NorthWest Arkansas Community College
Division of Science and Mathematics

Course Number: PHYS 1024 Physics & Human Affairs

Catalog Description: The great ideas of physics, together with their philosophical and social impact. Scientific topics include mechanics, electromagnetism, cosmology, relativity, and quantum mechanics. Philosophical and social topics include methods and values of science, problems related to energy sources, and implications of modern weapons. Designed for non-science majors. Will satisfy a 4-hour physical science requirement toward a B.A. degree. Lecture and laboratory.

Prerequisites: None

Credit/Contact/Load Hours: 4 credit hours, 6 contact hours, 5 load hours

Target Audience and Transfer: This course will satisfy a 4-hour physical science requirement toward a B.A. degree. It is designed for non-science majors, primarily in the areas of business, education, history, & political science. This course transfers to most 4-year colleges and universities.

Student Learning Outcomes: The student will:

1. Describe the development of the model of our solar system from both a scientific and historical perspective; explain, compare, and contrast the various models. Know who developed them. List the Models of the Atom and identify which physical phenomena each can be used to describe.
2. List the steps in the scientific method and apply it to the development of the Atomic Theory of Matter. Know who was involved and what evidence confirmed the theory.
3. Define length, mass, and time; distinguish between fundamental and secondary dimensions and/or units; recognize and define scalar and vector values; know how to convert from one system of measurements to another.
4. Define distance, displacement, speed, velocity, and acceleration. Apply basic kinematics formulas to one-dimensional motion. State and explain the Law of Inertia and the Law of Falling Objects.
5. Define force and inertia; identify and represent the various types of forces on a free-body diagram; determine the net force acting on an object. State, explain, compare, contrast, and apply Newton's Three Laws of Motions.
6. Define gravity and weight; explain and apply Newton's Law of Universal Gravitation and the concept of an inverse-squared relationship. Describe the experiment that "weighed the world". Know who performed it.
7. Define, compare, and contrast the concepts of work, energy, power, and efficiency. Recognize the type of energy an object has by virtue of some physical property of the object. State and explain the Law of Conservation of Energy and apply basic mechanical energy formulas.
8. Define, compare, and contrast the concepts of temperature, heat, and thermal energy; apply temperature conversion formulas. Describe the experiment that determined the mechanical equivalence of heat. Know who performed it. State and explain the Laws of Thermodynamics: Zeroth, First, Second (3 statements), and Third.
9. Define: what a wave is, wavelength, period, frequency, amplitude, and wavespeed; and apply the basic wave formulas. Describe the experiment that demonstrated the wave nature of light. Know who performed it. Describe and explain the electrical and/or magnetic properties of an object at both the macroscopic and atomic level. Know how either two charged or two magnetic objects behave when they interact.
10. Describe Maxwell's Equations. Explain what an electromagnetic wave is and describe its characteristics. Identify the various types of EM-waves that make up the Electromagnetic Spectrum. Know their relative placement on the EM-spectrum.
11. State the principles of both the Special & General Theories of Relativity along with the implications of each. Know who developed the theories and when. Explain the Big Bang theory; list and describe the evidence for the theory.
12. Describe the Photoelectric Effect and its implication. Know who explained it and when. Explain the wave-particle dualities of matter and radiation. State the evidence for each. Apply basic wave-particle formulas. Define quantum uncertainty and apply the Uncertainty Principle. Explain what an emission spectrum is and apply it to energy level diagrams.
13. Define atomic number and mass number as it pertains to elements and isotopes. Define nuclear process, radioactive decay, fusion, fission, and half-life. Explain alpha and beta decay. Identify the resulting element. Explain the thermonuclear fusion process in stars. Explain the process involved in producing a fission bomb. Know the primary elements involved in each.

Topics:

1. Models of the Solar System & Atom
2. Scientific Method
3. Measurement and units
4. One-dimensional motion
5. Newton's Laws of Motion
6. Gravitation
7. Work and Energy

8. Thermodynamics
9. Light & Electrostatics
10. Electromagnetic Waves
11. Special & General Relativity
12. Basic Quantum Theory
13. Nuclear Physics