AREA III: Physical and Natural Sciences - 7 credit hours required			
Area III Goal 1: To develop students knowledge, skills and disposition for responsibility regarding principles, theories and methods of scientific inquiry associated with physical and natural sciences			
Courses	**Student Learning Outcomes**	**NM HED Core Area: Competency #**	**UNM Learning Goals: Knowledge, Skills & Responsibility (K,S & R)**
ANTH 120: Arch. Method & Theory	By the end of the course, students will be able to list the basic principles of the science of archaeology, including goals, methods, theory, terminology and ethics.	III: 1	K
	By the end of the course, students will be able to identify and evaluate archaeological objects and data in order to understand the human past.	III: 2,4	K & S
	By the end of the course, students will be able to discuss impacts of archaeological research on the archaeological record and on contemporary people and cultures.	III: 3,5	K, S & R
	By the end of the course, students will be able to provide examples of controversies associated with the development and implementation of legal protections and restrictions involving archaeology.	III: 3,5	K, S & R
ANTH 122L: Req. Lab for ANTH 120 (1cr)	By the end of the course, students will be able to list the basic principles of the science of archaeology, including goals, methods, theory, terminology and ethics.	III: 1	K
	By the end of the course, students will be able to identify and evaluate archaeological objects and data in order to understand the human past.	III: 2,4	K & S
	By the end of the course, students will be able to discuss impacts of archaeological research on the archaeological record and on contemporary people and cultures.	III: 3,5	K, S & R
	By the end of the course, students will be able to provide examples of controversies associated with the development and implementation of legal protections and restrictions involving archaeology.	III:3,5	K, S & R
ANTH 150: Evol & Human Emergence	By the end of the course, students will be able to generate hypotheses from observations of the natural world, predictions of the hypotheses and experiments to test the predictions.	III: 1,2	K, S & R
	By the end of the course, students will be able to define the forces of evolution and explain their effects on levels of variation within and between populations.	III: 3	K & S
	By the end of the course, students will be able to use Mendel's laws to predict offspring genotypes and phenotypes from parental genotypes and phenotypes.	III: 2,4	K & S
	By the end of the course, students will be able to apply the principles of the Central Dogma to generate amino acid sequences from DNA sequences.	III: 2,4	K, S & R
	By the end of the course, students will be able to construct a phylogenetic tree showing the evolutionary relationships among primate taxa, and list the derived traits associated with each branch of the tree.	III: 2,4	K, S & R

	By the end of the course, students will be able to predict primate social structures and mating systems from morphological and ecological data.	III: 2,3	K, S & R
	By the end of the course, students will be able to list the geographic range, time of origin and extinction, unique behaviors and derived anatomical traits of the major hominin taxa.	III: 2,3	K & S
	By the end of the course, students will be able to use the scientific method to test evolutionary and non-evolutionary hypotheses for the causes of variation in human mate choice, parenting, and cultural institutions.	III: 3,5	K, S & R
ANTH 151L: Opt. Lab for ANTH 150 (1cr)	By the end of the course, students will be able to generate hypotheses from observations of the natural world, predictions of the hypotheses and experiments to test the predictions.	III: 1,2	K, S & R
	By the end of the course, students will be able to define the forces of evolution and explain their effects on levels of variation within and between populations.	III: 3	K & S
	By the end of the course, students will be able to use Mendel's laws to predict offspring genotypes and phenotypes from parental genotypes and phenotypes.	III: 2,4	K & S
	By the end of the course, students will be able to apply the principles of the Central Dogma to generate amino acid sequences from DNA sequences.	III: 2,4	K, S & R
	By the end of the course, students will be able to construct a phylogenetic tree showing the evolutionary relationships among primate taxa, and list the derived traits associated with each branch of the tree.	III: 2,4	K, S & R
	By the end of the course, students will be able to predict primate social structures and mating systems from morphological and ecological data.	III: 2,3	K, S & R
ANTH 160: Human Life Course	By the end of the course, students will be able to define basic concepts in evolutionary theory, including natural selection, sexual selection and reproductive success.	III: 1,3	K
	By the end of the course, students will be able to describe the major life history tradeoffs and apply this framework to understanding variation in the human life course.	III: 1-3	K
	By the end of the course, students will be able to describe life history pattern in human foraging societies and explain how and why they differ from modern industrialized societies.	III: 1-3	K & S
	By the end of the course, students will be able to discover how humans fit in the natural world, and use comparative data from other primates to investigate how human features have changed from our evolutionary relatives.	III: 1-5	K, S & R
	By the end of the course, students will be able to evaluate scientific hypotheses using empirical evidence.	III: 2,4	K & S
	By the end of the course, students will be able to apply evolutionary/scientific reasoning to understand real-world phenomena, such as modern health problems and the demographic transition.	III: 2,3,5	K, S & R

ANTH 161L: Opt. Lab for ANTH 160 (1cr)	By the end of the course, students will be able to define basic concepts in evolutionary theory, including natural selection, sexual selection and reproductive success.	III: 1,3	K
	By the end of the course, students will be able to describe the major life history tradeoffs and apply this framework to understanding variation in the human life course.	III: 1-3	K & S
	By the end of the course, students will be able to describe life history pattern in human foraging societies and explain how and why they differ from modern industrialized societies.	III: 1-3	K, S & R
	By the end of the course, students will be able to discover how humans fit in the natural world, and use comparative data from other primates to investigate how human features have changed from our evolutionary relatives.	III: 1-5	K, S & R
	By the end of the course, students will be able to evaluate scientific hypotheses using empirical evidence.	III: 2,4	K & S
	By the end of the course, students will be able to apply evolutionary/scientific reasoning to understand real-world phenomena, such as modern health problems and the demographic transition.	III: 2,3,5	K, S & R
ASTR 101: Intro to Astronomy	<u>Models and Scientific Inquiry:</u> By the end of the course, students will be able to identify models and theories, for example, heliocentric and geocentric models of the universe and the Big Bang theory. <u>Course level instruction objectives:</u> Students will be able to recognize how the scientific process was involved in the development and acceptance or rejection of such models and theories.	III: 1	K & S
	<u>Knowledge of Basic Laws of Physics Related to Astronomy and Use of Units:</u> By the end of the course, students will be able to use basic laws of physics related to astronomy to estimate answers to various problems. <u>Course level instruction objectives:</u> Students will be able to recognize metric units and the correct units in which to measure various astronomical properties.	III: 2,4	K & S
	<u>Basic Astronomical Phenomena:</u> By the end of the course, students will be able to identify basic everyday concepts like seasons, the rising and the setting of the Moon and its appearance, and our place in the universe. <u>Course level instruction objectives:</u> Students will recognize valid explanations of these phenomena.	III: 3	K, S & R
	<u>Environmental Issues Related to Astronomy:</u> By the end of the course, students will be able to identify environmental issues that arise in the context of astronomy, namely greenhouse gases, the ozone layer and light pollution.	II : 2,3,5	K, S & R
	<u>Origin and Nature of the Universe:</u>		

	By the end of the course, students will be able to identify the origin and nature of the universe – subjects with relevance to contemporary societal issues.	II: 3,5	K, S & R
ASTR 101L: Opt. Lab for ASTR 101 (1cr)	Models and Scientific Inquiry: By the end of the course, students will be able to identify models and theories, for example, heliocentric and geocentric models of the universe and the Big Bang theory. Course level instruction objectives: Students will be able to recognize how the scientific process was involved in the development and acceptance or rejection of such models and theories.	III: 1	K, S & R
	Knowledge of Basic Laws of Physics Related to Astronomy and Use of Units: By the end of the course, students will be able to use basic laws of physics related to astronomy to estimate answers to various problems. Course level instruction objectives: Students will be able to recognize metric units and the correct units in which to measure various astronomical properties.	III: 2,4	K & S
	Basic Astronomical Phenomena: By the end of the course, students will be able to identify the reasons for basic everyday concepts like seasons, the rising and the setting of the Moon and its appearance, and our place in the universe. Course level instruction objectives: Students will recognize valid explanations of these phenomena.	III: 3	K, S & R
	Environmental Issues Related to Astronomy: By the end of the course, students will be able to identify environmental issues that arise in the context of astronomy, namely greenhouse gases, the ozone layer and light pollution.	II : 2,3,5	K, S & R
	Origin and Nature of the Universe: By the end of the course, students will be able to identify current theories of the origin and nature of the universe – subjects with relevance to contemporary societal issues.	II: 3,5	K, S & R
BIOL 110/112L: Biology for Non-Majors	By the end of the course, students will be able to explain the nature and process of science.	III: 1,5	S
	By the end of the course, students will be able to use the logic of scientific discovery to critically evaluate scientific information and to develop a testable hypothesis to explain phenomena of the natural world.	III: 1,5	K, S & R
	By the end of the course, students will be able to analyze data, construct and interpret graphs.	III: 4	S
	By the end of the course, students will be able to identify macromolecules of life and explain how their structures relate to their functions in cells.	III: 3	K, S & R
	By the end of the course, students will be able to describe how cellular structures and functions are related.	III: 2,3	S
	By the end of the course, students will be able to explain energy transformation pathways in autotrophs and heterotrophs.	III: 3	S

	By the end of the course, students will be able to explain the basic mechanisms of inheritance from the molecular to organismal level.	III: 3	S
	By the end of the course, students will be able to define biological evolution by natural selection and explain microevolution and macroevolution.	III: 3	K & S
	By the end of the course, students will be able to explain the basic principles of ecology at the population, community and ecosystem levels.	III: 3,5	K, S & R
BIOL 123/BIOL 124L: Biology for Non-Majors Health Related Sciences	By the end of the course, students will be able to explain why evolution is the central paradigm of biology.	III: 1,3,4	S
	By the end of the course, students will be able to explain the nature and process of science and use it to critically evaluate scientific information and to develop a testable hypothesis to explain phenomena of the natural world.	III: 1,4	K, S & R
	By the end of the course, students will be able to analyze data, construct and interpret graphs.	III: 4	K & S
	By the end of the course, students will be able to explain the importance of water to life and apply basic chemistry to the biology of cells.	III: 2,4	K & S
	By the end of the course, students will be able to describe how the features of eukaryotic cellular structures and functions are related, including organelles, membranes, and the cytoskeleton.	III: 1,3,5	K & S
	By the end of the course, students will be able to use the laws of thermodynamics to explain energy transformation and describe the various metabolic energy-transformation pathways in eukaryotic cells.	III: 1-2,4	K & S
	By the end of the course, students will be able to explain the significance of meiosis, sexual reproduction, and the generation of genetic diversity and its relation to patterns of inheritance.	III: 1-2,4-5	K, S & R
	By the end of the course, students will be able to explain the goals and mechanisms of nuclear division by mitosis and its role in the cell cycle.	III: 1,2,4,5	K & S
	By the end of the course, students will be able to explain the structure and functions of DNA in cells and the mechanisms for replication and regulation of gene expression.	III: 1,2,4,5	K, S & R
CHEM 101: Chemistry in Our Community	By the end of the course, students will be able to define and explain basic chemical terms, principles and concepts and recognize simple compounds.	III: 3,5	K & S
	By the end of the course, students will be able to interpret information from data presented in charts, graphs, tables and spreadsheets.	III: 2,5	S
	By the end of the course, students will be able to balance chemical and nuclear reactions.	III: 2,4,5	K
	By the end of the course, students will be able to conclude whether or not a statement has both a logical and a scientific basis.	III: 1,5	K
	By the end of the course, students will be able to identify reliable government and scientific websites for accessing data relevant to current local, national and international issues.	III:1 3,5	K, S & R

	By the end of the course, students will be able to understand and explain the basic chemistry behind and major issues of debate concerning air quality, global climate change, use of fossil fuels, nuclear power, alternative energy and water quality.	III: 1,3,5	K, S & R
CHEM 111: Elem of General Chemistry (4cr)	By the end of the course, students will be able to use dimensional analysis, the SI system of units and appropriate significant figures to express quantities, convert units and perform quantitative calculations in science.	III: 2,5	K
	By the end of the course, students will be able to diagram the structure of the atom in terms of its subatomic particles; and justify the existence and nature of the subatomic particles and the scale of the nucleus using appropriate experiments from scientific history.	III: 1,2	K & S
	By the end of the course, students will be able to use the IUPAC system of nomenclature and knowledge of reaction types to describe chemical changes, predict products and represent the process as a balanced equation.	III: 4	K, S & R
	By the end of the course, students will be able to apply the mole concept to amounts on a macroscopic and a microscopic level and use this to perform stoichiometric calculations including for reactions in solution and gases.	III: 2,4	K, S & R
	By the end of the course, students will be able to apply the gas laws and kinetic molecular theory to relate atomic level behavior to macroscopic properties.	III: 2,4	S
	By the end of the course, students will be able to describe the ways in which atoms combine to form molecules (ionic and covalent). Apply knowledge of electronic structure to determine molecular structure, geometry and hybridization.	III: 2,4	K & S
	By the end of the course, students will be able to analyze how periodic properties (valence, electronegativity, etc.) and reactivity of elements result from electron configurations of atoms.	III: 4	K
	By the end of the course, students will be able to explain the intermolecular attractive forces that determine physical properties; apply this knowledge to qualitatively evaluate these forces; and predict the physical properties that result.	III: 2	K, S & R
	By the end of the course, students will be able to calculate solution concentrations in various units and explain the effects of temperature, pressure and structure on solubility.	III: 2	K & S
	By the end of the course, students will be able to explain rates and rate laws; determine the rate, rate law and rate constant of a reaction; and calculate concentration as a function of time and *vice versa* .	III: 2,4; II: 1,2	K & S
	By the end of the course, students will be able to explain the collision model of reaction dynamics, including activation energy, catalysts and temperature; derive a rate law from a reaction mechanisml; and evaluate the consistency of a mechanism with a given rate law.	III: 2,4	K, S & R

	By the end of the course, students will be able to recognize oxidation-reduction reactions; and identify oxidizing and reducing agents.	III: 2,4	K
	By the end of the course, students will be able to describe the dynamic nature of chemical equilibrium and its relation to reaction rates; and apply Le Chatelier's Principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures.	III: 2	S
	By the end of the course, students will be able to describe the equilibrium constant and use it to determine whether equilibrium has been established; and calculate equilibrium constants from equilibrium concentrations and *vice versa*.	III: 2,4; II: 2	K, S & R
	By the end of the course, students will be able to describe the different models of acids and base behavior and recognize common acids and bases.	III: 2	K & S
	By the end of the course, students will be able to apply equilibrium principles to aqueous solutions, including acid-base and solubility reactions; and calculate pH and species concentrations in buffered and unbuffered solutions.	III: 2,4; II: 2	S
	By the end of the course, students will be able to recognize the basic radioactive decay modes; compare the penetrating and ionizing power of various types of radiation; fill in a missing species in a balanced nuclear equation; and perform half-life calculations for radioactive isotopes.	III: 2,5	K, S & R
CHEM 121: General Chemistry	By the end of the course, students will be able to relate the development of essential chemical theories to the application of the scientific method.	III: 1	K
	By the end of the course, students will be able to use dimensional analysis, the SI system of units and appropriate significant figures to express quantities, convert units and perform quantitative calculations in science.	III: 2,5	K & S
	By the end of the course, students will be able to explain the structure of the atoms, isotopes and ions in terms of its subatomic particles.	III: 1,2	K & S
	By the end of the course, students will be able to use the IUPAC system of nomenclature and knowledge of reaction types to describe chemical changes, predict products and represent the process as a balanced equation.	III: 4	K & S
	By the end of the course, students will be able to describe physical states and changes, and distinguish these from chemical changes.	III: 4	K & S
	By the end of the course, students will be able to apply the mole concept to amounts on a macroscopic and a microscopic level; and use this to perform stoichiometric calculations including for reactions in solution, gases and thermochemistry.	III: 2,4	K, S & R
	By the end of the course, students will be able to apply the gas laws and kinetic molecular theory to relate atomic level behavior to macroscopic properties.	III: 2,4	S

	By the end of the course, students will be able to describe the energy conversions that occur in chemical reactions, relating heat of reaction to thermodynamic properties such as enthalpy and internal energy; and calculate and describe how to measure energy changes in reaction.	III: 4,5	K, S & R
	By the end of the course, students will be able to use different bonding models to describe formation of compounds (ionic and covalent); and apply knowledge of electronic structure to determine molecular spatial arrangement and polarity.	III: 4	K, S & R
	By the end of the course, students will be able to analyze how periodic properties (e.g. electronegativity, atomic and ionic radii, ionization energy, electron affinity, metallic character) and reactivity of elements results from electron configurations of atoms.	III: 4	S
	By the end of the course, students will be able to apply principles of general chemistry to specific real world problems in environment, engineering and health-related fields.	III:4 II:2	K, S & R
CHEM 123L: Req. Lab for Chem 121 (1cr)	By the end of the course, students will be able to dress properly for laboratory work and wear safety googles for eye protection.	III: 2,5	K
	By the end of the course, students will be able to handle chemicals safely and properly, which include transfer and disposal of chemicals.	III: 2,5	K
	By the end of the course, students will be able to prepare solutions with an acceptable accuracy to a known concentration using volumetric flask.	III: 2,4	K
	By the end of the course, students will be able to properly prepare scientific graphs to demonstrate quantitative relationships between variables.	III: 2,4	K & S
	By the end of the course, students will be able to demonstrate mastery in experimental techniques for pressure measurements, calorimetric measurements and spectrophotometric measurements.	III: 2	K, S & R
	By the end of the course, students will be able to write simple hypotheses based on selected chemical principles and or observations.	III: 1,2	S
	By the end of the course, students will be able to design experimental procedure for simple lab questions.	III: 1,2	S
	By the end of the course, students will be able to properly use lab notebook to record experimental data and observations with correct significant figures and units.	III: 1,2,4	K & S
	By the end of the course, students will be able to make meaningful analysis of experimental data and summarize the results in a proper format.	III: 1,4	K
	By the end of the course, students will be able to communicate scientific arguments effectively and logically in a written and an oral form.	III: 1,3,5	K & S
	By the end of the course, students will be able to explain the intermolecular attractive forces that determine physical properties and phase transitions; apply this knowledge to qualitatively evaluate these forces from structure; and to predict the physical properties that result.	III: 2	K, S & R

CHEM 122: General Chemistry II	By the end of the course, students will be able to calculate solution concentrations in various units (molarity, molality, mole fraction, % by mass, and % m/v); and explain the effects of temperature, pressure and structure on solubility.	III: 2	S
	By the end of the course, students will be able to describe the colligative properties of solutions and explain them using intermolecular forces; and determine solution concentrations using colligative property values and vice versa.	III: 2,4	K & S
	By the end of the course, students will be able to explain reaction rates, rate laws, and half-life; determine the rate, rate law and rate constant of a reaction; and calculate concentration as a function of time and vice versa.	III: 2,4 II: 1,2	K & S
	By the end of the course, students will be able to explain the collision model of reaction dynamics, including activation energy, catalysts and temperature; derive a rate law from a reaction mechanism; and evaluate the consistency of a mechanism with a given rate law.	III: 2,4	K, S & R
	By the end of the course, students will be able to describe the dynamic nature of chemical equilibrium and its relation to reaction rates; apply Le Chatelier's Principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures.	III: 2	K, S & R
	By the end of the course, students will be able to describe the equilibrium constant and use it to determine whether equilibrium has been established; amd calculate equilibrium constants from equilibrium concentrations and vice versa.	III: 2,4 II: 2	K & S
	By the end of the course, students will be able to describe the different models of acids and base behavior and the molecular basis for acid strength.	III:2	K & S
	By the end of the course, students will be able to apply equilibrium principles to aqueous solutions, including acid-base and solubility reactions; and calculate pH and species concentrations in buffered and unbuffered solutions.	III: 2,4 II:2	K & S
	By the end of the course, students will be able to explain titration curves and speciation diagrams; and calculate concentrations of reactants from the former and determine dominant species as a function of pH from the latter.	III: 2,4 II:1,2	K, S & R
	By the end of the course, students will be able to explain and calculate the thermodynamic functions enthalpy, entropy and Gibbs free energy for a chemical system; and relate these to equilibrium constants and reaction spontaneity.	III: 2,4	K, S & R
	By the end of the course, students will be able to balance redox equations, express them as two half reactions and evaluate the potential, free energy and equilibrium K for the reaction, as well as predict the spontaneous direction.	III: 2,4	K & S

	By the end of the course, students will be able to construct a galvanic or electrolytic cell; determine the standard (and non-standard) cell potential of the former; and relate current to electron transfer rates in the latter.	III: 2,4	K, S & R
CHEM 124L: Req. Lab for Chem 122 (1cr)	By the end of the course, students will be able to dress properly for laboratory work and wear safety googles for eye protection.	III: 2,5	K
	By the end of the course, students will be able to handle chemicals safely and properly, which include transfer and disposal of chemicals.	III: 2,5	K
	By the end of the course, students will be able to prepare solutions accurately and correctly.	III: 2,4	K
	By the end of the course, students will be able to apply appropriate chemical principles to solve practical chemistry problems.	III: 2,4	K & S
	By the end of the course, students will be able to demonstrate mastery in experimental techniques for titrations, gravity or vacuum filtrations, extraction of proteins from food samples, monitoring reaction rates, pH measurements and voltage measurements from electrochemical cells.	III: 2	K & S
	By the end of the course, students will be able to write appropriate hypotheses for lab questions.	III: 1,2	S
	By the end of the course, students will be able to design experiments to obtain useful data for integrated lab questions.	III: 1,2	K
	By the end of the course, students will be able to properly use lab notebook to record experimental data and observations with correct significant figures and units.	III: 1,2,4	K & S
	By the end of the course, students will be able to make meaningful analysis of experimental data and summarize the results in a proper format.	III: 1,4	K & S
	By the end of the course, students will be able to communicate scientific arguments effectively and logically in a written and an oral form.	III: 1,3,5	S
	By the end of the course, students will be able to apply the mole concept to amounts at a microscopic level and use this to perform stoichiometric calculations for reactions in solution, gases and thermochemistry.	III: 2,4	K, S & R
	By the end of the course, students will be able to apply the mole concept to amounts at a microscopic level and use this to perform stoichiometric calculations for reactions in solution, gases and thermochemistry.	III: 2,4	K, S & R
	By the end of the course, students will be able to calculate solution concentrations in various units.	III: 2,4	K
	By the end of the course, students will be able to apply the gas laws and kinetic molecular theory to relate atomic level behavior to macroscopic properties.	III: 2,4	S
	By the end of the course, students will be able to explain the electronic structure of atoms, isotopes and ions in terms of its subatomic particles.	III: 2,3	S
	By the end of the course, students will be able to analyze how periodic properties (e.g. electronegativity, atomic and ionic radii, ionization energy, electron affinity, metallic character) and reactivity of elements results from electronic configurations of atoms.	III: 2	K & S

CHEM 131: Principles of Chemistry	By the end of the course, students will be able to describe the nature of chemical bonds (ionic and covalent).	III: 2	K & S
	By the end of the course, students will be able to apply knowledge of electronic structure to determine molecular structure and polarity.	III: 2	S
	By the end of the course, students will be able to explain the formation of different phases of matter and the underlying fundamental intermolecular interactions; describe physical states and changes; and distinguish these from chemical changes.	III: 2	K, S & R
	By the end of the course, students will be able to describe the energy conversions that occur in chemical reactions and state changes, relating heat of reaction to thermodynamic properties such as enthalpy and internal energy; and apply these principles to measure and calculate energy changes in reaction.	III: 2,4	K, S & R
	By the end of the course, students will be able to apply principles of general chemistry to specific real-world problems in environment, engineering and health-related fields.	III: 5	K, S & R
CHEM 132: Principles of Chemistry	By the end of the course, students will be able to describe the colligative properties of solutions and explain them using intermolecular forces; and determine solution concentrations using colligative property values and *vice versa* .	III: 2,4	K & S
	By the end of the course, students will be able to explain rates of reactions, rate laws, and half-life; determine the rate, rate law and rate constant of a reaction; calculate concentration as a function of time and *vice versa* ; and explain the principle of catalysis.	III: 2,4	K & S
	By the end of the course, students will be able to explain the collision model of reaction dynamics, including activation energy, catalysts and temperature; derive a rate law from a reaction mechanism; and evaluate the consistency of a mechanism with a given rate law.	III:2	K, S & R
	By the end of the course, students will be able to describe the dynamic nature of chemical equilibrium and its relation to reaction rates; and apply Le Chatelier's Principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures.	III: 2	K & S
	By the end of the course, students will be able to describe the equilibrium constant and use it to determine whether equilibrium has been established; and calculate equilibrium constants from equilibrium concentrations (including pressures) and *vice versa* .	III: 2,4	K, S & R
	By the end of the course, students will be able to describe the different models of acids and base behavior and the molecular basis for acid strength.	III:2	K & S
	By the end of the course, students will be able to apply equilibrium principles to aqueous solutions, including acid-base and solubility reactions; and calculate pH and species concentrations in buffered and unbuffered solutions.	III: 2,4	K & S

	By the end of the course, students will be able to explain titration curves and speciation diagrams; calculate concentrations of reactants from the former; and determine dominant species as a function of pH from the latter.	III: 2,4	K & S
	By the end of the course, students will be able to explain and calculate the thermodynamic functions enthalpy, entropy and Gibbs free energy for a chemical system; and relate these to equilibrium constants and reaction spontaneity.	III: 2,4	K & S
	By the end of the course, students will be able to balance redox equations; express them as two half reactions; and evaluate the potential, free energy and equilibrium K for the reaction; as well as predict the spontaneous direction.	III: 2,4	K, S & R
	By the end of the course, students will be able to construct a galvanic or electrolytic cell; determine the standard (and non-standard) cell-potential of the former; and relate current to electron transfer rates in the latter.	III: 2	K, S & R
	By the end of the course, students will be able to explain the basic chemical properties of main group and transition metal elements; and develop a broad understanding of several key branches of chemistry.	III: 2	K, S & R
EPS 101: Intro to Geology	By the end of the course, the student will be able to evaluate a set of data in order to define a problem, pose a hypothesis and describe how the hypothesis can be tested.	III: 1,2,4	K
	By the end of the course, students will be able to state the age of the Earth and describe how geologists measure absolute rock ages by radioactive decay.	III: 1,3	K & S
	By the end of the course, students will be able to determine the relative order in which a series of geologic events occurred by applying the concepts of relative dating.	III: 1,3	K & S
	By the end of the course, students will be able to describe the compositional (crust, mantle, core) and mechanical (lithosphere, asthenosphere, outer core, and inner core) layers that exist in the Earth.	III: 3	K
	By the end of the course, students will be able to use the concept of isostasy to explain why continental crust is at a higher elevation than the oceanic crust.	III: 1,2,3,4	K & S
	By the end of the course, students will be able to describe the three main rock types (igneous, sedimentary and metamorphic) and how they form in the context of the rock cycle.	III: 3	K & S
	By the end of the course, students will be able to explain the evidence for the plate tectonic processes that occur at each of the three types of plate boundaries.	III: 2,3	K & S
	By the end of the course, students will be able to describe the geologic processes involved in formation and concentration of a significant geologic resource (examples include fossil fuels and metals).	III: 3,4	K & S
	By the end of the course, students will be able to describe the processes that are responsible for specific geologic hazards (e.g., earthquakes, volcanic eruptions, mass movement, flooding, etc.).	III: 3,5	K, S & R

EPS 105L: Opt. Lab for EPS 101 (1cr)	By the end of the course, students will be able to construct a hypothesis, propose a test, and then complete the test using quantitative and spatial data.	III: 1,2	K
	By the end of the course, students will be able to make measurements and make calculations using those measurements that lead to graphical display and interpretation of data.	III: 4	K
	By the end of the course, students will be able to analyze graphical data and use the graphs to make interpretations.	III: 2	K & S
	By the end of the course, students will be able complete a written report that effectively communicates an interpretation of quantitative and spatial data to evaluate a societally relevant geologic problem.	III: 3,5	K, S & R
	By the end of the course, students will be able to provide written descriptions of rocks that correctly uses geological terminology and links these descriptions to an acceptable explanation of rock origins.	III: 3	K & S
	By the end of the course, students will be able to provide a written explanation of the geologic history (including ages of events) of a location portrayed in photograph or diagram.	III: 3,4	K & S
	By the end of the course, students will be able to interpret scales and elevations on a topographic contour map.	N/A	K
	By the end of the course, students will be able to determine the rate of plate motions by using spatial and graphical data.	III: 4	K
EPS 201L: Earth History	By the end of the course, students will be able to use data obtained from rocks to interpret and write about events in Earth history.	III: 2,5	K & S
	By the end of the course, students will be able to explain how the age of Earth and the ages of events in Earth history are determined.	III: 4	K
	By the end of the course, students will be able to explain, apply and evaluate the evidence provided by fossils for biological evolution.	III: 1,2	K, S & R
	By the end of the course, students will be able to explain how plate tectonics accounts for the major features of Earth’s surface.	III: 3	K & S
	By the end of the course, students will be able to explain the natural processes that cause climate change over time scales of millennia-tens of thousands of years to many tens of millions of years-and put these processes in context with modern climate change influenced by human activities.	III: 3,5	K & S
	By the end of the course, students will be able to explain the processes that control surface and deep ocean circulation patterns and how circulation changes influence the global climate.	III: 2	K, S & R
	By the end of the course, students will be able to clearly state what is meant by an observation, hypothesis, hypothesis test and a theory.	III: 1	K

ENVS 101: The Blue Planet	By the end of the course, students will be able to describe examples of questions science can answer and those that cannot be answered by science	III: 1	K
	By the end of the course, students will be able to construct simple hypotheses and develop possible hypothesis tests related to environmental geoscience.	III: 2,5	K & S
	By the end of the course, students will be able to read material presented in popular literature (e.g., Scientific American or National Geographic) and report on hypotheses presented, hypothesis tests used and results of reported work. <u>Course level instruction objectives:</u> Students will evaluate whether results reported are scientifically based, given their level of experience with the topic.	III: 1,3,5	K, S & R
	By the end of the course, students will be able to evaluate rate problems in geoscience (e.g., rate at which tectonic plates separate, relative rate of seismic wave movement, and rate of water flow in channels or aquifers).	III: 4	K
	By the end of the course, students will be able to draw plate tectonic cross sections and report locations of related earthquakes and volcanoes.	III: 3,4	K
	By the end of the course, students will be able to construct, read and interpret common graphs used in geoscience (e.g., hydrographs, rainfall vs. time, temperature/CO2 change through time, etc.).	III: 4	K & S
	By the end of the course, students will be able to discuss hypotheses related to global warming; and describe scientific evidence for global warming.	III: 1,5	K & S
	By the end of the course, students will be able to explain mechanisms of climatic change (e.g., the greenhouse effect).	III: 3,5	K, S & R
	By the end of the course, students will be able to define basic concepts in water resources (e.g., stream discharge, aquifer recharge/discharge, and water table).	III: 3,5	K
	By the end of the course, students will be able to explain the link between energy resource use and environmental impact in a scientific manner.	III: 3,5	K & S
	By the end of the course, students will be able to evaluate tectonic plate boundary types from a relief map of the Earth; and identify potential geologic hazards along the different boundaries.	III: 3	K, S & R
	By the end of the course, students will be able to construct a hypothesis, propose a test and then complete the test using quantitative and spatial data.	III: 1,2	K
	By the end of the course, students will be able to make measurements and make calculations using those measurements that lead to graphical display and interpretation of data.	III: 4	K
	By the end of the course, students will be able to make and use observational data to infer geologic/environmental processes.	III: 2,5	K

ENVS 102L: Opt. Lab for ENVS 101 (1cr)	By the end of the course, students will be able to analyze graphical data; and use the graphs to make interpretations.	III: 2	S
	By the end of the course, students will be able to effectively communicate (written and/or oral) an interpretation of quantitative and spatial data to evaluate a societally relevant environmental problem.	III: 3,5	K, S & R
	By the end of the course, students will be able to use the basics to function successfully in a field setting, including use of some basic equipment and techniques, and putting into practice the basic steps of collecting field data.	III: 4	K & S
	By the end of the course, students will be able to interpret scales and elevations on a topographic contour map.	N/A	K
	By the end of the course, students will be able to use observational data in one context and apply this information in other contexts.	III: 2,5	K & S
GEOG 101: Physical Geography	By the end of the course, students will be able to identify the basic atmospheric, geological, hydrological and biological processes that shape Earth's landscapes.	III: 1,2,4	K
	By the end of the course, students will be able to explain physical geographic variation across the Earth's surface over time.	III: 1,2,4	K & S
	By the end of the course, students will be able to identify and analyze the current and historical physical processes responsible for shaping specific landscapes.	III: 1,2,5	K, S & R
	By end of the course, students will be able to use spatial identification systems and geographic technology to locate specific physical features on Earth's surface.	III: 2,3,4	K & R
GEOG 105L: Opt. Lab for GEOG 101 (1cr)	By end of the course, students will be able to identify, describe, and analyze the primary processes that produce spatial variation on Earth's surface.	III: 1,2,3,4	K & S
	By the end of the course, students will be able to identify, describe, and predict likely environmental impacts of possible human activities within specific landscapes.	III: 1,2,3,4,5	K, S & R
	By the end of the course, students will be able to identify, describe, and analyze the current and historical physical processes responsible for shaping specific landscapes.	III: 1,2,5	K & S
	By the end of the course, students will be able to use spatial identification systems and geographic technology to locate specific physical features on Earth's surface.	III: 2,3,4	K, S & R
	By the end of the course, students will be able to describe and demonstrate the differences between position, speed, velocity and acceleration. <u>Course level instruction objectives:</u> This includes interpreting graphs of any of these variables vs time as well as creating such graphs. Students will be able to quantitatively work with those three variables as well as describe them without math for young children. Students will be able to describe several relevant in-class activities for K-8 students.	III: 2,3,4	K

NTSC 261L: Physical Science (4cr)	By the end of the course, students will be able to illustrate Newton's three laws, both conceptually and mathematically. Course level instruction objectives: Students will be able to describe several relevant in-class activities for K-8 students regarding each of the three laws, including those that reveal Newton's laws through the experimental method / inquiry.	II: 1,2,3,4	K
NTSC 261L: Physical Science (4cr)	By the end of the course, students will be able to describe the effects of gravity. Course level instruction objectives: This includes gravitational force and acceleration. Students will be able to demonstrate the effects of gravity both in classroom demonstrations and on computer models. Students will be able to describe several relevant inquiry-based in-class activities for K-8 students.	II: 1,2,3,4	S
NTSC 261L: Physical Science (4cr)	By the end of the course, students will be able to describe how energy travels in waves using terms such as period, wavelength, amplitude, frequency, etc. Course level instruction objectives: Students will be able to treat such physics problems mathematically, graphically, and conceptually.	II: 1,2,4	K, S & R
NTSC 261L: Physical Science (4cr)	By the end of the course, students will be able to demonstrate basic principles of sound waves. Course level instruction objectives: Students will be able to build at least one apparatus demonstrating a feature of sound waves. Students will be able to describe several relevant in-class activities for K-8 students.	II: 1,2,3,4	K & S
NTSC 261L: Physical Science (4cr)	By the end of the course, students will be able to demonstrate basic principles of light waves. Course level instruction objectives: Students will be able to build at least one apparatus demonstrating a feature of light waves. Students will be able to describe several relevant in-class activities for K-8 students.	II: 2,3,4	K & S
NTSC 261L: Physical Science (4cr)	By the end of the course, students will be able to describe the large-scale structures of the universe and the life cycle of stars. Course level instruction objectives: Students will be able to describe how scientists are able to study and gain information about distant objects in the universe. Students will be able to describe several relevant in-class activities for K-8 students.	II: 1,2,3,4	S

	By the end of the course, students will be able to describe the fundamental properties of our solar system, including the major features of each planet. Course level instruction objectives: Students will be able to describe the series of events leading up to the formation of the solar system and be able to illustrate the evidence used by scientists to lead to this theory. Students will be able to construct a properly scaled solar system within the confines of any area such as a playground. Students will be able to describe several relevant in-class activities for K-8 students.	II: 2,3,4	K, S & R
NTSC 262L: Life Science (4cr)	By the end of the course, students will be able to describe examples of adaptations of plants and animals to their environments, both external and internal, as well as animal senses and responses to their environment and patterns of animal life cycles. Course level instruction objectives: Students will be able to describe several relevant in-class activities for K-8 students. III: 1,2,3	III: 1,2,3	K, S & R
	By the end of the course, students will be able to plan and conduct an investigation into the growth and life cycle of plants; and describe the role of photosynthesis in Earth's ecosystems. Course level instruction objectives: Students will be able to describe several relevant in-class activities for K-8 students.	III: 1,2,3	K, S & R
	By the end of the course, students will be able to describe the function of cells internally and in systems with other cells. Course level instruction objectives: Students must be able to identify and describe the major body systems of vertebrates: circulatory, excretory, digestive, respiratory, muscular, and nervous. They will be able to describe several relevant in-class activities for K-8 students.	III: 2,3	K & S
	By the end of the course, students will be able to model sources of energy for plant and animal life. Course level instruction objectives: This includes tracing the one-way path of energy in ecosystems as well as the cycle of matter in ecosystems (verbally or through diagram). Students will be able to describe several relevant in-class activities for K-8 students.	III: 2,3,4,5	K
	By the end of the course, students will be able to demonstrate the effects of resource availability on organisms and populations in ecosystems and how changes in ecosystems affect populations. Course level instruction objectives: This includes describing and modeling species interaction patterns seen across ecosystems such as the effect of predators on prey populations or mutually dependent species.	III: 1,2,3,4,5	K, S & R

	By the end of the course, students will be able to describe the major ideas of heredity and natural selection. Course level instruction objectives: This includes the ability to design experiments that investigate the effect of local resources on a plant or animal's growth. Students will be able to discuss genetic variation between asexual and sexual reproduction.	III: 1,2,3,5	S
	By the end of the course, students will be able to describe the various lines of evidence that support the theory of evolution. Course level instruction objectives: Students must demonstrate the ability to communicate these ideas to a K-8 audience.	III: 1,2,3	K & S
	By the end of the course, students will be able to teach middle school students about the basic principles of weather. Course level instruction objectives: This includes cloud identification, humidity (mixing ratio, dew point, relative humidity), air pressure, wind, atmospheric structure, convective storms, frontal systems, and ENSO. Students must be able to read weather maps and make predictions about the weather. Students will be able to describe several relevant in-class activities for K-8 students.	III: 1,2,3,4,5	K, S & R
	By the end of the course, students will be able to identify major climatic zones in the world; and describe the atmospheric phenomenon that are responsible for creating these zones, including a particularly detailed explanation of the climate of New Mexico and the American Southwest. Course level instruction objectives: Students will be able to draw and describe the major global circulation patterns in the atmosphere and ocean. Students will be able to describe several relevant in-class activities for K-8 students.	III: 1,2,3,4,5	K, S & R
	By the end of the course, students will be able to teach others about the evidence for climate change and why scientists theorize that anthropogenic greenhouse gasses are responsible. Course level instruction objectives: Students will be able to describe and diagram out the greenhouse effect and the carbon cycle. Students will be able to list some of the consequences of climate change, including impacts on ecosystems and human populations around the world. Students will be able to describe several relevant in-class activities for K-8 students.	III: 1,2,3,4,5	K, S & R

NTSC 263L: Environmental Science (4 Cr)	By the end of the course, students will be able to describe how 40 million people are able live in the American Southwest despite most of it being arid or semi-arid desert. Course level instruction objectives: Given a blank map, students will be able to identify the major water projects that affect water resources of the American Southwest. Students will able to describe the ecological impacts of major water projects and the political controversies surrounding such projects. Students will be able to describe several relevant in-class activities for K-8 students.	III: 5	K & S
	By the end of the course, students will be able to describe and draw human population growth in the past few thousand years and compare it to the naturally occurring growth curves observed in nature. Course level instruction objectives: Students will be able to explain how this population growth has affected Earth's environment including air pollution, greenhouse gasses, freshwater use, and mineral extraction. Students will be able to describe several relevant in-class activities for K-8 students.	III: 3,4,5	K, S & R
	By the end of the course, students will be able to solve math problems involving powers of 10, including scientific and engineering notation. Course level instruction objectives: Students will be able to work problems dealing with units correctly and converting between decimal, scientific, and engineering notations as needed. Students will be able to describe several relevant in-class activities for K-8 students.	III: 4	S
	By the end of the course, students will be able to design, build and troubleshoot basic electrical circuits that utilize light bulbs, motors, switches, resistors and other common parts. Course level instruction objectives: Students will be able to design both series and parallel circuits and use a mustimeter to measure characteristics of the circuit such as current and voltage. Students will be able to calculate power and energy based upon the measurements that they take. Students will be able to describe several relevant in-class activities for K-8 students.	III: 2,4,5	K, S & R
	By the end of the course, students will be able to describe the different methods in which electricity is generated, along with the pros and cons of each method, including environmental impacts. Course level instruction objectives: Given different lifestyle scenarios, students will be able to calculate energy use and the resulting carbon footprints. Students will be able to describe several relevant in-class activities for K-8 students.	III: 2,3,4,5	K, S & R

PHYC 102: Introduction to Physics	By the end of the course, students will be able to answer positively on at least five questions surveying coverage of topics.	III: 3	K
	By the end of the course, students will be able to recognize basic elements of science and the scientific approach to understanding nature at least at the satisfactory level.	III: 1	K
	By the end of the course, students will be able to apply physical models in simple situations at least at the satisfactory level.	III: 2	K & S
	By the end of the course, students will be able to read and interpret information from graphs at least at the satisfactory level.	III: 2,4	K
PHYC 102L: Opt. Lab for PHYC 102 (1cr)	By the end of the course, students will be able to answer positively on at least five questions surveying coverage of topics.	III: 3	K
	By the end of the course, students will be able to recognize basic elements of science and the scientific approach to understanding nature at least at the satisfactory level.	III: 1	K
	By the end of the course, students will be able to apply physical models in simple situations at least at the satisfactory level.	III: 2	K & S
	By the end of the course, students will be able to read and interpret information from graphs at least at the satisfactory level.	III: 2,4	K & S
PHYC 105: Physics and Society	The Nature of Scientific Inquiry: By the end of the course, students will be able to articulate that physics and all natural science is based on observations of nature that can be replicated and scrutinized by others. Course level instruction objectives: Students will be able to articulate that scientific theories are logical and thoroughly tested against observations and that those that contradict observations are discarded.	III: 1	K & S
	Waves and Particles: By the end of the course, students will be able to articulate that there are two great intellectual models of the material universe–particles and waves. Course level instruction objectives: Students will be able to articulate how the particle model has led to deep understanding, not only of the motion of planets, but also of the mechanical, thermal, and optical properties of matter. Students will be able to articulate how the wave model has led to deep understanding of material waves (mechanical vibrations, sound, seismic waves, water waves), electromagnetic waves (radio waves, light, X-rays), and quantum waves.	III: 2	K
	The Laws of Physics: By the end of the course, students will be able to identify the fundamental laws of physics–laws of mechanics, laws of thermodynamics, laws of electromagnetism, laws of quantum physics and conservation laws. Course level instruction objectives: Students will be able to articulate when these laws are valid and when they are known to fail. Students will recognize the working of these laws in the life of society and in their every-day life.	III: 2,5	K & S
	Analysis:		

	By the end of the course, students will be able to apply the laws of physics and the rules of logic and simple mathematics to understand simple, realistic physical situations.	III: 2,4,5	K, S & R
	Communication. By the end of the course, students will be able to communicate effectively about physics subjects.	III: 3	S
PHYC 151: General Physics	Unit Conversion: By the end of the course, students will be able to convert from non-metric system units to metric system units and vice versa (for example, from miles to hour to meters per second).	III: 4	K
	Vectors: By the end of the course, students will be able to complete simple operations with vectors. Course level instruction objectives: These include resolving a vector into components, adding vectors using components, finding the magnitude of a vector given its components and finding the direction of a vector given its components.	III: 2,4,5	K
	Motion with Constant Acceleration: By the end of the course, students will be able to solve problems involving motion with constant acceleration. Course level instruction objectives: Many everyday type events will be modeled as problems of this type. These include both horizontal motion (examples, an aircraft taking off on the runway, an automobile coming to a stop) and vertical motion near Earth's surface where the acceleration of gravity can be considered constant (for example, a ball thrown straight up in the air). Projectile motion problems also fall into this category; these involve objects experiencing vertical and horizontal motion at the same time (for example, a baseball hit at an angle of 30 degrees above the horizontal).	III: 2,4,5	S
	Newton's Second Law: By the end of the course, students will be able to solve a variety of problems with Newton's second law. Course level instruction objectives: Problems of various types (possible examples include effects of forces on objects, circular motion, orbits of planets, inclined planes and motion with friction) will be analyzed.	III: 2,4,5	K & S
	Fluids: By the end of the course, students will be able to solve problems involving fluid statics and fluid flow. Course level instruction objectives: Applications of fluid statics may, for example, include pressure in a fluid and buoyancy. Use of Bernoulli's equation and the continuity equation are examples of fluid flow.	III: 2,4,5	K & S

PHYC 151L: Opt. Lab for PHYC 151 (1cr)	By the end of the course, students will be able to solve problems involving the concepts of velocity, acceleration, Newton's laws and energy at the math level of pre-calculus and trigonometry.	III: 2,5	K & S
PHYC 152: General Physics	<u>Coulomb's Law</u>: By the end of the course, students will be able to solve problems using Coulomb's Law. <u>Course level instruction objectives:</u> Examples would include understanding the inverse square dependence of Coulomb's law, calculating the total electric force on a charge due to 1 other charge, and using superposition to calculate the total force from two other charges or to combine an electric force with another force such as gravity.	III: 4	K & S
	<u>Magnetic Fields</u>: By the end of the course, students will be able to identify magnitudes and directions of magnetic fields. <u>Course level instruction objectives:</u> Examples would include finding the magnitude and direction of a magnetic force on a moving charge or a current carrying wire, recognizing how we know that a current carrying wire produces a magnetic field, calculating the magnetic field due to a current carrying wire, and determining if a particular field would affect a compass.	III: 1,4,5	K
	<u>Simple Circuits</u>: By the end of the course, students will be able to make calculations involving simple circuits. <u>Course level instruction objectives:</u> Examples would include recognizing series and parallel resistors, calculating current, resistance, voltage and power, and showing where a voltmeter or ammeter is connected to a circuit to measure voltage or current.	III: 2,4	K & S
	<u>Geometric Optics</u>: By the end of the course, students will be able to recognize and draw correct ray diagrams for geometric optics and perform related calculations. <u>Course level instruction objectives:</u> Examples would include plane mirrors, spherical mirrors, lenses, and the transitions between materials of differing indices of refraction.	III: 3	K & S
	<u>Faraday's Law</u>: By the end of the course, students will be able to determine the direction of induced currents and find the magnitude of induced voltages. <u>Course level instruction objectives:</u> Examples would include changing B fields and moving loops. An application example could include the basic concepts pertaining to transformers.	II: 2,4,5	K, S & R
PHYC 152L: Opt. Lab for PHYC 152 (1 cr)	By the end of the course, students will be able to solve problems involving the concepts of electric charge, electric fields and the electric force electric potential and energy, magnetic fields and force, and electromagnetic induction at the math level of trigonometry and pre-calculus.	III: 2,4,5	K, S & R

PHYC 160: General Physics	Motion with Constant Acceleration: By the end of the course, students will be able to solve problems involving motion with constant acceleration. Course level instruction objectives: Many practical events will be modeled as problems of this type. These include both horizontal motion (for example, an aircraft taking off on the runway, an automobile coming to a stop) and vertical motion near Earth's surface where the acceleration of gravity can be considered constant (for example, a ball thrown straight up in the air). Projectile motion problems also fall into this category; these involve objects experiencing vertical and horizontal motion at the same time (for example, a baseball hit at an angle of 30 degrees above the horizontal).	III: 2,4,5	K & S
	Newton's Second Law: By the end of the course, students will be able to solve a variety of problems with Newton's second law. Course level instruction objectives: Problems of various types (possible examples include effects of forces on objects, circular motion, orbits of planets, inclined planes and motion with friction) will be analyzed.	III: 2,4,5	S
	Newton's Universal Law of Gravity: By the end of the course, students will be able to solve problems involving Newton's Universal Law of Gravity. Course level instruction objectives: Possible examples may include planetary orbits, calculation of the acceleration of gravity on a planet, derivation of Kepler's 3rd law and calculation of forces that masses attract each other.	III: 2,4,5	K & S
	Conservation of Energy and Momentum: By the end of the course, students will be able to solve problems involving the Conservation of Energy and Momentum. Course level instruction objectives: Possible examples of problems include elastic and inelastic collisions and the basic concepts of impulse, momentum, kinetic energy, gravitational potential energy and elastic potential energy.	III: 2,4,5	K & S
	Rotational Motion: By the end of the course, students will be able to solve problems involving Rotational Motion. Course level instruction objectives: Many concepts and their application can be included in rotational motion; possible examples include angular momentum, moment of inertia, conservation of angular momentum, angular velocity, angular acceleration and torque.	III: 2,4,5	K & S
PHYC 160L: Opt. Lab for PHYC 160 (1cr)	By the end of the course, students will be able to solve problems involving the concepts of velocity, acceleration, Newton's laws and energy at a math level of elementary calculus.	III: 2,5	K, S & R
	Electric Force and Field:		

PHYC 161: General Physics	By the end of the course, students will be able to solve problems involving electric forces and electric fields. Course level instruction objectives: Examples would include problems such as calculating forces using Coulomb's Law, using superposition to add forces, using Gauss' Law to solve for electric fields or charge distributions, and interpreting information from sketches of electric field lines.	III: 3,4	S
	Magnetic Fields: By the end of the course, students will be able to identify magnitudes and directions of magnetic fields. Course level instruction objectives: Examples would include finding the magnitude and direction of a magnetic force on a moving charge or a current carrying wire, recognizing how we know that a current carrying wire produces a magnetic field, calculating the magnetic field due to a current carrying wire, and determining if a particular field would affect a compass.	III: 1,4,5	K
	Ohm's Law and Simple Circuits: By the end of the course, students will be able to make calculations involving simple circuits. Course level instruction objectives: Examples would include recognizing series and parallel resistors, calculating current, resistance, voltage and power, and showing where a voltmeter or ammeter is connected to a circuit to measure voltage or current.	III: 2,4	K & S
	Faraday's and Lenz' Laws: By the end of the course, students will be able to determine the magnitude and direction of induced currents and voltages. Course level instruction objectives: Examples of applications could include generators or transformers.	II: 2,4,5	S
	Thermodynamics: By the end of the course, students will be able to recognize and apply the first and second law of thermodynamics. Course level instruction objectives: Examples for the First Law of Thermodynamics would include the connection between heat, work and the conservation of energy, specific heat, phase changes, PV diagrams and thermodynamic graphs, and the determination of the amount of heat and work added to a system for various processes. Examples for entropy and the Second Law of Thermodynamics would include understanding entropy at a conceptual level as disorder, calculating changes in entropy for several processes, recognizing the Second Law of Thermodynamics in several forms, and stating whether a particular process violates the second law of thermodynamics.	III: 2,5	K, S & R
PHYC 161L: Opt. Lab for PHYC 161 (1cr)	By the end of the course, students will be able to solve problems involving the concepts of electric charge, electric fields and the electric force electric potential and energy, magnetic fields and force, and electromagnetic induction a math level of elementary calculus.	III: 2,4,5	K & S

UHON 203: Science in the 21st Century	By the end of the course, students will be able to articulate scientific method and how it is practiced by the disciplines represented in this theme.	III: 1	K & S
	By the end of the course students will be able to apply the scientific method and scientific techniques appropriate to the theme of the course to address problems.	III: 2,4,5	K, S & R
	By the end of the course students will be able to communicate the results of scientific analyses.	III: 3	S