ASTRONOMY 1000K – INTRODUCTION TO THE UNIVERSE
Student learning outcomes will be:

(1) Demonstrate an understanding of the history of the principles, instruments, and key players of modern astronomy

(2) Solve physics-related problems which demonstrate an understanding of the basic principles of modern astronomy

(3) Analyze and interpret key features of stellar spectra, spatial and temporal measurements of solar position, and basic telescopic images

(4) Collect, present and justify statistical and graphical data related to a term-long astronomical project; explain data outliers and their significance.

(5) Demonstrate an ability to identify and locate specific celestial objects using both a telescope and astronomical simulation software.

BIOLOGY 2107K - PRINCIPLES OF BIOLOGY I
Student learning outcomes will be:

(1) to understand and describe the fundamental biology of the cell, including cellular anatomy, cellular metabolism, cellular respiration, photosynthesis, cell growth and cellular reproduction.

(2) to understand and describe the fundamental principles of Mendelian genetics.

(3) to understand and describe the molecular basis for heredity, DNA structure and replication, and protein synthesis.

(4) to understand and describe the principles of evolution, from both Darwinian and modern perspectives.

(5) to develop laboratory skills that allow a student to perform experiments and analyze data based on the concepts listed above.

BIOLOGY 2108K – PRINCIPLES OF BIOLOGY II
Student learning outcomes will be:

(1) to identify and describe the homeostatic mechanisms allow organisms to survive in their respective environments.

(2) to understand and describe the fundamental anatomy and physiology of animals.

(3) to understand and describe the fundamental anatomy and physiology of plants.

(4) to understand and describe the basic principles of ecology and population biology.

(5) to develop laboratory skills that allow a student to recognize and observe the concepts listed above, as well as develop the ability to analyze experimental data.

BIOLOGY 3000K - GENETICS
Student learning outcomes will be:

(1) to be able to apply the concepts of Mendelian genetics to solve problems regarding the inheritance patterns of animals, fungi, and plants.

(2) to understand the inheritance properties of bacteria and their phages and be able to solve problems that involve these concepts.

(3) to be able to create genetic maps; map distances between genes or mutations in animals, fungi, plants, bacteria and their phages.

(4) to understand pedigree trees and solve pedigree analysis problems using them

(5) to understand the structure of DNA, from the level of entire chromosomes to individual molecules.

(6) to be able to apply your understanding of and how the structure of DNA relates to function; specifically in replication, expression of genes, recombination, repair, and mutation.

BIOLOGY 3100K - Microbiology
Student learning outcomes will be:

(1) to identify the anatomical features of microorganisms and understand how they function mechanically

(2) to understand the major physiological processes of microorganisms that are critical for structure, metabolism, and utilization of ecological niches.

(3) to understand the biochemical basis of important physiological characteristics of microorganisms, including: pathogenicity, motility, and unique forms of energy production.

(4) to use your knowledge of microbial anatomy and physiology of microorganisms to analyze and evaluate problems.

(5) to be able to use practical techniques to culture, identify, and study bacteria in the laboratory.

BIOLOGY 3200K - BIOTECHNOLOGY
Student learning outcomes will be:

(1) to develop the technical and analytical skills necessary to work on a research project.

(2) to be able to appropriately record all experimental data in a lab notebook.

(3) to be able to prepare materials for experiments, including sterilization, etc.

(4) to contribute intellectually to work of others in the lab.

(5) to be able to communicate experimental results to others in the lab.

(6) to be able to critique the content of journal articles to others during a group meeting.

BIOLOGY 3300 - ECOLOGY
Student learning outcomes will be:

(1) to understand and describe how organisms interact with each other and their environments.

(2) to describe the physiological mechanisms that organisms use to respond to their environments.

(3) to understand and describe how and why traits evolve within a population over ecological time.

(4) to understand and apply models that describe population growth and dynamics, competitive interactions between two species, and predator-prey interactions.

(5) to understand and describe life history strategies employed by organisms.

(6) to understand and describe how communities and ecosystems are structured.

(7) to develop proficiency in using the scientific method to solve problems in ecology.

BIOLOGY 3310K - MOLECULAR BIOLOGY
Student learning outcomes will be:

(1) to identify the major structures and components important for mediating processes involving nucleic acids.

(2) to understand how molecular experiments are used to comprehend processes occurring at the molecular level.

(3) to apply your basic understanding of experiments in molecular biology to solve problems.

(4) to analyze experimental data and recognize the information that is contained within it.

(5) to design experiments such that questions in molecular biology can be answered after careful evaluation of the results.

BIOLOGY 4200K - ZOOLOGY
Student learning outcomes will be:

(1) to understand and describe the evolutionary relationships among animal groups.

(2) to understand and describe the structural and functional characteristics that define each major animal group.

(3) to develop an appreciation of animal diversity through in-depth study of animal taxonomy & systematics.

(4) to recognize, analyze, and compare the behaviors that optimize the ability of an animal to survive in its environment.

(5) to develop proficiency in microscopy and animal dissection techniques.

BIOLOGY 4400K - ANATOMY & PHYSIOLOGY I (part 1 of a 2 semester course)
Student learning outcomes will be:

(1) to understand the basic physiological principles of each major organ system, ranging from the molecular level to that of the organ system.

(2) to recognize, identify, and describe the basic anatomical structures associated with each major organ system.

(3) to develop basic dissection techniques appropriate to the field of anatomy.

(4) to develop basic laboratory techniques appropriate to the field of physiology.

(5) to develop study skills and habits appropriate for pre-professional students interested in health-related fields.

BIOLOGY 4410K - IMMUNOLOGY

Student learning outcomes will be:

(1) to understand and describe the biology of the immune system, including the structure and function of antibodies and antibody-antigen interactions.

(2) to develop a strong understanding of the mechanisms involved in the immune response.

(3) to understand and describe the cellular and physiological consequences of immunological responses.

(4) to develop skills in using modern laboratory techniques for applications in immunology.

BIOLOGY 4440K - BOTANY
Student learning outcomes will be:

(1) to understand and describe plant cell structure and organization.

(2) to describe the reproduction, growth, and development of plants.

(3) to describe the anatomy and physiology of plants.

(4) to understand the ecology and evolution of plants.

(5) to describe the diversity and distribution of plant species.

(6) to develop skills in plant collection and identification.

BIOLOGY 4460K - ANATOMY & PHYSIOLOGY II (part 2 of a 2 semester course)
Student learning outcomes will be:

(1) to understand the basic physiological principles of each major organ system, ranging from the molecular level to that of the organ system.

(2) to recognize and identify the basic anatomical structures associated with each major organ system.

(3) to develop basic dissection techniques appropriate to the field of anatomy.

(4) to develop basic laboratory techniques appropriate to the field of physiology.

(5) to develop study skills and habits appropriate for pre-professional students interested in health-related fields.

BIOLOGY 4470 - PLANT PHYSIOLOGY
Student learning outcomes will be:

(1) to understand and describe water relations and mineral transport in plants.

(2) to understand plant biochemistry and metabolism, including energy and carbon assimilation and nitrogen assimilation.

(3) to understand and describe plant growth and development, including embryogenesis and early development, flowering, and the role of plant hormones.

BIOLOGY 4480 - EVOLUTION
Student learning outcomes will be:

(1) to explain how life might have originated on this planet.

(2) to use cladistic analysis to better understand and explain the phylogenetic relatedness among organisms.

(3) to describe Darwin's theories and how the principles of natural selection can lead to speciation.

(4) to contrast alternate models for macroevolution and describe the major patterns in the fossil record.

(5) to relate broad patterns in the fossil record to major geological events and plate tectonic movement.

BIOLOGY 4500K - BIOINFORMATICS I
Student learning outcomes will be:

(1) to understand how sequence information collected, stored and organized, managed and distributed.

(2) to be able to use standard bioinformatic tools to access biological information.

(3) to understand the theoretical basis of the algorithms used in the programs for bioinformatics.

(4) to know which bioinformatic methods best reveal and conceptualize the raw information provided by genomics and proteomics research.

BIOLOGY 4510K - BIOINFORMATICS II
Student learning outcomes will be:

(1) to use bioinformatic methods to answer specific biological questions.

(2) to discover new knowledge about Biological systems through computational analyses of molecular sequences.

(3) to evaluate comparative and predictive analyses of DNA and protein sequences.

(4) critically assess solutions to bioinformatic problems.

BIOLOGY 4903 – DINOSAUR BIOLOGY
Student learning outcomes will be:

(1) to be able to understand and describe the global environment of the Mesozoic Period, concepts of stratigrapy, radiometric dating, as well as the fossil evidence that exists for the existence of dinosaurs.

(2) to understand and apply the principles of phylogenetic systematics (cladistics) to the field of paleontology.

(3) to be able to describe the taxonomy and evolutionary history of the major dinosaur groups.

(4) to be able to discuss and interpret the evidence regarding the biological nature of dinosaurs, as well as their evolutionary relationship to birds.

(5) to know the major theories that explain the Cretaceous-Tertiary extinction event that is responsible for the demise of the dinosaurs.

BIOLOGY 4903 – PARASITOLOGY
Student learning outcomes will be:

(1) to compare and contrast the morphology, natural history, and taxonomy of the major parasites of animals and man.

(2) to understand the evolution, ecology, and pathology of parasitic infections.

(3) to obtain a functional understanding of the host-parasite relationships and host-parasite population dynamics.

BIOLOGY 4903A – ICHTHYOLOGY
Student learning outcomes will be:

(1) to describe the form, function, and ontogeny of fishes.

(2) to understand and describe the taxonomy, phylogeny, and evolution of fishes.

(3) to understand and describe how fishes are distributed throughout the world and among different habitats.

(4) to understand and describe the behavior and ecology of fishes.

(5) to develop skills in fish collection and identification.

CHEMISTRY 1211 – PRINCIPLES OF CHEMISTRY I
Student learning outcomes will be:

(1) identify the general properties of matter.

(2) name and classify inorganic compounds.

(3) identify empirical and molecular formulas.

(4) balance chemical equations.

(5) identify and predict outcomes of reactions.

(6) comprehend gas and thermodynamic laws.

(7) comprehend quantum theory, and periodicity.

(8) comprehend chemical bonding, and Lewis structures.

CHEMISTRY 1212K – PRINCIPLES OF CHEMISTRY II
Student learning outcomes will be:

(1) Develop and apply Molecular Orbital and Hybrid Orbital models of chemical bonding.

(2) Explain the properties of water and its impact on chemical reactions.

(3) Explain how the properties of the solid, liquid, and vapor phases of substances depend on chemical bonding and structure.

(4) Predict the properties of solutions.

(5) Understand how reaction mechanisms determine and control reaction rates.

(6) Manipulate chemical equlibria to obtain physical properties such as acidity, basicity and solubility.

(7) Use the laws of thermodynamics to discuss and predict chemical reactivity and spontaneity.

(8) Describe and calculate the properties of electrochemical cells.

(9) Describe the features of organic compounds, including carbohydrates, proteins, lipids, and nucleic acids.

PHYSICS 1111K – INTRODUCTION TO PHYSICS I
Students learning outcomes will be:

(1) explains and interprets physical situations as stated in a word problem

(2) identify the physical laws appropriate to the physical situation at hand

(3) predict the behavior of representative physical systems using mathematics/physical laws as a tool.

(4) interpret the outcome of a physical system .

(5) use various types of data collection tools for the experimental investigation of physical laws

(6) represent physical systems in multiple representations: i.e., mathematically, pictorially, graphically, etc.

PHYSICS 1112K – INTRODUCTION TO PHYSICS II
Student learning outcomes will be:

(1) explains and interprets physical situations as stated in a word problem

(2) identify the physical laws appropriate to the physical situation at hand

(3) predict the behavior of representative physical systems using mathematics/physical laws as a tool.

(4) interpret the outcome of a physical system .

(5) use various types of data collection tools for the experimental investigation of physical laws

(6) represent physical systems in multiple representations: i.e., mathematically, pictorially, graphically, etc.

PHYSICS 2211K – INTRODUCTION TO PHYSICS I
Students learning outcomes will be:

(1) explains and interprets physical situations as stated in a word problem using calculus as a tool.

(2) identify the physical laws appropriate to the physical situation at hand

(3) predict the behavior of representative physical systems using calculus and physical laws as a tool.

(4) interpret the outcome of a physical system using calculus as a tool.

(5) use various types of data collection tools for the experimental investigation of physical laws

(6) represent physical systems in multiple representations: i.e., mathematically, pictorially, graphically, etc.

PHYSICS 2212K – INTRODUCTION TO PHYSICS II
Student learning outcomes will be:

(1) explains and interprets physical situations as stated in a word problem using calculus as a tool.

(2) identify the physical laws appropriate to the physical situation at hand

(3) predict the behavior of representative physical systems using calculus and physical laws as a tool.

(4) interpret the outcome of a physical system using calculus as a tool

(5) use various types of data collection tools for the experimental investigation of physical laws

(6) represent physical systems in multiple representations: i.e., mathematically, pictorially, graphically, etc.

PHYSICS 3210 -- INTERMEDIATE MECHANICS
Learning outcomes: students should be able to

(1) Manipulate the mathematical forms used to model small vibration behavior

(2) Analyze the Kepler problem in detail

(3) Solve a variety of problems arising in physics, utilizing differential equations

(4) Work with Lagrangian formalism at an initial level

PHYSICS 3220 -- ELECTROMAGNETISM I
Learning outcomes: students should be able to

(1) Derive electric and magnetic field configurations from the integral form of Maxwell's equations

(2) Demonstrate the equivalence of the integral and differential forms of Maxwell's equations

(3) Apply the differential forms of Maxwell's equations in selected cases

(4) Comprehend how electromagnetic waves arise from Maxwell's equations

PHYSICS 3230K - OPTICS
Student learning outcomes will be:

(1) Use the laws of reflection and refraction to explain the behavior of electromagnetic waves in the realm of geometrical optics.

(2) Apply geometrical optics to study various optical systems (e.g. the camera and human eye).

(3) Use the laws of interference and diffraction to explain the behavior of electromagnetic waves in the realm of wave optics.

(4) Describe the operation of lasers.

PHYSICS 3410K -- ELECTRONICS LABORATORY
Learning outcomes: students should be able to

(1) Produce advanced circuit assemblies

(2) Gain an appreciation of the physics of introductory solid-state devices

(3) Demonstrate an understanding of basic circuit theory using advanced mathematical techniques

PHYSICS 3720L -- MODERN PHYSICS LABORATORY
Learning outcomes: students should be able to

(1) Perform sophisticated data analyses

(2) Perform advanced experiments (generating substantial data) demonstrating principles of modern physics

(3) Demonstrate an understanding of either the historical context or modern relevance of the experiments performed

PHYSICS 4220 -- ELECTROMAGNETISM II
Learning outcomes: students should be able to

(1) Understand dielectric and magnetic susceptibilities

(2) Work with special instances of Maxwell's equations in matter

(3) Demonstrate understanding of relativistic transformations of electric and magnetic fields

PHYSICS 4901 -- SPECIAL TOPICS (one credit hour)
Learning outcomes: students should be able to

(1) Comprehend and demonstrate understanding of and competence in subject matter, varying by course offering

(2) Display clear evidence of professional growth and development in an environment approaching that of graduate study