



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
Total Credits	4
Total Hours	80

Types of Instruction

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

Pre/Corequisites

Prerequisite PHYS 211 Principles in Physics I

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 charged 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.

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 induced 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.