystems and ecology, population modeling, animal behavior, food and cover, wildlife diseases, predators and predation, and hunting and trapping. Offered: FALL

BSC 336 - Wildlife Management II
Hours: 3
This course is designed to complement Wildlife Management I and provides an introduction to the many aspects of wildlife ecology and conservation science. Topics covered include water and soils, farmlands, rangelands, and forests, parks and refuges, urban wildlife management, and non-game and endangered species. Offered: SPRING

BSC 337 - Field Methods in Wildlife and Conservation Science
Hours: 4
This course provides students with practical training in the methods used to collect quantitative data on plant and animal populations, animal movements and home ranges, habitat associations, and animal behavior. Field exercises are integrated with lecture material emphasizing study design, statistics, and data interpretation. Crosslisted with: AG 337.

BSC 338 - Wildlife Management Techniques
Hours: 3
This class will develop the principles and techniques for managing wildlife populations. Topics covered will include experimental design, hypothesis testing, scientific writing, techniques for capturing and marking wildlife, age and sex determination, parameter estimation (population size, density, survival, etc.), radio-telemetry, home range and resource selection. Students enrolled in this course must be willing to participate in a field-based classroom research project when and where feasible. Crosslisted with: AG 338.

BSC 339 - Becoming a Wildlife Professional
Hours: 3
Working with wildlife can be a thrilling adventure steeped in the wonders of the natural world, but entering the field demands a strong personal commitment. Students will gain knowledge in the proper training and guidance needed to transform themselves into competitive applicants for wildlife jobs and forge successful careers. Student will learn about many entry-level jobs available for the next generation of wildlife biologists and conservationists. Over 100 diverse career options for aspiring wildlife workers will be presented, including work in biological field research, forestry, rehabilitation, ranching, photography, and refuge management. Crosslisted with: AG 339.

BSC 371 - Science and Math Education Theory and Practice
Hours: 1
Learning theory and teaching practices for science learning assistants. Topics include questioning strategies, conceptual development, formative assessment, argumentation, metacognition, and nature of science. Crosslisted with: PHYS 371, CHEM 371, MATH 371.

BSC 381 - Big Game Management
Hours: 3
This class will expose students to concepts of managing major big game species in North America (i.e. white-tailed deer, feral hog, desert mule deer, pronghorn antelope, desert bighorn sheep, javelina, mountain lion, bear), with focus on the conservation practices of those species in Texas. Overview of topics include taxonomy, life history, harvest management, habitat management, population estimation, and conservation ecology of exotic species. Additional topics cover wildlife diseases, genetics, economic significance, and human dimensions. Indoor lab exercise will cover identification and aging of species. Field trips will expose students to actual management practices conducted in the field and provide an opportunity for applied skills in planning field studies, data collection, analysis, and synthesis of a management plan. Crosslisted with: AG 381.

BSC 383 - Waterfowl Management
Hours: 3
The course will expose students to concepts of managing waterfowl in North America (i.e.with focus on the conservation practices of those species in Texas. Overview of topics include taxonomy, life history, harvest management, habitat management, population estimation, and conservation ecology of exotic species. Additional topics cover wildlife diseases, genetics, economic significance, and human dimensions. Indoor lab exercise will cover identification and aging of species. Field trips will expose students to actual management practices conducted in the field and provide an opportunity for applied skills in planning field studies, data collection, analysis, and synthesis of a management plan. Crosslisted with: AG 383.

BSC 385 - International Wildlife Conservation
Hours: 3
The course covers select topics in wildlife conservation such as biodiversity, habitat management, and cultural and political influences for the conservation of fauna in major biomes of Africa, Asia, Europe, Latin America, Oceania and other regions of the world. Students will i) build an understanding of and appreciation for diverse perspectives in wildlife management approaches throughout the world, ii) Competently assess and apply past and current ecological principles to evaluating international approaches to wildlife conservation, iii) Demonstrate constructive dialog with diverse perspectives focusing on international wildlife conservation, and iv) Critically assess an international wildlife conservation policy issue using examples from scientific literature. Crosslisted with: AG 385.

BSC 397 - Special Topics
Hours: 1-4

BSC 401 - Research Literature and Seminar
Hours: 3
This course provides students with the fundamentals of scientific thinking and scientific writing. The course starts with a brief overview of the history and philosophy of science as it pertains to biology. Students will learn about each steps in scientific processes including empiricism, parsimony, and developing and testing hypotheses. Students will be taught how to write in scientific style, how to critically read and analyze scientific articles, how to avoid obfuscatory scrivenry, establishing flow, organizing a scientific document, how to present scientific data and statistics, how to cite figures and tables, how to cite scientific sources, how to avoid plagiarism; and concepts of bioethics Discussions and presentations of issues of current interest in the biological sciences and of related career opportunities also will be covered. Prerequisites: BSC 304, 305, 306, 307, concurrent enrollment in one or more of these classes or permission of instructor.

BSC 402 - Ornithology
Hours: 3
This course begins with an overview of current theories regarding the origins of birds and flight. This is followed by a brief survey the living orders and their biogeography. Other topics include the mechanics and adaptations for flight, avian physiology and anatomy, migration, communication and behavior, ecology, and avian conservation. Crosslisted with: AG 402.

BSC 403 - Ichthyology
Hours: 3
This course will provide students with a broad understanding of the field of ichthyology (the study of fishes). The course will examine form and function in fish anatomy, physiology, patterns of life history, reproduction and growth, fish environmental biology, aspects of fish social behavior and predation, fish population and community ecology, fish conservation, and broadly explore freshwater and marine fish taxonomic diversity. The class will also introduce current field methods in freshwater fish sampling and include identification information for local, North Texas freshwater fish species.

BSC 404 - Vertebrate Biology
Hours: 3
This course takes a systematic approach to understanding vertebrate evolution, diversity and biology. It will follow the development of each vertebrate taxon through the fossil record from late Cambrian to the present. This is followed by discussions of vertebrate zoogeography, habitat and foraging, feeding modes, dispersal and migration, mating systems and parental care. Crosslisted with: AG 404.

BSC 404A - Advanced Biostatistics
Hours: 3
(Same as BSC 504) The objective of this course is to provide students with the knowledge and understanding of the methods of statistical analysis applicable to biological research. Emphasis will be placed on the concepts and application of statistical thinking. Basic probability theory, parametric and non-parametric statistics including t-test, analysis of variance, correlation, simple linear regression will be reviewed. Advanced statistical methods including multiple regression, logistic regression, model selection and other quantitative methods will be introduced. Crosslisted with BSC 504 Advanced Biostatics. Prerequisites: An undergraduate degree in Biology, Wildlife, or related discipline or permission from instructor.

BSC 405 - Wildlife Internship
Hours: 1-6
This course, required for Wildlife and Conservation Science Majors, provides the opportunity for students to gain hands-on experience in preparation for careers in wildlife conservation and management and wildlife or ecological research. Assignments will be at an approved work situation under supervision of a designated faculty member. Ten to twenty hours per week will be required. Crosslisted with: AG 405.

BSC 406 - Mammalogy
Hours: 3
Mammalogy - Three semester hours The objective of this course is to survey the phylogenetic relationships, diversity, biology, and ecology of mammals, including an understanding of the characterization of the orders and families of the extant mammals based on morphological traits, evolutionary Crosslisted with: AG 406.

BSC 410 - Fundamentals of Bioremediation
Hours: 3
This undergraduate course explores fundamental aspects of using microorganisms and plants for the remediation of inorganic and organic pollutants impacted soil, groundwater and surface water; and discuss the applications of bioremediation methods for contaminated field in real world.

BSC 412 - Fundamentals of Biostatistics
Hours: 3
The objective of this course is to provide students with the knowledge and understanding of the methods of statistical analysis applicable to biological research. Emphasis will be placed on the concepts and application of statistical thinking. Basic probability theory, parametric and non-parametric statistics including t-tests, analysis of variance, correlation, regression, and other quantitative methods will be introduced. Prerequisites: MATH 1314.

BSC 414 - Evolutionary Biology
Hours: 3
In-depth view of evolutionary theory including gene flow, genetic drift, mutation, molecular evolution, mechanisms of speciation, phylogenies, and the evolution of sex, and sexual selection.

BSC 415 - Upland Game Bird Ecology and Management
Hours: 3
Status, ecology, management, and conservation issues of North American upland game birds. Student will understand the role of upland game bird professionals. Develop knowledge of the status of North American upland game birds. Understand the basic principles of upland game bird ecology and management. Learn to apply knowledge to solve conservation problems. Crosslisted with: AG 415.

BSC 415A - Advanced Cell Biology
Hours: 3
This course is designed for graduate students with a thorough background in biology and cell biology. Therefore, this course provides students with a greater understanding of molecular mechanisms of cellular function. Emphasis will be placed on internal organization of the cell. Students are expected to gain an in-depth understand of basic principles and concepts of eukaryotic cells at the molecular levels, to learn to reason scientifically, and to understand and describe the cooperative function of organelles in the specialized cells. Prerequisites: An undergraduate degree in Biology or related discipline or permission from instructor.

BSC 416 - Wildlife Population Biology
Hours: 3
This course outlines processes governing the abundance and distribution of animals and plants, and the consequences for natural resource management. Practical applications lie in wildlife management, sustainable harvesting of resources, pest control and conservation of endangered species. Topics will include mathematical models of population growth, population viability analysis, and metapopulations, dispersal, population harvesting, predation, population cycles, and competition. Prerequisites: MATH 142 or MATH 2312. Crosslisted with: AG 416.

BSC 417 - Geospatial Mapping
Hours: 3
Three semester hours. (3 lecture, 0 lab) The course will provide basic knowledge of the fundamentals of Geographic Information Systems (GIS), including GIS theory and applications. The course will take a hands-on and problem solving approach to learning GIS and will cover basic GIS including map characteristics and projections, spatial data models, relational databases, and spatial analysis with a focus on natural resource research and management and environmental science. Prerequisites: BSC 1407 or BSC 1413. Crosslisted with: AG 417.

BSC 418 - Undergraduate Research
Hours: 1-3
Individual research project under the guidance of a biology faculty member. May be repeated for up to six (6) hours credit. Prerequisites: Consent of the faculty prior to registration.

BSC 419 - Gene Control
Hours: 3
This course will provide a rigorous knowledge in regulation of gene expression so that students will be ready for graduate level courses. Although this course will introduce students to prokaryotic gene transcription and gene regulation, the emphasis will be on the molecular biology of gene control in eukaryotes. This course will familiarize the student with current technology and driving principles of the field of gene regulation. Prerequisites: BSC 303 and BSC 304 with a grade of C or more.

BSC 420 - Immunology
Hours: 3
This course is designed for majors with a well-rounded background in biology. This course provides students with a deeper understanding of fundamental concepts in immunology. First, we will examine the molecular and cellular dynamics and principles of the immune system. We will cover topics such as the development of the immune system, humoral and cell-mediated responses. In the second half of the course, we will discuss diseases and treatments related to immunization, immunodeficiency, autoimmunity, and tumors. Prerequisites: BSC 303 and 305 with a grade of C or more.

BSC 421 - Essentials of Plant Microbiome
Hours: 3
This undergraduate course mainly introduces what are plant microbiome; covers the relationships between plant and microorganisms; and discuss the applications of plant microbiome for nutrients uptake, soil health improvement and pollutants cleaning.

BSC 422 - Comp Vertebrate Anatomy
Hours: 0-4
Comparative Vertebrate Anatomy. Four semester hours. (3 lecture, 4 lab) The lecture material in this course explore the evolution of vertebrate structure and design among vertebrate taxa. Emphasis is placed on the integument, skeletal, muscular, digestive, urogenital, respiratory, circulatory and nervous systems. Laboratory dissections, using the dogfish and the cat as models, are used to complement the lecture material.

BSC 423 - Introduction to Soil and Biogeochemistry
Hours: 3
The biogeochemistry of soil investigates processes that drive the environmental cycles of matter, nutrients, and energy through time and space. This undergraduate course mainly introduces the physico-chemical and microbial nutrient transformations and exchange processes in soil and water, for example food-water-energy exchange nexus. In summary, students will receive in depth knowledge of biogeochemical properties of the major global systems (terrestrial, atmospheric, and oceanic systems), biogeochemical cycles of carbon, nitrogen, phosphorus, and sulfur, and patterns of productivity, pollution, and consequences of environmental change from local to regional to global scale.

BSC 424 - Bacteriophage Discovery
Hours: 3
This course is designed to immerse students in fundamental biological concepts and scientific reasoning through original, hypothesis-driven research. As part of the Howard Hughes Medical Institutes SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) research team, students will engage in hands-on molecular techniques to discover, propagate, and characterize bacteriophages isolated from soil samples across diverse biomes. They'll also sharpen their scientific communication skills by maintaining a laboratory notebook and presenting their findings in a final poster project. This unique opportunity allows students to explore novel bacteriophages while learning key concepts in molecular biology, microbiology, and evolution through practical experiments. The course includes a mix of lectures and lab work. Prerequisites: BSC 303 Cell Biology with a grade of C or more.

BSC 425 - Fundamentals of Neuroscience
Hours: 3
This course is intended for advanced undergraduate biology students who understand genetics and cell biology/biochemistry. The course is a survey introducing various aspects of neuroscience and is textbook based. The cell types of the nervous system are introduced, with emphasis on the molecular specializations used for these cells to function and develop connections to other cells. The structure, function, and processing of all 6 senses (including kinesthesia) are covered, as are muscle control circuits. More complex functions of the nervous system, including control of eye movements, hunger, sleep, addiction, speech, and learning and memory are also covered. Prerequisites: BSC 303 with a minimum grade of C.

BSC 426 - Fundamentals of Human Anatomy
Hours: 4
This four hour course examines gross and microscopic human anatomy. The blended course covers classroom lecture plus laboratory with hands on (Models) experience of human anatomy. Prerequisite: BSC 1407 or BSC 305 with a grade of C.

BSC 427 - Pharmacology
Hours: 3
This course is designed for undergraduate students with a background in biology, cell biology, and chemistry. It provides an in-depth understanding of the fundamental concepts in pharmacology. The course begins with an examination of specific drugs and their sites of action, focusing first on the autonomic nervous system. It then explores the pharmacology of major organ systems and concludes with a detailed study of the central nervous system. Prerequisites: BSC 303 with a minimum grade of C and CHEM 1411 with a minimum grade of C.

BSC 428 - Introductory Medical Microbiology
Hours: 3
Introductory Medical Microbiology. Three Semester Hours. This is a course for junior or senior biology undergraduate students designed to help understand the basic principles of pathogenic microorganisms, infection, and human-pathogen interactions. Specific topics covered during this class include pathogenic microorganisms, diagnostic laboratory procedures, infection controls, and emerging diseases. This course includes many etiological agents responsible for infectious diseases and will focus on the principles of pathogenic mechanisms, rather than individual cases of diseases, in order to foster a student’s ability to develop the fundamental understanding required for their future clinical career.

BSC 430 - Introductory Virology
Hours: 3
Introductory Virology (Three Hours). This course is designed to introduce the significance of viruses to biology, the origin of life, and our current world. Viruses are the most numerous and the most ubiquitous form of life, although whether viruses are life or not is still an open debate. They are virtually everywhere and they are in tight relationship with other forms of life on earth. This course will focus on the principle nature of viral life; obligate parasite and host dependency. Topics include introduction to viruses, host specificity, viral replication cycles, virus classification & nomenclature, viral diseases, how viruses interact with host body, and host resistance to viruses. Prerequisites: BSC 306.

BSC 431 - Eukaryotic Cell Biology
Hours: 3
This course is the study of advanced knowledge of the eukaryotic cell including contemporary concepts of membranes, signal transduction mechanisms, messengers and receptors, extracellular structures, cell adhesions and attachment proteins, cell cycle and regulation, protein synthesis, sorting and targeting, cytoskelton and cell movements. Prerequisites: BSC 303 Cell Biology or concurrent enrollment.

BSC 435 - Wildlife Habitat Ecology and Management
Hours: 3
This class will expose the student to the history and concepts of an animal's habitat beginning with the ideas of Aldo Leopold to current ideas of what habitat is. Students will be introduced to principles and techniques of habitat management as they apply to forest, rangeland, wetland, and agricultural ecosystems. Current concepts of Conservation Biology such as fragmentation, meta-population ecology, and corridor ecology will also be covered. Students enrolled in this course must be willing to attend field trips when and where feasible to see actual management practices conducted in the field. Crosslisted with: AG 435.

BSC 436 - Plant Diversity & Conservation
Hours: 3
Plant Diversity and Conservation. Three semester hours. The course focuses on patterns and distribution of plant diversity and threats to plant diversity. Range of strategies and approaches used in plant conservation will be discussed. Crosslisted with: AG 436.

BSC 437 - Fundamentals of Genetic Engineering
Hours: 3
Ecological Restoration of Plant Communities - Three semester hours The class is an introduction to landscape scale, process-oriented approaches to ecological restoration. Topics include enhancing resource capture, techniques in re-vegetation and restoration of historic vegetation. Prescribed fire and grazing as restoration and management techniques will also be addressed. Pre-requisites: BSC 303 Cell Biology and BSC 304 Genetics.

BSC 438 - Wetland Ecology and Management
Hours: 4
This class will address the ecology of wetlands from a systems approach, starting first with what defines a wetland both legally and functionally, and covering important and defining principles of hydro-period, soils, wetland plants, wetland succession, delineation, and wetlands as wildlife habitat. The lab will immerse students in field exercises ranging from wetland plant collection and identification, and wetland bird identification. Students enrolled in this course must be willing to attend field trips when and where feasible to see different wetland types and the function and values they provide. Prerequisites: BSC 307 Ecology. Crosslisted with: AG 438.

BSC 440 - Human Dimensions of Wildlife
Hours: 3
Human Dimensions of Wildlife Management explains how a wildlife professional can more effectively manage species and social-ecological systems by fully considering the role that humans play in every stage of the wildlife management process. Human Dimensions of Wildlife Management provides the essential information that students and practitioners need to be effective problem solvers to handle a variety of situations, such as managing deer populations in residential areas, encounters between predators and people, or managing citizen input on wildlife issues. Topics will include human dimensions of wildlife management and conservation, wildlife use (hunting and fishing), working with public and private landowners, involving citizen scientists, managing citizen input, using economics to inform Crosslisted with: AG 440.

BSC 461 - Biology for Mid School Teacher
Hours: 3
Biology for Middle School Teachers. Three semester hours. (2) This course will examine the necessary content for students wishing to teach at the fourth through eighth grade level. This course will combine both content and pedagogy. Emphasis will be placed on the content as expressed the Texas Essential Knowledge and Skills. This course cannot be used for advanced credit for a biology major or minor. Prerequisites: MATH 1314 and 8 sh of biological science or consent of instructor.

BSC 463 - Landscape Ecology
Hours: 3
BSC 463 landscape Ecology is a three hour course designed to provide an overview of the relationships between ecological processes in the environment and particular ecosystems using a variety of landscape scales, development of spatial patterns, and organizational levels of research and policy. Crosslisted with: AG 463.

BSC 464 - Principles of Sustainability
Hours: 3
BSC 464 Principles of Sustainability is a three hour course designed to provide an overview of the social and biological principles of sustainability. An emphasis will also be placed on understanding on the education, health, population dynamics, culture, agriculture, food security, and natural resources aspects of sustainability.

BSC 489 - INDEPENDENT STUDY
Hours: 0-5
Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a consenting faculty member. May be repeated when the topic varies. Prerequisite: Consent of department head.

BSC 490 - H Honors Thesis
Hours: 3
Honors Thesis.

BSC 491 - H Ind Honors Readings
Hours: 0-4
Individual Honors Reading.

BSC 492 - Developmental Biology
Hours: 3
This course is designed to explore the fundamental concepts and mechanisms that regulate the wonder of animal development from fertilization of the egg to formation of the adult organism, including such topics as cycle of life, differential gene expression, cell-cell communication, fertilization, early development, formation of germ layers (ectoderm, mesoderm, endoderm) and their derivatives, inductive cell/tissue interactions, stem cells, organogenesis, environment/genetics/birth defects, evolutionary changes and more. Prerequisites: BSC 303, a grade of "C" or more must be earned in the course; BSC 305 a grade of "C" or more must be earned in the course.

BSC 493 - Bioinformatics of Bacteriophages
Hours: 4
This is the second part of the Howard Hughes Medical Institute's SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) program. This course is designed to immerse students in fundamental biological concepts and scientific reasoning through original, hypothesis-driven research. Students will characterize phages discovered by previous cohorts or explore other novel genomes using a comprehensive array of molecular and bioinformatics techniques. They will perform comparative genomics, complete genome annotation, and utilize molecular and recombinant DNA techniques to characterize these novel genomes. The course will be delivered in a blended format, combining traditional lectures with hands-on laboratory sessions. Students must register for both lecture and lab sections. Prerequisites: BSC 303 with a grade of C or more.

BSC 497 - Special Topics
Hours: 1-4
Special Topics. One to four semester hours. Organized class. May be repeated when topics vary.

BSC 498 - Health Professions Internship
Hours: 3
The internship intends to provide students pursuing a career in the health professions exposure to a professional healthcare environment along with interaction with professionals from various fields of healthcare. The student learning experience is faculty supervised and requires journal documentation and a final report. Students with a GPA of 3.25 at the end of 90 credits hrs is eligible to register with the recommendation advisor. Department approval required. Prerequisites: Students with a GPA of 3.25 at the end of 90 credits hrs is eligible to register with the recommendation advisor. Department approval required.

CHEM 1105 - Introductory Chemistry Laboratory I
Hours: 1
A one semester experimental survey of the fundamentals of chemistry, exploring the basic physical principles and the descriptive chemistry of metals and non-metals, with applications to related fields. This course is not suitable for biological science majors or minors. (Students planning to enter professional and/or graduate schools should elect CHEM 1111-1112.) Prerequisites: MATH 1314 with a minimum grade of C, MATH 1324 with a minimum grade of C, MATH 179 with a minimum grade of C or MATH 1332 with a minimum grade of C (concurrent or adequate high school mathematical preparation). Corequisites: CHEM 1305.

CHEM 1107 - Introductory Chemistry Laboratory II
Hours: 1
A one semester experimental survey of organic chemistry and biochemistry. The course explores the principles, nomenclature, reactions and synthesis of organic compounds and the chemistry of biological processes. This course is not suitable for biological science majors or minors. (Students planning to enter professional and/or graduate schools should elect Chemistry 2123-2125.) Prerequisites: CHEM 1305 with a minimum grade of C or CHEM 1311 with a minimum grade of C or CHEM 1312 with a minimum grade of C. Corequisites: CHEM 1307.

CHEM 1111 - General and Quantitative Chemistry Laboratory I
Hours: 1
Introduction to methods and techniques of chemical experimentation using quantitative and semi-quantitative procedures to explore problems in chemistry. Prerequisites: MATH 1314 (concurrent or adequate high school mathematical preparation) with a minimum grade of C or concurrent enrollment. Corequisites: CHEM 101, CHEM 1311.

CHEM 1112 - General and Quantitative Chemistry Laboratory II
Hours: 1
Introduction to methods and techniques of chemical experimentation using qualitative and semiquantitative procedures to exploring problems in chemistry. Prerequisites: CHEM 1311 and CHEM 1111 with a minimum grade of C, and CHEM 101 with a minimum grade of C. Corequisites: CHEM 102, CHEM 1312.

CHEM 1305 - Introductory Chemistry I
Hours: 3
Three semester hours (3 lecture). A one semester survey of the fundamentals of chemistry covering the basic physical principles and the descriptive chemistry of the metals and non-metals with applications to related fields. This course is not suitable for biological science majors or minors. (Students planning to enter professional and/or graduate schools should elect Chemistry 1311-1312). Prerequisites: MATH 1314 with a minimum grade of C, MATH 1324 with a minimum grade of C, MATH 179 with a minimum grade of C or MATH 1332 with a minimum grade of C (concurrent or adequate high school mathematical preparation).

CHEM 1307 - Introductory Chemistry II
Hours: 3
A one semester survey of organic chemistry and biochemistry. The course treats the principles, nomenclature, reactions and methods of synthesis of organic compounds. Special attention is given to the chemistry of biological processes. This course is not suitable for biological science majors or minors. (Students planning to enter professional and/or graduate schools should elect Chemistry 2323-2325.) Prerequisites: CHEM 1305 with a minimum grade of C or CHEM 1311 with a minimum grade of C or CHEM 1312 with a minimum grade of C.

CHEM 1311 - General and Quantitative Chemistry I
Hours: 3
This course is primarily for students majoring in the sciences or in pre-professional programs. The lecture covers the fundamental laws, theories, and descriptive aspects of chemistry. Problem solving is stressed. Prerequisites: MATH 1314 (concurrent or adequate high school mathematical preparation) with a minimum grade of C or concurrent enrollment. Corequisites: CHEM 101, CHEM 1111.

CHEM 1312 - General and Quantitative Chemistry II
Hours: 3
A continuation of General Chemistry. Prerequisites: CHEM 1311 and CHEM 1111 with a minimum grade of C, and CHEM 101 with a minimum grade of C, or CHEM 1411 with a minimum grade of C, and MATH 1314 with a minimum grade of C or MATH 141 with a minimum grade of C. Corequisites: CHEM 102, CHEM 1112.

CHEM 2123 - Organic Chemistry Laboratory I
Hours: 1
Introduction of techniques for organic chemistry laboratory, including preparation, setup, and running reactions and the characterization of the properties of representative organic compounds. Prerequisites: CHEM 1312 with a minimum grade of C, CHEM 102 with a minimum grade of C and CHEM 1112 with a minimum grade of C. Corequisites: CHEM 201, CHEM 2323.

CHEM 2125 - Organic Chemistry Laboratory II
Hours: 1
Continuation of CHEM 2123. Prerequisites: CHEM 2323 or CHEM 2423 with minimum grade of C, CHEM 201 with minimum grade of C and CHEM 2123 with a minimum grade of C. Corequisites: CHEM 202, CHEM 2325.

CHEM 2323 - Organic Chemistry I
Hours: 3
An integrated introductory course in organic chemistry. The reactions of aliphatic compounds are considered in terms of molecular orbital theory, carbonium ion, carbanion and free radical reaction mechanisms; stereochemistry and molecular conformations, transition state theory and principles of organic synthesis are covered. Prerequisites: CHEM 1312 with a minimum grade of C, CHEM 102 with a minimum grade of C and CHEM 1112 with a minimum grade of C. Corequisites: CHEM 201, CHEM 2123.

CHEM 2325 - Organic Chemistry II
Hours: 3
A continuation of Chemistry 2323. The chemistry of polyfunctional aliphatic compounds, amino acids and proteins, sugars, and carbohydrates, polycyclic and heterocyclic compounds. Spectroscopy (NMR, IR, MS and Uv/Vis) is covered. Prerequisites: CHEM 2323 or CHEM 201 with a minimum grade of C, and CHEM 2123 with a minimum grade of C. Corequisites: CHEM 202, CHEM 2125.

CHEM 101 - General Chemistry Tutorial I
Hours: 1
Practice in chemical reasoning and solving of conceptual and numerical problems in general chemistry. Review and application of mathematical skills in chemistry. Prerequisites: MATH 1314 (concurrently or adequate high school mathematical preparation) with a minimum grade of C or concurrent enrollment. Corequisites: CHEM 1111, CHEM 1311.

CHEM 102 - General Chemistry Tutorial II
Hours: 1
A continuation of Chemistry 101. Further practice in chemical reasoning and solving of conceptual and numerical problems in general chemistry, especially those concerning chemical equilibrium and reactions. Prerequisites: CHEM 1311 and CHEM 1111 with a minimum grade of C, and CHEM 101 with a minimum grade of C. Corequisites: CHEM 1112, CHEM 1312.

CHEM 201 - Organic Chemistry Tutorial I
Hours: 1
Practice in chemical reasoning and problem solving in organic chemistry. Review and application of relevant facts and principles of general chemistry and organic chemistry. Prerequisites: CHEM 1312 with minimum grade of C, CHEM 102 with minimum grade of C and CHEM 1112 with minimum grade of C. Corequisites: CHEM 2123, CHEM 2323.

CHEM 202 - Organic Chemistry Tutorial II
Hours: 1
Practice in chemical reasoning and problem solving in organic chemistry. Review and application of relevant facts and principles in organic chemistry. Prerequisites: CHEM 2323 or CHEM 2423 with a minimum grade of C, CHEM 201 with a minimum grade of C and CHEM 2123 with a minimum grade of C. Corequisites: CHEM 2125, CHEM 2325.

CHEM 314 - General Biochemistry
Hours: 3
Introductory Biochemistry. Three semester hours. This is a one-semester course that serves as an introduction to the nomenclature and function of the major classes of molecules associated with living organisms. The subject matter is tailored for students interested in pharmacy, dentistry, medicine, and related health science disciplines that need a lecture course in Biochemistry with no laboratory. The course topics will be presented along with examples where basic knowledge in the field of biochemistry is relevant for the practice of modern medicinal chemistry and pharmacy. Prerequisites: BSC 1407 with a minimum grade of C and CHEM 2325 with a minimum grade of C.

CHEM 330 - Environmental Chemistry
Hours: 3
A study of the impact of chemistry on the environment. This course will cover topics, such as air pollution, water pollution and beneficial modifications of the environment. This course will provide a basic understanding of interactions between chemical compounds, whether anthropogenic or natural, and the environment. Prerequisites: CHEM 1307 or CHEM 2323 with minimum grade of C.

CHEM 335 - Theory of Biochemical Techniques
Hours: 3
This course explores the study of the principles and applications of analytical techniques used in biochemical research. The underlying concepts behind such analytical techniques as protein analysis, enzyme assays, nucleic acid quantification, chromatography, electrophoresis and spectroscopy will be studied. The interpretation of data generated from these methods will also be studied. Pre-requisites: CHEM 2325 with a minimum grade of C and MATH 2414 with a minimum grade of C.

CHEM 340 - Quantitative & Instrumental Analysis
Hours: 4
Quantitative and Instrumental Analysis. Four semester hours (2 lecture, 8 lab). The theories and techniques of classical quantitative analysis and modern instrumental analysis will be covered. Prerequisite: CHEM 1312 with a minimum grade of C.

CHEM 341 - Advanced Chemistry I
Hours: 3
The course is one of the two courses that combine the basic theory and applications of existing advanced chemistry courses, including CHEM 2325, 340, 351, 352, 414, 415, and 441 into two courses that meet the needs of high school teachers. Prerequisites: CHEM 2323 with a minimum grade of C.

CHEM 342 - Advanced Chemistry II
Hours: 3
The course is one of the two courses that combine the basic theory and applications of existing advanced chemistry courses, including CHEM 2325, 340, 351, 352, 414, 415, and 441 into two courses that meet the needs of high school teachers. Prerequisites: CHEM 2323 with a minimum grade of C.

CHEM 351 - Physical Chemistry
Hours: 4
This course introduces the student to the field of physical chemistry, and consists of a presentation of the fundamental theories of chemistry, involving a detailed study of the properties of matter in the gaseous, liquid, and solid states. Properties of solutions, colloids, and elementary principles of thermodynamics and thermochemistry are given extensive consideration. Prerequisites: CHEM 1312 or equivalent with a minimum grade of C; MATH 2414 with a minimum grade of C, PHYS 2426 with a minimum grade of C (may be taken concurrently), or consent of the instructor.

CHEM 352 - Physical Chemistry
Hours: 4
A continuation of Chemistry 351 including a detailed study of chemical kinetics, atomic structure, and quantum mechanics. Prerequisites: PHYS 2426 and MATH 2414 with a minimum grade of C or consent of the instructor.

CHEM 361 - Physical Biochemistry
Hours: 3
This course explores the fundamental concepts of physical chemistry and their application to understanding how biological systems behave. This includes an overview of the basic laws of thermodynamics, quantum mechanics, biochemical equilibria, reaction rates and kinetics in biological reactions, and molecular spectroscopy. Prerequisites: CHEM 2325 Organic Chemistry II; MATH 2414, Calculus II.

CHEM 371 - Science and Math Education Theory and Practice
Hours: 1
Learning theory and teaching practices for science and math learning assistants. Topics include advanced questioning strategies, conceptual development, formative assessment, argumentation, metacognition, and nature of science. Crosslisted with: PHYS 371, BSC 371, MATH 371. Prerequisites: Instructor approval.

CHEM 397 - Special Topics
Hours: 1-4
Special Topics. One to four semester hours. Organized class. May be repeated when topics vary.

CHEM 401 - Chemical Sci & Profession
Hours: 1
One semester hour. (1, 2) Topics in chemical research, professional concerns, and employment trends are treated in seminar format. The course may be taken as many as four times for credit. This course integrates students' knowledge from other chemistry courses and prepares student for future careers. Prerequisites: CHEM 2325 with a minimum grade of C is the prerequisite. Crosslisted with: CHEM 501.

CHEM 402 - Biochemical Science & Profession
Hours: 1
Topics in biochemical research, professional concerns, and employment trends are treated in seminar format. The course may be taken twice for credit. This course intends to integrate students' knowledge from other biochemistry courses in order to prepare them for their future careers. Pre-requisites: CHEM 2325 with a minimum grade of C.

CHEM 414 - Biochemistry
Hours: 4
Structure and function of large and small biomolecules involved in metabolism and information transfer in living organisms. The course treats both chemical and biological processes and their mechanisms. For students majoring in chemistry and life sciences, especially those interested in scientific, medical, or similar professional career. Prerequisites: CHEM 2325 with a minimum grade of C or concurrent enrollment.

CHEM 415 - Advanced Inorganic Chemistry
Hours: 4
Advanced study of inorganic reactions and mechanisms based on modern structural concepts. Prerequisites: CHEM 2325 with a minimum grade of C.

CHEM 416 - Special Topics in Advanced Organic Chemistry
Hours: 3
Topics of current interest in advanced organic chemistry. Prerequisites: CHEM 2325 with a minimum grade of C and consent of the instructor.

CHEM 417 - Advanced Biochemistry
Hours: 3
Advanced study of biochemistry from the standpoint of interrelationships between metabolic pathways and control mechanisms. Topics to be covered include the metabolism of lipids, amino acids and nucleotides, exploring the mechanisms behind bacterial photosystems and plant photosynthesis as well as comprehending the biochemical basis of DNA replication, RNA transcription, processing of transcripts and protein synthesis. Prerequisites: CHEM 314 or CHEM 414-414L with minimum grade of C.

CHEM 418 - Undergraduate Research
Hours: 1-3
Undergraduate Research. One to three semester hours. (1, 2, 3). Individual research project under the guidance of a faculty member. May be repeated for up to six (6) hours credit. Prerequisites: Consent of the faculty prior to registration.

CHEM 420A - Chemical Thermodynamics
Hours: 3
Same as CHEM 521 Chemical Thermodynamics-An advanced study of the theories and applications of classical thermodynamic functions. Course registration is limited to only students in the Chemistry Fast Track BS-MS non-thesis program. Prerequisites: Registration in the Chemistry Fast Track BS-MS non-thesis program.

CHEM 421 - Chemistry Lab Design I
Hours: 4
The course is one of the two courses that combine the design, development, setup, and operation of laboratories of existing chemistry courses, including CHEM 2325, 340, 351, 352, 414, 415, 441 into two courses which meet the needs of high school teachers.

CHEM 422 - Chemistry Lab Design II
Hours: 4
The course is one of the two courses that combine the design, development, setup, and operation of laboratories of existing chemistry courses, including CHEM 2325, 340, 351, 352, 415, 415, and 441, into two courses which meet the needs of high school teachers. Prerequisite: CHEM 2323 with a minimum grade of C.

CHEM 431A - Advanced Inorganic Chemistry
Hours: 3
Same as CHEM 531 -A study of the application of modern concepts of bonding and energetics to problems of the structure and reactions of inorganic compounds. Course registration is limited to only students in the Chemistry Fast Track BS-MS non-thesis program. Prerequisites: Registration in the Chemistry Fast Track BS-MS non-thesis program.

CHEM 441 - Instrumental Analysis
Hours: 4
Instrumentation and laboratory techniques that are used in the modern analytical laboratory are discussed. The lecture presents the phenomenological basis for the techniques, applicability of the technique, and the instrument design. The laboratory demonstrates the use of some of the instruments. Some of the techniques that are discussed are: ultraviolet and visible, fluorescence and phosphorescence, flame emission and atomic absorption, infrared and Raman, X-ray, nuclear magnetic resonance, and mass spectroscopy. Chromatography and electroanalytical methods are also discussed. Prerequisites: CHEM 340-340L with a minimum grade of C or consent of the instructor.

CHEM 450 - Biotechnology and Applied Biochemistry
Hours: 3
This is a one-semester course that serves as an introduction to the role of biochemistry in biotechnology. The course topics include examples how the field of biochemistry has impacted a variety of biotechnological applications using bacterial, plants and animals such as the synthesis of biologically important products. Prerequisites: CHEM 2325 Organic Chemistry II; CHEM 414-414L Biochemistry-Biochemistry Laboratory.

CHEM 452 - Proteins and Enzymes
Hours: 3
An in-depth analysis of the structure and function of proteins and a special class of proteins called enzymes. The course will explore protein structure, protein motifs, protein domains, membrane proteins, glycoproteins, allosteric proteins, enzyme classification, mechanisms of enzyme function, enzyme kinetics and the importance of enzymes to metabolism. Prerequisites: CHEM 2325 Organic Chemistry II; CHEM 414-414L Biochemistry-Biochemistry Laboratory.

CHEM 489 - Independent Study
Hours: 1-6
Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: Consent of department head.

CHEM 490 - H Honors Thesis
Hours: 1-6
Honors Thesis. One to six semester hours.

CHEM 491 - H Ind Honors Readings
Hours: 1-3
Honors Readings. One to three semester hours.

CHEM 497 - Special Topics
Hours: 1-4
Special Topics. One to four semester hours. Organized class. May be repeated when topics vary.

MATH 1314 - College Algebra
Hours: 3
This course covers an in-depth study and applications of quadratics, polynomial, rational, exponential and logarithmic functions, and systems of equations. Additional topics such as arithmetic and geometric progressions; sequences and series; and matrices and determinants are included. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 131 in the co-requisite model.

MATH 1324 - Math for Business Applications I
Hours: 3
Functions (linear, quadratic, polynomial, rational, exponential, and logarithmic), mathematics of finance (simple and compound interest, future and present value of an annuity, etc.), probability and statistics, linear programming, and systems of linear equations and matrices. To enroll in this course, students must meet or exceed the benchmark set by the state for the TSI assessment, or have one of the various TSI exemptions, or be concurrently enrolled in MATH 131 in the co-requisite model.

MATH 1325 - Mathematics for Business Applications II
Hours: 3
This course is the basic study of limits and continuity, differentiation, optimization and graphing, and integration of elementary functions, with emphasis on applications in business, economics, and social sciences. This course is not a substitute for MATH 2413, Calculus I. Prerequisites: MATH 1314 with a minimum grade of C or MATH 1324 with a minimum grade of C.

MATH 1332 - Contemporary Mathematics
Hours: 3
Intended for Non STEM (Science, Technology, Engineering, and Mathematics) majors. Topics include introductory treatments of sets and logic, financial mathematics, probability and statistics with appropriate applications. Number sense, proportional reasoning, estimation, technology, and communication should be embedded throughout the course. Additional topics may be covered. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 120 in the co-requisite model.

MATH 1342 - Elementary Statistical Methods
Hours: 3
Collection, analysis, presentation and interpretation of data, and probability. Analysis includes descriptive statistics, correlation and regression, confidence intervals and hypothesis testing. Appropriate technology will be used. In order to take this course, students must meet or exceed the benchmark determined by the state for the TSI assessment, or have one of various TSI exemptions, or be concurrently enrolled in MATH 120 in the co-requisite model.

MATH 1350 - Mathematics for Teachers I
Hours: 3
This course is intended to build or reinforce a foundation in fundamental mathematics concepts and skills. It includes the conceptual development of the following: sets, functions, numeration systems, number theory, and properties of the various number systems with an emphasis on problem solving and critical thinking. There will be an emphasis placed on developing an understanding of mathematics and learning how to teach these concepts to elementary-level students. Prerequisites: MATH 1314 with a minimum grade of C.

MATH 1351 - Mathematics for Teachers II
Hours: 3
This course is intended to build or reinforce a foundation in fundamental mathematics concepts and skills. It includes the concepts of geometry, measurement, probability, and statistics with an emphasis on problem solving and critical thinking. There will be an emphasis placed on developing an understanding of mathematics and learning how to teach these concepts to elementary level students. Prerequisites: MATH 1350 with a minimum grade of C and MATH 1314 with a minimum grade of C.

MATH 2305 - Discrete Mathematics
Hours: 3
A course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science.Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques Prerequisites: MATH 2413 Calculus I with a minimum grade of C.

MATH 2312 - Pre-Calculus
Hours: 3
In-depth combined study of algebra, trigonometry, and other topics for calculus readiness. Prerequisites: MATH 1314 with a minimum grade of C.

MATH 2318 - Linear Algebra
Hours: 3
Introduces and provides models for application of the concepts of vector algebra. Topics include finite dimensional vector spaces and their geometric significance; representing and solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion; matrices; determinants; linear transformations; quadratic forms; eigenvalues and eigenvector; and applications in science and engineering. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 2320 - Differential Equations
Hours: 3
Ordinary differential equations, including linear equations, systems of equations, equations with variable coefficients, existence and uniqueness of solutions, series solutions, singular points, transform methods,and boundary value problems; application of differential equations to real-world problems. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 2413 - Calculus I
Hours: 4
Limits and continuity; the Fundamental Theorem of Calculus; definition of the derivative of a function and techniques of differentiation; applications of the derivative to maximizing or minimizing a function; the chain rule, mean value theorem, and rate of change problems; curve sketching; definite and indefinite integration of algebraic, trigonometric, and transcendental functions, with an application to calculation of areas. Prerequisites: MATH 2312 with a minimum grade of C.

MATH 2414 - Calculus II
Hours: 4
Differentiation and integration of transcendental functions; parametric equations and polar coordinates; techniques of integration; sequences and series; improper integrals. Prerequisites: MATH 2413 with a minimum grade of C.

MATH 2415 - Calculus III
Hours: 4
Advanced topics in calculus, including vectors and vector-valued functions, partial differentiation, Lagrange multipliers, multiple integrals, and Jacobians; application of the line integral, including Green's Theorem, the Divergence Theorem, and Stokes' Theorem. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 100 - TSI
Hours: 0

MATH 120 - Foundations of Mathematics for Non-STEM Non-Algebra Majors
Hours: 3
Intended for Non STEM (Science, Technology, Engineering, and Mathematics) majors. In particular, students who are majoring in fields considered to be in the "liberal arts" (students who will not be continuing in an Algebra-intensive math pathway), and who are not TSI complete, will take this course. Course topics include: sets, Venn diagrams, basic arithmetic/algebra operations, rational expressions, exponents and radicals, evaluating formulas, Fundamental Counting Principles, Summation and subscript notation, dimensional analysis, graphing, and the beauty of mathematics. The course helps prepare students for further study in first year college level non-STEM math courses. This course is considered developmental and may not be used to satisfy any mathematics or degree requirements.

MATH 131 - Intermediate Algebra
Hours: 3
May not be used to satisfy any mathematics or degree requirements. This course covers: Basic algebraic operations, equations and inequalities, polynomials, functions, rational expressions, exponents and radicals, quadratic equations, and graphing. This course is being used as a co-requisite course to support students in their study at the level of college mathematics, specifically in College Algebra or Business Mathematics.

MATH 177 - Business Applications in Mathematics II
Hours: 3
This course includes an intense Algebra review, followed by an extensive look at derivatives in Calculus, as applied to future courses in Business. This course is intended for Business majors. Topics include an in-depth Algebra review (solving equations and systems of equations), finding derivatives, matrices, and in-depth applications problems. Prerequisites: MATH 1314 or MATH 1324 with a grade of C or better.

MATH 189 - Independent Study
Hours: 0-4
Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: consent of department head.

MATH 289 - Independent Study
Hours: 0-4

MATH 297 - Special Topics
Hours: 0-4

MATH 301 - Introductory Geometry
Hours: 3
Topics will include plane and solid Euclidean geometry, including the properties of parallels, perpendiculars, triangles, and circles along with perimeter and formulas for area of plane regions and for the surface area and volume of solids. Prerequisites: MATH 1351 with a minimum grade of C or MATH 2414 with a minimum grade of C.

MATH 303 - Introduction to Data Science
Hours: 3
An introductory course in data science with an application in statistical software R. Students will learn about the fundamental concepts, tools and techniques to solve data driven problems. Students will also develop skills in data analysis such as preparing, cleaning, manipulating, visualization and reporting techniques along with basic statistical methods. Emphasis will be given on hands-on experience with real-world datasets and practical applications. Prerequisites: MATH 1342 - Elementary Statistical Methods or MATH 1314 - College Algebra or similar courses with grade of “C” or better.

MATH 316 - Mathematical Methods in Physics & Engineering
Hours: 3
Mathematical techniques from the following areas: infinite series; integral transforming; applications of complex variables; vectors, matrices, and tensors; special functions; partial differential equations; Green's functions; perturbation theory; integral equations; calculus of variations; and groups and group representatives. Prerequisites: MATH 2415 Calculus III or Math 314 with "C" or higher, or consent of instructor.

MATH 317 - Numerical Analysis
Hours: 3
(Same as CSCI 317) Computer algebra systems will be introduced. Topics include methods for approximate solutions of equations in one variable, polynomial approximation methods, numerical calculus, splines and accuracy acceleration, linear systems of equations, and finite differences. Prerequisites: MATH 2414 with a minimum grade of C and COSC 1436 with a minimum grade of C.

MATH 321 - College Geometry
Hours: 3
Advanced treatment of standard topics in Euclidean geometry for teachers and others using informal and axiomatic approaches. Includes proofmaking techniques, traditional and transformational geometry, finite geometries, and a brief introduction to other geometries. Prerequisites: MATH 2305 with a minimum grade of C.

MATH 325 - Partial Differential Equations
Hours: 3
This course studies the general theory of partial dierential equations with emphasis on linear equations and the basic techniques for solving initial boundary value problems involving one unknown function and one independent variable. In addition, this course will helps student understand how to model the world in terms of partial dierential equations, and how to solve those equations and interpret the solutions. Topics may include transport equation, Laplace's equation, heat equation,wave equation, application of Sturm-Liouville's theory, Fourier series/transforms, Green's functions,method of characteristics, Duhamel's principle, and maximum principle. Prerequisites: MATH 2320 with a minimum grade of C.

MATH 326 - Mathematical Modeling and Simulation
Hours: 3
An introduction to developing, solving, and validating mathematical models of real-life problems. Topics may include unconstrained and constrained growth models, epidemiological models, equilibrium analysis, stability, force and motion, predator-prey model, enzyme kinetics, data-driven models, probability distributions, and high-performance computing. Case-study approach will be implemented. Prerequisites: MATH 2415 with a minimum grade of C and MATH 2320 with a minimum grade of C.

MATH 332 - Methods of Mathematical Proofs
Hours: 3
This course trains students on mathematical proof to deepen and broaden the knowledge of various aspect of discrete mathematics that will lay a foundation for further study of many fields in mathematics including topology, analysis, number theory, abstract algebra, probability, and computer science. Topics may include: functions and relations on sets, equivalence relations and partitions of sets, mathematical theorems and proofs, Peano Axiom and natural numbers, Cardinality and Cantor’s theorem, the barber’s Paradox and the Axiom of Choice, Countably infinite sets and Hilbert’s infinite hotel paradox, algebraic, metric and topological structures on a set. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 333 - Advanced Linear Algebra
Hours: 3
Covers real and complex vector spaces, subspaces, linear operators, eigenvalues and eigenvectors, inner product spaces, operators on inner product spaces, singular value decomposition and pseudo-inverse, canonical forms. Prerequisites: MATH 2414 with a minimum grade of C and MATH 2305 with a minimum grade of C or MATH 2318 with a minimum grade of C or MATH 332 with a minimum grade of C. Crosslisted with: MATH 531.

MATH 334 - Abstract Algebra
Hours: 3
Properties of the integers, permutations, groups, rings, integral domains and fields. Prerequisites: MATH 2305 with a minimum grade of C. Crosslisted with: MATH 550.

MATH 341 - Statistical Modeling
Hours: 3
A calculus-based course in statistical regression models with an application in R. Topics covered include: Introduction to statistical models, simple linear regression, multiple linear regression, parameter estimation, inference in linear regression models, regression diagnostics, model selection, and multicollinearity. Prerequisites: MATH 2414 with a grade of "C" or higher.

MATH 342 - Mathematics for Machine Learning
Hours: 3
This course will introduce mathematical concepts from calculus, linear algebra and optimization required for Machine Learning. Basic Machine Learning concepts including, activation functions, loss function, weights, and popular learning methods such as gradient descend and the stochastic gradient descend methods will be introduced. Prerequisites: Linear Algebra-MATH 2318 and MATH 2413-Calculus I with Min Grade of C.

MATH 361 - Mathematical Modeling of Science for Middle School I
Hours: 3
Mathematics will serve as the basis of the course and the following topics will be covered: Mathematical modeling, transformation of functions, data analysis skills, linear models, exponential growth and decay, logarithmic functions, logistic models, power and polynomial models, inverse and direct variation, periodic models and trigonometric functions. Prerequisites: MATH 1350 with a minimum grade of C.

MATH 362 - Mathematical Modeling of Science for Middle School II
Hours: 3
Mathematics will serve as the basis of the course and the following topics will be covered: Trigonometric functions and relationships, rate of change, derivative concepts, extrema and points of inflection, accumulating change, concepts of the definite integral, finite difference equations. Technology will be a vital part of the course. Prerequisites: MATH 361 with a minimum grade of C.

MATH 371 - Science and Math Education Theory and Practice
Hours: 1
Learning theory and teaching practices for science learning assistants. Topics include questioning strategies, conceptual development, formative assessment, argumentation, metacognition, and nature of science. Prerequisites: Instructor permission. Crosslisted with: PHYS 371, CHEM 371, BSC 371.

MATH 372 - Mathematics Structures and Applications
Hours: 3
A study of the algebraic processes, polynomials, equations, inequalities, functions, graphs, and mathematics of finance. Prerequisites: MATH 1351 with a minimum grade of C or MATH 2414 with a minimum grade of C.

MATH 380 - Mathematics History
Hours: 3
A survey of the history of mathematics; attention will be given to the origin, development and importance of mathematical ideas. Prerequisite: MATH 301.

MATH 389 - Independent Study
Hours: 1-4
Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: consent of department head.

MATH 397 - Special Topic
Hours: 1-4
Special Topics. One to four semester hours. Organized class. May be repeated when topics vary

MATH 402 - Mathematical Statistics I
Hours: 3
A calculus-based course in statistics. Topics covered include probability and its properties; discrete random variables and their probability distributions; continuous random variables and their probability distributions; joint probability distributions; sampling distributions and central limit theorem; one- and two-sample point and interval estimation problems; test of hypotheses; and other topics as time allows. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 403 - Mathematical Statistics II
Hours: 3
A calculus-based course in statistical inference. Topics covered include functions of random variables - moment generating functions; methods of point estimation; correlation; simple and multiple linear regression; ANOVA; Bayesian statistics; and other topics as time allows. Prerequisites: MATH 402 (Mathematical Statistics I) or similar statistics courses with a minimum grade of C.

MATH 411A - Real Analysis I
Hours: 3
Properties of real numbers, continuity, differentiation, integration, sequences, and series of functions. Prerequisites: MATH 2415, or Math 314 with a minimum grade of C, or Consent of Instructor.

MATH 426 - History of Mathematics
Hours: 3
Selected topics in the history of mathematics; the growth of algebra, trigonometry, geometry, and the calculus; the contribution of different cultures; selected biographies of mathematicians. Prerequisites: MATH 2414 with a minimum grade of C or consent of Instructor.

MATH 436 - Real Analysis
Hours: 3
Real number system; sequences and series; limit, continuity and differentiation; sequences and series of functions; uniform convergence; the Riemann integral, proofs in real analysis. Prerequisites: MATH 2414 Min Grade C and MATH 2305 with a minimum grade of C. Crosslisted with: MATH 511.

MATH 437 - Number Theory
Hours: 3
Mathematical induction, divisibility, prime numbers, congruences, factorization, arithmetic functions, quadratic reciprocity, primitive roots, diophantine equations. Prerequisites: MATH 2305 with a minimum grade of C.

MATH 438 - Complex Analysis
Hours: 3
This course covers one-dimensional complex analysis, including complex numbers, elementary complex functions, analytic functions, Mobius transformations, integration in the complex plane, and infinite series of complex numbers and variables. Prerequisites: MATH 2415 with a minimum grade of C. Crosslisted with: MATH 538.

MATH 439A - Functions Complex Variables I
Hours: 3
Geometry of complex numbers, mapping, analytic functions, Cauchy-Riemann conditions, complex integration. Taylor and Laurent series, residues. Prerequisites: MATH 436 or MATH 438 with a minimum grade of C, or Consent of Instructor.

MATH 440 - Topology
Hours: 3
Ordinals and cardinals, topology of the real line, metric spaces, topological spaces, sequences, continuity and homeomorphisms on topological spaces. Prerequisites: MATH 2305 with a minimum grade of C or MATH 2414 with a minimum grade of C. Crosslisted with: MATH 522.

MATH 453 - Essentials of Statistics
Hours: 3
Techniques of statistical applications concerning descriptive statistics, tests of hypothesis, regression and analysis of variance. Prerequisite MATH 1314 or above with a minimum grade of C.

MATH 454 - Introduction to Sports Analytics
Hours: 3
An introductory course in sports analytics with a focus on using the R programming language. Students will learn fundamental concepts, techniques, and tools used to analyze sports data, evaluate player performance, optimize game strategies, and make data-driven decisions in sports management. Throughout the course, we will conduct exploratory data analysis, correlations, ANOVA, regression models, as well as non-parametric statistical models commonly implemented in pro sports. Prerequisites: MATH 403 - Intro to Mathematical Statistics or MATH 303 - Intro to data science or similar courses with grade of “C” or better.

MATH 460 - Math for Secondary Teachers
Hours: 3
Mathematics for Secondary Teachers. Three semester hours. Exploration of problems in algebra, trigonometry, analytic geometry, calculus, Euclidean geometry, probability, statistics and discrete mathematics using technology. The course is intended as a capstone study for prospective secondary teachers of mathematics. Graphing calculators and computers will be employed to illustrate and encourage conjecturing and problem solving with an emphasis on applications. In addition, a brief survey will be made of major documents and resources pertinent to secondary mathematics teachers, such as the NCTM Standards. Prerequisites: MATH 2414 with a minimum grade of C.

MATH 486 - Image Processing with Applications
Hours: 3
This course will introduce students to image processing and image enhancement by applying mathematical methods in the spatial domains – first and second derivatives and the gradient; Image Restoration; Transformation, and applications will be introduced. Skills for working with image processing (IP) algorithms and tools including development and coding IP algorithms will be introduced. Prerequisites: MATH 2414-Calculus II with Min Grade of C.

MATH 489 - Independent Study
Hours: 1-4
Independent Study. One to four semester hours. Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisite: consent of department head.

MATH 490 - H Honors Thesis
Hours: 3
H Honors Thesis Hours: 6 Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. Prerequisite Consent of head. Note May be repeated when the topic varies.

MATH 491 - H Ind Honors Readings
Hours: 3
Hours: One to four - Organized class Note May be graded on a satisfactory (S) or unsatisfactory (U) basis. May be repeated when topics vary

MATH 497 - Special Topics
Hours: 0-4
Special Topics. One to four semester hours. Organized class. May be repeated when topics vary.

PHYS 1401 - College Physics I
Hours: 4
Topics include vectors, mechanics, Newton's laws of motion, work, energy, power, impulse and momentum, conservation laws, heat and thermodynamics.Prerequisites: MATH 1314 Min Grade C or MATH 2312 Min Grade C or MATH 1325 Min Grade C or MATH 2413 Min Grade C.

PHYS 1402 - College Physics II
Hours: 4
Topics include electric charges and fields, DC circuits, magnetic fields, fields due to currents. Prerequisites: PHYS 1401 Min Grade C.

PHYS 2425 - University Physics I
Hours: 4
Calculus based physics course in mechanics for science, mathematics and engineering students. Prerequisites: MATH 2413 with a minimum grade of C or concurrent enrollment.

PHYS 2426 - University Physics II
Hours: 4
Second semester of calculus-based physics covering electricity and magnetism for science, mathematics, and engineering students. Topics include electric forces and fields, Gauss's law, electric potential, capacitance, current and resistance, direct-current circuits, magnetic fields and forces, sources of magnetic fields, and electromagnetic induction and inductance. Emphasis is placed on conceptual understanding, problem solving, and applications of calculus to physical systems. Prerequisites: PHYS 2425 with a minimum grade of C, MATH 2414 with a minimum grade of C or concurrent enrollment.

PHYS 101 - Physics and Astronomy Seminar
Hours: 1
Introduces some of the major contemporary problems and research areas in physics and astronomy.

PHYS 119 - Introduction to Python Computer Programming for the Physical Sciences
Hours: 1
An introductory Python programming course designed to provide students without any prior programming experience with basic programming skills. The course includes an overview of Python programming language and scientific library packages. Students will learn skills to build programs and applications useful for problem solving and simulations in the physical sciences and engineering.

PHYS 131 - Introduction to Musical Acoustics: The Science of Sound
Hours: 3
The course covers basic physical principles of waves required to understand the phenomenon of music, the characteristics of musical instruments and sound effects of rooms/halls for music majors and any one interested in the sciences behind the music, in musician-friendly format. Basic concepts such as frequency, harmonics, and pitch, physics-based questions on such topics as music acoustics, stringed instruments, wind instruments, singing and electronic instruments will be discussed in lectures. Hands on labs and web-based exercises will supplement the lectures. Prerequisites: MATH 1314 or MATH 2312 or MATH 1325 or MATH 1332 or MATH 2413.

PHYS 151 - Physics From Absolute Zero I
Hours: 3
This course is a first semester course for future physicists and those curious about physics. Students are introduced to relativity from Galileo to black holes and modern cosmology using a conceptual and algebra-based approach. Along the way, students will learn about conservation laws, dynamics, special relativity, and general relativity as well as previews of how calculus enables our understanding of physics. In addition, students will practice skills such as estimation, geometry and trigonometry, metacognition, technical reading, writing, and speaking, and positive mental health strategies. The course will discuss challenges and opportunities facing the science and the wide range of career options for physics graduates. First-year physics students are required to take this course; other interested students are welcome.

PHYS 201 - Problem Solving in Mechanics
Hours: 1
Extension of concepts developed in introductory mechanics with emphasis on problem solving techniques.

PHYS 202 - Problem Solving in Electricity & Magnetism
Hours: 1
Extension of concepts developed in introductory Electricity and Magnetism with emphasis on problem solving techniques.

PHYS 317 - Mathematical Methods for Physics and Engineering
Hours: 3
Mathematical techniques from the following areas: infinite series; integral transforming; applications of complex variables; vectors, matrices, and tensors; special functions; partial differential equations; Green's functions; perturbation theory; integral equations; calculus of variations; and groups and group representatives. Prerequisites: Concurrent enrollment in MATH 2415 or MATH 2320 or consent of instructor.

PHYS 319 - Computational Physics with Python
Hours: 3
This course introduces the student to the Python programming language as applied to computational physics applications, including finite difference methods, solving linear and non-linear equations, Fourier transforms, simulating physical systems governed by ordinary and partial differential equations, random processes and the Monte Carlo method. Prerequisites: PHYS 2425 with a minimum grade of C. In addition, PHYS 119, or ENGR 2304, or COSC 1436, or consent of instructor. Crosslisted with: CSCI 319.

PHYS 321 - Modern Physics
Hours: 3
An introduction to special relativity and elementary quantum mechanics. Topics include spacetime, relativistic energy and momentum, the uncertainty principle, Schrödinger’s equation, observables and operators, bound states, potential barriers, and the hydrogen atom. Prerequisites: PHYS 2426, MATH 2415, or consent of instructor.

PHYS 332 - Electronics for Scientists and Engineers
Hours: 4
An introduction to the operation and use of fundamental components in modern analog and digital electronics. This course covers the principles of analog circuit analysis, filters, diodes, transistors, operational amplifiers, and oscillators. Additionally, it explores power supplies, Boolean logic, digital circuits, and the electrical responses of biological systems. Emphasizing hands-on experience, the course is designed for individuals utilizing electronic equipment in research and practical applications. It is recommended for students across pure and applied sciences, as well as for those not majoring in electrical engineering. Prerequisites: PHYS 1402 or PHYS 2426 or consent of instructor.

PHYS 333 - Wave Motion, Acoustics, and Optics
Hours: 4
An introduction to vibrational and wave motion with applications to acoustics, optics, and electromagnetic phenomena. Topics include oscillatory motion, properties and propagation of sound and light, geometric optics, and interference and diffraction. Students gain hands-on experience through laboratory work. Prerequisites: PHYS 2426 with a minimum grade of C or consent of the instructor.

PHYS 335 - Advanced Physics Laboratory
Hours: 3
An introduction to the equipment and techniques of experimental physics. Experiments are selected from a wide range of fields in physics. Research grade equipment is used in many experiments. Prerequisites: PHYS 2426 Min Grade C. PHYS 321 Min Grade C or PHYS 333 Min Grade C.

PHYS 345 - Teaching and Learning Physics
Hours: 3
How people teach, learn, and understand key concepts in physics. This course is a survey of physics education research. Topics include constructivism, student conceptions, the hidden curriculum, identity and assessment. Prerequisites: PHYS 2425 and PHYS 2426.

PHYS 371 - Science and Math Education Theory and Practice
Hours: 1
Learning theory and teaching practices for science and math learning assistants. Topics include advanced questioning strategies, conceptual development, formative assessment, argumentation, metacognition, and nature of science. Prerequisites: Instructor approval. Crosslisted with: CHEM 371, BSC 371, MATH 371.

PHYS 389 - Independent Study
Hours: 0-4
Individual study of specific problems in physics. Prerequisites: Department head approval.

PHYS 401 - Current Topics in Physics and Astronomy
Hours: 1
Current problems or topics in research, employment, and trends in physics are considered. Prerequisites: Junior standing.

PHYS 411 - Classical Mechanics
Hours: 3
A mathematical treatment of the fundamentals of classical mechanics. Topics include particle dynamics in one, two and three dimensions; conservation laws; dynamics of a system of particles; motion of rigid bodies; central force problems; central force problems; accelerating coordinate systems; gravitation; Lagrange's equations and Hamilton's equations. Prerequisites: PHYS 2426, and concurrent enrollment in MATH 2415 or MATH 2320 or consent of instructor.

PHYS 412 - Electricity and Magnetism
Hours: 3
An advanced undergraduate course in theoretical electricity and magnetism. Geometry of static electric and magnetic fields, electric charges and currents, calculating electric and magnetic fields from potentials, fields inside matter, Maxwell's equations, and EM waves. Prerequisites: PHYS 2426, and concurrent enrollment in MATH 2415 or MATH 2320 or consent of instructor.

PHYS 414 - Thermodynamics and Kinetic Theory
Hours: 3
Introduction to the kinetic theory of matter and to thermodynamics and statistical mechanics, with applications to physical and chemical systems. Prerequisites: PHYS 317 or consent of instructor.

PHYS 418 - Undergraduate Research
Hours: 3
Individual research related to physics, directed by a faculty member. Prerequisites: Department head approval.

PHYS 420 - Quantum Mechanics
Hours: 3
The Schrödinger equation; one dimensional systems; the Heisenberg uncertainty principle; magnetic moments and angular momentum; two and three dimensional systems; approximation methods; scattering theory. Prerequisites: PHYS 317 or consent of instructor.

PHYS 421 - Semiconductor Physics and Engineering
Hours: 3
The physical, chemical and electrical properties of metals and semi-conductors and the relationship between these properties and the electronic and crystal structures of these materials is studied. Prerequisites: PHYS 321 and PHYS 333.

PHYS 430 - Optics
Hours: 3
Fundamentals of geometrical and physical optics and applications to optical instrumentation. Prerequisites: PHYS 333 or consent of the instructor.

PHYS 432 - Advanced Electronics
Hours: 3
Embedded system design and programming. Topics include microcontroller selection, peripheral interfacing, low and high-level programming languages, and microcontroller development tools. Prerequisites: (PHYS 132 or PHYS 332) and (CSCI 151 or PHYS 319 or CSCI 319).

PHYS 437 - Nuclear Physics
Hours: 3
The study of nuclear phenomena and properties including mass, stability, magnetic moment, radioactive decay processes and nuclear reactions. The application of nuclear principles to other fields such as astronomy, engineering, manufacturing, and medicine. Prerequisites: PHYS 321.

PHYS 461 - Physics Research Project
Hours: 3
This is the first part of a two-semester course sequence. Each participating student will conduct literature surveys on a research topic agreed to between him/her and their local advisor. The research problem must be approved through the Texas Physics Consortium. Completion of the research will be consummated during the second semester. Areas of research will primarily be in those areas represented by the Consortium which include nuclear physics, high energy particle physics, medical/health physics, computational and mathematical physics, atomic and molecular physics, astrophysics, and other forefront areas. Prerequisites: PHYS 321 and department head approval.

PHYS 462 - Physics Research Seminar
Hours: 3
An experimental or theoretical project will be continued by the student and the results reported in a seminar. Students who have not yet taken the ETS Major Field Test in Physics are required to do so while enrolled in Seminar. Prerequisites: PHYS 461 and department head approval.

PHYS 489 - Independent Study
Hours: 1-4
Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. May be repeated when the topic varies. Prerequisites: Department head approval.

PHYS 490 - Honors Thesis
Hours: 3
Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. Note May be repeated when the topic varies. Prerequisites: Department head approval.

PHYS 491 - Individualized Honors Readings
Hours: 3
Individualized instruction/research at an advanced level in a specialized content area under the direction of a faculty member. Prerequisites: Department head approval.

PHYS 492 - Instrumentation and Control
Hours: 3
Sensors and actuators in real-time systems. Topics include the physics of sensors and actuators, sensor signal conditioning, real-time data acquisition, elementary signal processing, motion control, and software for instrumentation and control. Prerequisites: PHYS 2426.

PHYS 497 - Special Topics
Hours: 1-4
Organized class. May be repeated when topics vary.