

HIBBING COMMUNITY COLLEGE COURSE OUTLINE

COURSE NUMBER & TITLE: PHYS 1005 - Physics Concepts

CREDITS: 4 (3 Lec / 1 Lab)

PREREQUISITES: MATH 0971: Beginning Algebra or IST1350 and IST 1450: Industrial Technology Math Lab I and II or instructor consent

CATALOG DESCRIPTION:

Physics Concepts is an overview of the basic principles of physics from a conceptual and practical viewpoint with a minimal amount of math. Topics include mechanics, waves, sound, fluids, thermodynamics, electricity, magnetism, and light. It is designed for students in general education or those who are preparing to take additional physics courses. A laboratory component is included. MNTC goal area: (3)Natural Science.

OUTLINE OF MAJOR CONTENT AREAS:

- I. Units and problem solving
 - A. Units for length, mass, and time
 - B. The metric system
 - C. Dimensional analysis
 - D. Unit conversions
 - E. Significant figures
 - G. Problem solving
- II. Description of motion
 - A. Kinematics
 - B. Motion in two dimensions
 - C. Force and motion
- III. Work, energy, and momentum
 - A. Work done by forces
 - B. Work-energy theorem and kinetic energy
 - C. Potential energy and conservation of energy
 - D. Power
 - E. Linear momentum
 - F. Elastic and inelastic collisions
- IV. Circular and rotational motion
 - A. Angular measurement
 - B. Rigid bodies, translations, and rotations
 - C. Torque, equilibrium, and stability
 - D. Rotational work and kinetic energy
 - E. Angular momentum

- V. Solids and fluids
 - A. Solids and elastic moduli
 - B. Fluids: pressure and Pascal's principle
 - C. Buoyancy and Archimedes' principle
 - D. Fluid dynamics and Bernoulli's equation
- VI. Vibrations, waves, and sound
 - A. Simple harmonic motion
 - B. Wave motion
 - C. Standing waves and resonance
 - D. Sound waves
 - E. Sound intensity
 - F. The Doppler effect
- VII. Temperature, heat, and thermodynamics
 - A. Temperature
 - B. Gas laws and absolute temperature
 - C. Thermal expansion
 - D. Heat
 - E. Heat transfer
 - F. Thermodynamics
- VIII. Electricity
 - A. Electric charge, forces, and fields
 - B. Electric potential, energy, and capacitance
 - C. Electric current and resistance
 - D. Electric power
 - E. Basic electric circuits
- IX. Magnetism
 - A. Magnets and magnetic poles
 - B. Electromagnetism, magnetic forces, and the source of magnetic fields.
 - C. Electromagnetic induction
 - D. Transformers and power transmission
 - E. Electromagnetic waves
- X. Geometrical optics: reflection and refraction of light
 - A. Wave fronts and rays
 - B. Reflections and mirrors
 - C. Refraction and lenses
 - D. Total internal reflection and fiber optics
 - E. Optical instruments
 - F. Polarization

COURSE GOALS/OBJECTIVES/OUTCOMES:

Students will

1. perform dimensional analysis.
2. perform vector computations.
3. use kinematic equations to solve motion problems.
4. utilize Free Body Diagrams and Mass Accelerations Diagrams to solve dynamics kinetics problems.
5. use conservation of mechanical energy to analyze systems.
6. use the principle of conservation of momentum to analyze impacts and collision.
7. perform rotational mechanics analysis.
8. use the equations of fluid mechanics to analyze static and dynamic fluid systems.
9. perform oscillatory motion analysis.
10. use wave equations to analyze mechanical waves.
11. analyze sound wave phenomenon.
12. analyze temperature and heat transfer.
13. utilize the First and Second Law of Thermodynamics to interpret thermodynamic cycles.
14. analyze electric force using Coulomb's Law.
15. determine electric potential for simple generators.
16. utilize Ohm's Law and Kirchhoff's Laws to analyze simple DC circuits.
17. summarize electromagnetic induction.
18. explain electromagnetic waves and the nature of light.
19. utilize laboratory equipment to analyze reflection and refraction.
20. perform assigned laboratories in a team environment.
21. communicate all written work in a professional manner utilizing spreadsheets and word processing applications.

MNTC COMPETENCIES MET:

Natural Sciences

HCC COMPETENCIES MET:

Thinking Creatively & Critically

STUDENT CONTRIBUTIONS:

The student will attend class regularly, participate in class discussion, complete assignments and team laboratory or design projects, and take a comprehensive final examination. The student will spend sufficient time to complete all assignments.

**STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS
SELECTED/DEVELOPED BY THE COURSE INSTRUCTOR.**

**SPECIAL INFORMATION: (SPECIAL FEES, DIRECTIVES ON HAZARDOUS
MATERIALS, TEXTBOOK USED, ETC.)**

A basic calculator is required for this course.

AASC APPROVAL DATE: May 9, 2012

REVIEW DATE: May 2017

PHYS1005: so
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