South Central College

PHYS 212  Principles in Physics II

Common Course Outline

Course Information

Description  This second course will provide students with the principles of algebra based physics. The course will cover basic principles of waves, electricity and magnetism, light and optics, and topics in modern physics; (MNTC 3: Natural Sciences) Prerequisite: PHYS 211 Principles in Physics I

Instructional Level  Associate Degree

Total Credits  4.00

Total Hours  80.00

Types of Instruction

Instruction Type  Credits
Classroom Presentation  3 (48 Hours)
On Campus Lab  1 (32 Hours)

Pre/Corequisites

Prerequisite  PHYS 211 Principles in Physics I

Institutional Core Competencies

1  Analysis and inquiry: Students will demonstrate an ability to analyze information from multiple sources and to raise pertinent questions regarding that information.

2  Critical and creative thinking: Students will develop the disposition and skills to strategize, gather, organize, create, refine, analyze, and evaluate the credibility of relevant information and ideas.

3  Teamwork and problem-solving: Students will demonstrate the ability to work together cohesively with diverse groups of persons, including working as a group to resolve any issues that arise.

External Standards

Title  MN Transfer Goals

Target Standards

GOAL 3. NATURAL SCIENCES To improve students’ understanding of natural science principles and of the methods of scientific inquiry, i.e., the ways in which scientists investigate natural science phenomena.

3.a Demonstrate understanding of scientific theories.
3.b Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students’ laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.

3.c Communicate their experimental findings, analyses, and interpretations both orally and in writing.

3.d Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

Course Competencies

1 Demonstrate proper laboratory safety procedures.
   Learning Objectives
   Explain a safe workspace envelope.
   Review laboratory safety procedures.
   Demonstrate laboratory safety techniques.

2 Demonstrate knowledge of electric charge.
   Learning Objectives
   Describe an electric charge.
   Review characteristics of conductors and insulators.
   Discuss and study Coulomb's Law.
   Study charges that are quantized.
   Study charges are conserved.

3 Explain electric fields.
   Learning Objectives
   Define an electric field.
   Explain electric field lines.
   Characterize an electric field due to a point charge.
   Characterize an electric field due to an electric dipole.
   Study an electric field due to a line of charge.

4 Describe Gauss' Law.
   Learning Objectives
   Describe and define flux.
   Explain Gauss' Law
   Obtain a working knowledge of flux of an electric field.
   Review Coulomb's Law and relate to Gauss' Law.
   Review a charged isolated conductor.

5 Obtain a working knowledge of electric potentials.
   Learning Objectives
   Describe electrical potential energy.
   Explain equipotential surfaces.
   Discuss potential due to a group of point charges.
   Discuss potential due to a continuous charge distribution.
   Calculate the field from the potential.

6 Explain capacitance and determine capacitance for a system.
   Learning Objectives
Explain capacitance.
Calculate capacitance.
Study capacitors in parallel and in series circuits.
Explain energy stored in an electric field.
Identify capacitors with a dielectric.

7 Describe an electrical current and show an understanding of the relationship to resistance and electromotive force.

Learning Objectives
Explain electric current.
Describe current density.
Acquire an understanding of Ohm's Law.
Describe power in electric circuits.

8 Draw and describe electrical circuits identifying the current, resistance and voltage of the circuit.

Learning Objectives
Obtain a working knowledge of "pumping" charges.
Identify relationship of work, energy, and EMF (Electromotive Force).
Calculate the current in single-loop circuits.
Explain potential difference between two points.
Investigate multi-loop circuits.
Use ammeter and the voltmeter to analyze electrical circuits.

9 Develop and study direct-current circuits.

Learning Objectives
Review Kirchhoff's Rules
Identify and use electrical measuring instruments

10 Study magnetic fields and give an explanation of what produces a magnetic field.

Learning Objectives
Explain causes that produce a magnetic field.
Characterize the Hall Effect.
Obtain a working knowledge of circulating changed particles.
Explain magnetic force on a current-carrying wire.
Describe torque on a current loop.
Study magnetic dipole moment.
Describe force between two parallel currents.<br />
Calculate the magnetic field due to a current.
Study Ampere's Law.
Analyze a current-carrying coil as a magnetic dipole.

11 Study induction and electrical energy transfer.

Learning Objectives
Explain Faraday's Law of Induction.
Obtain a working knowledge of Lenz's Law.
Study induction and energy transfer.
Describe inducted electric fields.
Review RL circuits.
Explain inductors and inductance.
Discuss energy stored in a magnetic field.
Study energy density of a magnetic field.

12 Describe electromagnetic oscillations and the relationship to alternating current.

Learning Objectives
Study LC oscillations, qualitatively.
Study LC oscillations, quantitatively.
Explain damped oscillations in an RLC circuit.
Discuss alternating current.
Study forced oscillations.
Build and analyze three simple circuits.
Describe power in alternating current circuits.
Summarize how transformers function.

13 Generalize the operation of an alternating current.

Learning Objectives
Study the L-R-C Series Circuit
Demonstrate resonance in alternating-current circuits.
Build and demonstrate electrical transformers.

14 Describe Electromagnetic Waves and Maxwell's Equations.

Learning Objectives
Study and apply Maxwell's equations.
Review electromagnetic waves
Apply sinusoidal electromagnetic waves

15 Study the nature and propagation of light.

Learning Objectives
Study the nature of light.
Investigate the polarization of light.

16 Study geometric optics considering reflection, refraction, interference and diffraction.

Learning Objectives
Review the function of lenses in the eye.
Solve focal point problems for lenses and mirrors.
Study reflection, refraction, interference and diffraction.

SCC Accessibility Statement
If you have a disability and need accommodations to participate in the course activities, please contact your instructor as soon as possible. This information will be made available in an alternative format, such as Braille, large print, or cassette tape, upon request. If you wish to contact the college ADA Coordinator, call that office at 507-389-7222.

Disabilities page http://southcentral.edu/academic-policies/disability-rights.html