Physics II
A Model Course Guideline

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Foreword

Physics II Curricular Guidelines is a model designed to assist in developing a rigorous and relevant course of study for Physical Science, a course approved in the Secondary Science Program of Study (*Bulletin 741: Louisiana Handbook for School Administrators, 1997-98, pages 107-108)*. The model includes a brief outline and more detailed course guidelines that embrace the core content essential skills and understandings embodied in the Louisiana Science Framework (May, 1997). It also presents a discussion of standards-based curriculum, the use of technology, inquiry-based science, laboratory safety, assessment, and the concept of rigorous and relevant learning for *all students*.

The intended audience for this publication includes science teachers, science chairpersons, supervisors of science, local curriculum developers, and school administrators who are involved in secondary science curriculum development and committed to high quality science education.

Physics II

Course Description

Physics II utilizes quantitative and complex conceptual approaches in the study of mechanics, laws of thermodynamics, wave phenomena, electromagnetic radiation, electricity and magnetism, and current applications of physics. Studies include detailed investigations and applications to business, industry, and technology. Mathematical skills involving advanced mathematics and/or calculus are used in problem solving.

Prerequisite: Physics I

Content Outline

Curriculum has the same areas as Physics I but taught with a more in-depth approach.

I. Getting Started (These topics are pervasive throughout the course work.)

- A. Review of Physics I
- B. Independent Study Preparation
- C. Technical Reports
- D. Error Analysis of Systems
- E. Major Project Design

II. Mechanics

- A. Kinematics (Motion)
- B. Dynamics
- C. Work, Energy, Power

III. Energy and Their Transformations

- A. Forms and Kinds
- B. Conservation of Energy
- C. Conservation of Momentum

IV. Interactions of Energy and Matter

- A. Thermal
- B. Waves
- C. Electricity and Magnetism

V. Nuclear Energy

- A. High Energy and Particle Physics
- B. Nuclear Power Applications

Model Curriculum Guidelines

Physics II

TOPICS	BENCHMARKS
I. Getting Started (These topics are pervasive throughout the course work.)	
A. Cooperative Learning Strategies and Techniques	
1. Design and initiate the basic social skills needed for cooperative learning groups.	SI-H-A1 SI-H-A2
a. Establish and use basic classroom policies and procedures.	SI-H-A3 SI-H-A3
b. Establish and evaluate actions of effective group members.	SI-H-A5 SI-H-A6
2. Perform and rotate cooperative learning groups tasks and activities in a variety of roles (facilitator, recorder, manager, clerk).	SI-H-A7
3. Work as a cooperative learning team to design, conduct, and present and/or report a solution to a variety of scientific investigators or explanations.	
4. Communicate and defend a scientific point of view by collecting and analyzing data.	
B. Mathematical Preparation	
1. Discuss additional required math skills.	SI-H-B3
2. Manipulate and analyze quantitative data using scientific calculators.	PS-H-A1
C. Measurement	
1. Relate the metric system (SI) of measurements to problem solving utilizing dimensional analysis.	PS-H-A1
2. Organize and interpret the graphical representation of data.	
3. Compute, discuss, and integrate error analysis to include percent error, accuracy, precision, and standard deviation.	SI-H-A3, SI-H-B3
D. Lab Readiness (Hands-on)	
1. Use appropriate measuring instruments to conduct a variety of scientific investigations integrating scientific method.	PS-H-A1 SI-H-A4, SI-H-B3
2. Relate the results of data collection by analysis and graphical representation.	SI-H-B4 SI-H-A3, SI-H-A4
3. Relate the results of scientific investigations through the use of reports (written or oral, formal or informal).	SI-H-B2, SI-H-B3 SI-H-A1, SI-H-A2
4. Utilize safety procedures during scientific investigations (review/develop safety guidelines, usually located in textbooks or lab manuals).	SI-H-A6, SI-H-B1 SI-H-B4, SI-H-B5 SI-H-A7

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TOPICS	BENCHMARKS
II. Mechanics	
A. Kinematics (Motion)	
1. Construct and evaluate vectors (analytically and graphically).	PS-H-E2
2. Illustrate how frame of reference (inertial and non-inertial) affects our ability to judge motion.	PS-H-E4
3. Review distance and displacement, velocity and speed, using analytical methods and graphical representation.	PS-H-E2, SI-H-A4
4. Evaluate acceleration using analytical and graphical models and incorporating technology.	PS-H-E2, SI-H-A4
B. Dynamics	
1. Assess and demonstrate examples of Newton's three laws of motion.	PS-H-E1, PS-H-E2 PS-H-E3
2. Use analytical methods to solve real-world problems involving Newton's three laws of motion.	PS-H-E3, PS-H-E2
3. Integrate the laws of motion for orbiting bodies incorporating the laws of Newton and Kepler.	ESS-H-D6, PS-H-E1
4. Construct models to demonstrate motion in more than one dimension (projectile motion, simple harmonic motion, circular and rotary motion).	PS-H-E1, PS-H-E2 PS-H-E3
5. Explain momentum, explore its applications, and solve problems using analytical and graphical techniques.	PS-H-F2
6. Construct models to explain dynamic forces and static forces.	PS-H-E1, PS-H-E2 PS-H-F2
C. Work, Energy, Power	
1. Relate the relationships of work, power, energy, and efficiency through use of models.	PS-H-F1
2. Design and conduct laboratory investigations of various simple machines, and calculate their differences.	SI-H-A5, SI-H-B2
3. Relate the use of hydraulics to everyday applications using liquid and gas models.	PS-H-E1, PS-H-F1

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TOPICS	BENCHMARKS
III. Energy and Their Transformations	
A. Forms and Kinds	
1. Evaluate kinetic and potential energy through the use of problem solving.	PS-H-F1
2. Construct models to differentiate among the various forms of potential energy.	PS-H-F1, SI-H-A 4 SI-H-A 5
3. Propose and critique models that show characteristics of energy forms, e.g., mechanical, electrical, magnetic, gravitational, thermal, chemical, and nuclear.	PS-H-F1
B. Conservation of Energy	
1. Integrate various forms of energy and their transformations using analytical models.	PS-H-F2, PS-H-A 4 PS-H-A 5
2. ???	
C. Conservation of Momentum	
1. Evaluate the interrelationships between laws of conservation. of momentum and energy using analytical models.	PS-H-F2
2. ???	
IV. Interactions of Energy and Matter	
A. Thermal	
1. Kinetic theory	
a. Evaluate the connections relating particle motion and thermal energy.	PS-H-C3, PS-H-C7
b. Analyze phase diagrams to include heat calculations involving phase changes.	PS-H-C7
2. Introduction to thermodynamics	
a. Explore the laws of thermodynamics and draw conclusions from the collection of analytical data.	PS-H-C7, SI-H-C7
b. Apply the laws of thermodynamics to solve problems analytically.	PS-H-C7

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TOPICS	BENCHMARKS
B. Waves	
1. Models, types, and characteristics	PS-H-G1, PS-H-G3
a. Analyze the characteristics of waves and differentiate between the various types of waves and wave energy.	SI-H-A4, SI-H-A5
b. Analyze types of waves through the use of models.	SI-H-B1, SI-H-B2
2. Sound waves and applications	PS-H-G1, PS-H-G2
a. Design, construct, and evaluate a sound-producing device.	PS-H-G3, PS-H-G4 SE-H-D1, SE-H-D3
3. Light	SE-H-A11, PS-H-G4
a. Relate the nature and properties of light to applications of light waves to our environment, i.e., photosynthesis, electromagnetic spectrum, etc.	PS-H-G1, PS-H-G2 PS-H-G3, PS-H-G4
b. Assess various optical phenomena, utilizing graphical and analytical methods with applications to business and industry (refraction, reflection, diffraction, etc.).	PS-H-D6, PS-H-D7 PS-H-G1, PS-H-G3
C. Electricity and Magnetism	
1. Static electricity and magnetic fields	PS-H-G2
a. Integrate static electricity and calculate the forces involved.	
b. ???	
2. AC and DC currents and applications	PS-H-G2, SI-H-B2
a. Using circuit characteristics, construct various schematic diagrams.	SI-H-A5, SI-H-A7
b. Compare and contrast AC/DC circuitry through transducer application.	PS-H-G3 and those in 2a
V. Nuclear Energy	
A. High Energy and Particle Physics	PS-H-B1, PS-H-B2
1. Explore the model of nuclear energy, e.g., fission, fusion.	PS-H-D6
2. ???	
B. Nuclear Power Applications	PS-H-B2, PS-H-E1
1. Research uses of nuclear energy as adapted to society.	PS-H-G4, SI-H-A5
2. ???	SI-H-B2, SE-H-B1 SE-H-B6

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