

# PHYSICS II

LENGTH OF TIME: every day for one semester

GRADE LEVEL: 11-12

## COURSE STANDARDS:

Students will:

1. Take part in class discussions and small cooperative groups by asking and answering questions. (PA Std 3.1, 3.2)
2. Work cooperatively in groups to solve problems, make decisions, learn from peers, write and edit reports, and extend and apply their knowledge. (PA Std 3.1, 3.2)
3. Reinforce and extend their learning by completing homework assignments. (PA Std 3.1, 3.2)
4. Show evidence of the concepts presented in the course by explaining/solving new application problems not previously encountered. (PA Std 3.1, 3.2)
5. Solve problems involving application. (PA Std 3.1, 3.2)
6. Read and comprehend informational materials to develop their understanding of concepts and technology use. (PA Std 3.1, 3.2)
7. Demonstrate the rules of English through proper spelling and grammar in all written and oral communication.
8. Use mathematics to represent and solve problems. (PA Std 3.1)

## RELATED PA ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY

- 3.1 Unifying Themes
  - B. Models
  - C. Patterns
  - D. Scale
  - E. Change
- 3.2 Inquiry and Design
  - A. Nature of Scientific Knowledge
  - B. Process Knowledge
  - C. Scientific Method
  - D. Problem Solving in Technology

## PERFORMANCE ASSESSMENTS:

Students will demonstrate achievement of the standards by:

1. Drawing diagrams to demonstrate the properties of transverse and longitudinal (compressional) waves.
2. Describing the relationships between wave theory and the various properties of sound.
3. Describing how various behaviors of light are explained by wave theory.
4. Measuring the index of refraction of a medium in a laboratory setting.
5. Using ray diagrams to predict and describe the images formed by plane mirrors, parabolic mirrors, and lenses.

6. Using the diffraction and interference of light to measure the wavelength of light in a laboratory setting.
7. Outlining the origin and effects of static charges.
8. Mathematically predicting the magnitude and direction of forces produced on charged bodies by electric fields.
9. Describing the relationship between current, voltage, and resistance in a simple circuit.
10. Applying Ohm's Law to the solution of problems involving series and parallel circuits.
11. Describing the fields and properties of magnets and electromagnets.
12. Using the concept of electromagnetic induction to explain the operation of motors, generators, and transformers.
13. Building a simple motor.

#### DESCRIPTION OF COURSE:

Using a non-calculus approach, the students in Physics 2 will continue the detailed exploration of physics topics begun in Physics 1. Students will use algebra and trigonometry as mathematical tools to explore topics such as electricity and magnetism, optics (light, lenses, and mirrors), thermodynamics (heat and temperature), and waves and energy transfer. Mathematical problem-solving, laboratory experimentation, demonstrations, class discussions, and self-directed learning enable motivated students to get an in-depth view of these topics as they continue their study of physics.

#### TITLES OF UNITS:

1. Energy	2 weeks
2. Rotational Motion	2 weeks
3. Thermodynamics	2 weeks
4. Waves and Energy Transfer	1 week
5. Acoustics	2 weeks
6. Nature of Light	1 week
7. Reflection and Refraction	2 weeks
8. Mirrors and Lenses	2 weeks
9. Diffraction and Interference of Light	2 weeks
10. Static Electricity	1 week
11. The Electric Field	1 week
12. Magnetic Fields	1 week

#### SAMPLE INSTRUCTIONAL STRATEGIES:

1. Inductive/constructivist approach through activities, demonstrations, and labs
2. Cooperative group work
3. Class discussion
4. Application of theory through lab activities, problem-solving, worksheets, model-building, and discussion
5. Math skills development through solving mathematical problems both in and out of class

6. Teacher presentations
7. Individually-paced reading

#### MATERIALS:

1. Physics – Principle and Problems; Murphy, Hollon, Zitzewitz, and Smoot; and/or Physics – Principles and Problems; Zitzewitz, Elliott, Haase, Harper, Herzog, Nelson, Nelson, Schuler and Zorn; McGraw-Hill, 2005
2. Assorted physical supplies and equipment
3. Selected AV materials
4. Technology (e.g. Log-It sensors)
5. Computers and appropriate software

#### METHODS OF ASSISTANCE AND ENRICHMENT:

1. Opportunities for retesting
2. Opportunities for tutoring after school
3. Additional readings
4. Career and application readings in text

#### PORTFOLIO DEVELOPMENT:

In order to document achievement in science, students may include in their school portfolio:

1. Reports from labs, projects, and activities
2. Notes, evaluations, and /or video of presentations
3. Examples of extended learning and application (e.g. extra credit)

#### METHODS OF EVALUATION:

1. Reports from projects and labs
2. Objective tests (including midterm and final exams)
3. Homework completion
4. Class portfolio

#### INTEGRATED ACTIVITIES:

1. Concepts
  - Evidence, models, and explanations
  - Constancy, change, and measurement
  - Form and function
  - Systems, order, and organization
  - Communication and defending an argument with logic
2. Communication
  - Read, and use a variety of methods to make sense of the texts
  - Respond orally and in writing to information and ideas gained by reading, and use information and ideas to make decisions and solve problems
  - Write for a variety of purposes

Exchange information orally, ask and answer questions appropriately and promote effective communication and function in a group  
Compose and make oral presentations

3. Thinking/Problem Solving

Use effective research and information management skills  
Peer review of written documents  
Drawing appropriate conclusions from data  
Altering paradigms  
Inferring messages from text

4. Application of Knowledge

Use of computers and software  
Traditional and computer-aided research  
Written communications  
Appropriate use of laboratory equipment and materials

5. Interpersonal Skills

Demonstrate skills of communicating, negotiating, and cooperating with others in class and small group situations  
Work together effectively with peers to edit and prepare oral presentations, written documents, and projects