PHYC 693 Theories for Physics for Secondary Physics Teachers

Course Description

Classical mechanics, relativity, electricity, quantum mechanics, and statistical mechanics used to enable students to use new developments and recent scientific advances. Designed primarily for teachers and workers in the field who need to update their general knowledge of physics. No regularly scheduled laboratory. (3 credit hours)

Prerequisite: 8 hours of credit in college physics.

Course Objectives

This course will serve to increase inservice 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, relativity, and modern physics. 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.

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 inservice high school physics teachers and those seeking a high school teaching license. 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.

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
- *2D Motion*: projectile motion, circular motion, rotational motion
- *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/combination 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
- *Modern Physics*: quantum mechanics, wave-particle duality

Format

This course may be offered during the spring and fall semesters, as a five-week summer term course, or as a week-long workshop. Sessions will include lecture, discussion, and laboratory work. Student work used to determine the student's course grade may include classwork, homework, laboratory activities and investigations, and research reports.

Bibliography

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

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

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