

**J. Sargeant Reynolds Community College
Course Content Summary**

Course Prefix and Number: PHY 101

Credits: 4

Course Title: Introduction to Physics I

Course Description: Surveys general principles of physics. Includes topics such as force and motion, energy, heat, sound, light, electricity and magnetism, and modern physics. Part I of II. Prerequisites: high school mathematics, including algebra, trigonometry, and logarithms. Lecture 3 hours. Laboratory 3 hours. Total 6 hours per week.

General Course Purpose: The goal of the course is for students to pursue actively an understanding and appreciation of their physical world. It is intended for all audiences, but is geared toward students in General Education, Business Administration, Liberal Arts, Social Sciences, and Radiation Science. This course will allow students to describe examples and applications of the principles studied, and to some extent, explore their social and philosophical implications and the utility and limitations of physics for the solution of problems in the modern world. Laboratory experiments and computer-based exercises will enhance and consolidate the understanding of basic physical principles and applications.

Course Prerequisites and Co-requisites:

Prerequisites: high school mathematics, including algebra, trigonometry, and logarithms

Student Learning Outcomes:

Upon completing the course, the student will be able to

- a. Plan and conduct investigations using experimental design and product design processes;
- b. Demonstrate how to analyze and interpret data;
- c. Demonstrate an understanding of the nature of science, scientific reasoning, and logic;
- d. Demonstrate how applications of physics affect the world;
- e. Demonstrate the interrelationships among mass, distance, force, and time through mathematical and experimental processes;
- f. Demonstrate that quantities including mass, energy, momentum, and charge are conserved;
- g. Demonstrate that energy can be transferred and transformed to provide usable work;
- h. Demonstrate wave phenomena;
- i. Demonstrate that different frequencies and wavelengths in the electromagnetic spectrum are phenomena ranging from radio waves through visible light to gamma radiation;
- j. Demonstrate how to use the field concept to describe the effects of gravitational, electric, and magnetic forces;
- k. Demonstrate how to diagram, construct, and analyze basic electrical circuits and explain the function of various circuit components; and
- l. Demonstrate that extremely large and extremely small quantities are not necessarily described by the same laws as those studied in Newtonian physics.

Major Topics to Be Included:

- a. Size
- b. Measurements

- c. Mechanics
 - 1. Linear Motion
 - 2. Projectile Motion
 - 3. Newton's Three Laws of Motion
 - i. Inertia
 - ii. Force and Acceleration
 - iii. Action and Reaction
 - 4. Momentum
 - 5. Energy
 - 6. Rotational Mechanics
 - i. Circular Motion
 - ii. Center of Gravity
 - 7. Universal Gravitation
 - i. Satellite Motion
 - 8. Special Relativity
 - i. Space and Time
- d. The Atomic Nature of Matter
 - 1. Solids
 - 2. Liquids
 - 3. Gases
- e. Heat and Temperature
 - 1. Thermal Expansion
 - 2. Heat Transfer
 - 3. Change of Phase
 - 4. Thermodynamics
- f. Vibrations and Waves
 - 1. Light
 - 2. Reflection and refraction
 - 3. Lenses
 - 4. Sound
 - 5. Diffraction and Interference
- g. Electricity and Magnetism
 - 1. Electrostatics
 - i. Electric Fields and Potential
 - 2. Electric Current
 - i. Electric Circuits
 - 3. Magnetism
 - i. Electromagnetic Induction
- h. Atomic and Nuclear Physics
 - 1. The Quantum
 - 2. Atomic Nucleus and Radioactivity
 - 3. Nuclear Fission and Fusion

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