

# Warren County School District

## PLANNED INSTRUCTION

### COURSE DESCRIPTION

**Course Title:** Advanced Placement Physics

**Course Number:** 00353

**Course Prerequisites:** Concurrent enrollment or successful completion of elementary functions and one introductory physics class or special permission of the principal

**Special Requirements:** Computer and calculator based laboratory investigations

**Course Description:** (Include “no final exam” or “final exam required”)

Physics, as a scientific discipline, is a study of the relationship between matter and energy. This course deals with the building on the student’s knowledge and problem solving skills gained in the previous high school physics class or classes. The ultimate goal of this class is to prepare the student for the Advanced Placement Physics Examination. The class requires considerable study outside of class. Prerequisite: Concurrent enrollment or successful completion of elementary functions and one introductory physics class or special permission of the principal

**Suggested Grade Level:** 12

**Length of Course:** One Semester X Two Semesters Other  
(Describe)

**Units of Credit:** 1 (Insert **NONE** if appropriate.)

**PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certification(s)**  
(Insert certificate title and CSPG#) Physics

**Certification verified by WCSD Human Resources Department:**  
X Yes        No

**Board Approved Textbooks, Software, Materials:**

**Title:**

**Publisher:**

**ISBN #:**

**Copyright Date:**

**Date of WCSD Board Approval:**

**BOARD APPROVAL:**

**Date Written:** September 2009

**Date Approved:** \_\_\_\_\_

**Implementation Year:** \_\_\_\_\_

**Suggested Supplemental Materials:** (List or insert None)

**Course Standards**

**PA Academic Standards:** (List by Number and Description)

**3.1 Unifying Themes**

12A Apply concepts of systems, feedback and control to solve complex technological problems.

12E Evaluate change in nature, physical systems and man made systems.

**3.2 Inquiry and Design**

12B Evaluate experimental information for appropriateness and adherence to relevant science process.

**3.4 Physical Science, Chemistry and Physics**

12A Apply concepts about the structure and properties of matter.

12B Apply and analyze energy sources and conversions and their relationship to heat and temperature.

12C Apply appropriate thermodynamics concepts(e.g. conservation, entropy) to solve problems relating to energy and heat.

**3.7 Technological Devices**

12B Evaluate appropriate instruments and apparatus to accurately measure materials and processes.

**3.8 Science, Technology and Human Endeavors**

12B Apply the use of ingenuity and technological resources to solve specific problems and improve the quality of life.

12C Evaluate the consequences and impacts of scientific and technological solutions.

**WCSD Academic Standards:** (List or None)

None

**Industry or Other Standards:** (List, Identify Source or None)

None

**WCSD EXPECTATIONS**

WCSD K-12 Expectations for instruction in writing, reading, mathematics and, technology have been developed and revised annually. The teacher will integrate all WCSD Expectations into this planned instruction.

## **SPECIAL EDUCATION AND GIFTED REQUIREMENTS**

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP) or Gifted Individual Education Plan (GIEP).

### **SPECIFIC EDUCATIONAL OBJECTIVES/CORRESPONDING STANDARDS AND ELIGIBLE CONTENT WHERE APPLICABLE**

(List Objectives, PA Standards #'s, Other Standards (see samples at end))

This course is written to the 12<sup>th</sup> grade standards. No assessment anchors have been written for this level.

## **ASSESSMENTS**

### **PSSA Assessment Anchors Addressed:**

**Suggested Formative Assessments:** The teacher will develop and use standards-based assessments throughout the course.

- Pre-Assessments of prior knowledge (e.g. entrance cards or KWL chart)
- Labs/lab reports
- Bell ringers/Problems of the Day(PODs)
- Discussions
- Teacher observation/Questioning
- Graphic organizers (e.g. Venn diagrams, word mapping, webbing, KWL chart, etc.)
- Summarizing
- Retelling
- Note taking
- Problem-based learning modules
- Authentic assessment
- Oral presentations
- Outlining
- Journaling
- Student presentations/projects
- Open-ended response
- Quizzes/tests
- Activities
- Classroom Performance System (CPS)
- White boards

### **Suggested Summative Assessments:**

- Essays
- Open-Ended Responses
- Projects
- Quizzes/tests
- Student presentations
- Portfolios
- Lab Practical
- Lab Report

## District Approved Assessment Instruments

- PSSA Tests-Grades 4, 8 and 11 only

## Differentiated Instructional Assessment Strategies

Portfolio Assessment: \_\_\_\_\_ Yes      X   No

District-wide Final Examination Required: \_\_\_\_\_ Yes      X   No

Course Challenge Assessment (Describe):

### REQUIRED COURSE SEQUENCE AND TIMELINE

(Content must be tied to objectives)

Content Sequence	Dates
I. Newtonian Mechanics Time	<b>63 days</b>
A. Kinematics ( including vectors, vector algebra, components of vectors, coordinate systems, displacement, velocity, and acceleration )	
1. Motion in One Dimension	
2. Motion in Two Dimensions, including projectile motion	
B. Newton's Laws of Motion ( including friction and centripetal force )	
1. Static Equilibrium ( first law )	
2. Dynamics of a Single Particle ( second law )	
3. Systems of Two or more Bodies ( third law )	
C. Work, Energy, Power	
1. Work and work – energy theorem	
2. Conservative forces and potential energy	
3. Conservation of energy	
4. Power	
D. Systems of Particles, linear momentum	
1. Center of Mass	
2. Impulse and momentum	
3. Conservation of linear momentum, collisions	
E. Circular motion and rotation	
1. Uniform circular motion	
2. Torque and Rotational Statics	
F. Oscillations and Gravitation	
1. Simple harmonic motion ( dynamics and energy relationships )	
2. Mass on a spring	
3. Pendulum and other oscillations	
4. Newton's law of gravity	
5. Orbits of planets and satellites ( circular )	
II. Fluid Mechanics and Thermal Physics Time	<b>27 days</b>
A. Fluid Mechanics	
1. Hydrostatic pressure	

- 2. Buoyancy
  - 3. Fluid flow continuity
  - 4. Bernoulli's equation
  - B. Temperature and heat
    - 1. Mechanical equivalent of heat
    - 2. Specific and latent heat ( including calorimetry )
    - 3. Heat transfer and thermal expansion
  - C. Kinetic Theory and Thermodynamics
    - 1. Ideal gases
      - a. Kinetic model
      - b. Ideal gas law
    - 2. Laws of thermodynamics
      - a. First law ( including processes on pV diagrams )
      - b. Second law ( including heat engines )
- III. Electricity and Magnetism 45 days**
- A. Electrostatics
    - 1. Charge, field, and potential
    - 2. Coulomb's law and field potential of point charges
    - 3. Fields and potentials of other charge distributions
      - a. planar
  - B. Conductors, capacitors and dielectrics
    - 1. Electrostatics with conductors
    - 2. Capacitors
      - a. parallel plate
  - C. Electric Circuits
    - 1. Current, resistance, power
    - 2. Steady state direct current circuits with batteries and resistors only
    - 3. Capacitors in circuits
      - a. steady state
      - b. transient and initial periods
  - D. Magnetostatics
    - 1. Forces on moving charges in magnetic fields
    - 2. Forces on current-carrying wires in magnetic fields
    - 3. Fields on long current carrying wires
  - E. Electromagnetism
    - 1. Electromagnetic induction (including Faraday's law and Lenz's law )
- IV. Waves and Optics Time 27 days**
- A. Wave Motion (including sound )
    - 1. Properties of traveling waves
    - 2. Properties of standing waves
    - 3. Doppler Effect
    - 4. Superposition
  - B. Physical Optics
    - 1. Interference and diffraction
    - 2. Dispersion of light and the electromagnetic spectrum
  - C. Geometric Optics
    - 1. Reflection and refraction
    - 2. Mirrors
    - 3. Lenses
- V. Atomic and Nuclear Physics 18 days**
- A. Atomic Physics and Quantum Effects
    - 1. Photons and photoelectric effect
    - 2. Atomic energy levels

3. Wave-particle duality
- A. Nuclear Physics
  1. Nuclear reactions ( including conservation of mass number and charge )
  2. Mass – energy equivalence

### Objectives:

1. Apply concepts of systems , feedback and control to solve complex technological problems.
2. Evaluate change in nature, physical systems and man made systems.
3. Evaluate experimental information for appropriateness and adherence to relevant science process.
4. Apply concepts about the structure and properties of matter.
5. Apply conservation of energy to physical systems.
6. Apply and analyze energy sources and conversions and their relationship to heat and temperature.
7. Apply appropriate thermodynamics concepts(e.g. conservation, entropy) to solve problems relating to energy and heat.
8. Analyze the principals of translational motion.
9. Analyze the principles of rotational motion.
10. Describe circular motion and acceleration.
11. Demonstrate an understanding of Newton’s Laws of Motion.
12. Evaluate appropriate instruments and apparatus to accurately measure materials and processes.
13. Apply the use of ingenuity and technological resources to solve specific problems and improve the quality of life.
14. Evaluate the consequences and impacts of scientific and technological solutions.

**WRITING TEAM:** Jennifer Blum, Barb Vanatta

### WCSD STUDENT DATA SYSTEM INFORMATION

1. Is there a required final examination?                      X   Yes               No
2. Does this course issue a mark/grade for the report card?  
                                    X   Yes               No
3. Does this course issue a Pass/Fail mark?                           Yes          X   No
4. Is the course mark/grade part of the GPA calculation?  
                                    X   Yes               No
5. Is the course eligible for Honor Roll calculation?                      X   Yes               No
6. What is the academic weight of the course?  
                                         No weight/Non credit               Standard weight  
                                    X   Enhanced weight (Describe) As per current school board policy.