

## PHYC 101 Physical Science Concepts for Teachers

### Course Description

Principles and concepts of the laws of nature involving mechanical, heat, light, electrical, nuclear, and chemical energy and the conservation laws associated with these forms of energy. Emphasizes applications appropriate to the classroom. Designed primarily for students in elementary education programs. A total of 3 hours of credit may be earned.

Prerequisites: none

### Course Objectives

This conceptual survey course will give preservice teachers content background and laboratory experiences in topics of physics and physical science, including, but not limited to, motion, forces, energy, waves, sound, light, electricity, magnetism, heat, and atomic structure. As a result of these experiences, students who complete this course will be better prepared to teach physics and physical science content and lead students in laboratory investigations that are related to topics addressed in the k-8 grade curriculum.

### Course Rationale

Physical science is the study of the principles and concepts of the laws of nature involving mechanical, heat, light, electrical, nuclear, and chemical energy and the conservation laws associated with these forms of energy. This course is designed primarily for the students in elementary education programs with emphasis on applications appropriate to the k-8 classroom, but is open to other preservice teachers. It is a one-semester, three credit hour course that includes both lecture and laboratory sessions. It provides a rapid overview of topics in physics and physical science.

Since the goal of the course is to develop elementary school science teachers who are knowledgeable in the physical sciences, the National Science Education Standards and the Indiana State Science Standards are used as a guide to the topics covered in the course.

### Course Content, Format, and Bibliography

#### *Content*

Topics covered in this course may include concepts of:

Measurement: the metric system, precision of measured quantities

Properties of Matter: states of matter, density

1D Motion: constant and accelerated motion, gravitational acceleration

Forces: Newton's laws of motion, friction, equilibrium, torque and balance

Mechanical Energy: kinetic energy, gravitational potential energy, elastic potential energy, simple machines, work, power, conservation of mechanical energy

Momentum and Impulse: elastic and inelastic collisions

Wave Characteristics and Properties: velocity, frequency, amplitude, wavelength, period, phase, standing waves, reflection, refraction, diffraction, interference

Sound Waves: sound production, music, speed of sound

Electromagnetic Radiation: speed of light, frequency, wavelength, polarization, electromagnetic spectrum

Light: mirrors and reflection, lenses and refraction, diffraction and interference, color

Static Electricity: Coulomb's law; electric potential difference, historical static devices

Current Electricity: cells and batteries, resistance, series/parallel/combo circuits, Ohm's law, light bulbs circuits, Kirchhoff's equations

Magnetism: magnetic fields, magnetic interactions

Electromagnetism: electromagnets, transformers, motors and generators

Thermal Energy: heat transfer, changes of state

Atomic Energy: the atom, radioactivity, nuclear fission and fusion

### *Format*

Students meet 2 hours per week in lecture and 2 hours per week in lab during the fall and spring semesters. Student work used to determine the student's course grade includes classwork, homework, laboratory activities and investigations, and examinations.

### *Bibliography*

**Physics by Inquiry: Volume I** by Lillian C. McDermott (1996). ISBN 0471144401

**Physics by Inquiry: Volume II** by Lillian C. McDermott (1996). ISBN 047114441X

**Five Easy Lessons: Strategies for Successful Physics Teaching** by Randall D. Knight (2002). ISBN 0-8053-8702-1

**Teaching Physics with the Physics Suite** by Edward Redish (2003). ISBN 0-471-39378-9

**Targeting Students' Science Misconceptions: Physical Science Concepts Using the Conceptual Change Model** by Joseph Stepan (2006). ISBN 1-891022-07-5

Recommended Textbook **Conceptual Physics**; Author: Paul Hewitt; Publisher: Addison-Wesley