

**Radnor High School  
Course Syllabus**

**Honors Physics  
340**

*I. Course Description*

**1.0 Credit, weighted**

**Length: Year**

**Format: Meets daily**

**Prerequisite(s): Honors chemistry or advanced chemistry**

**Co-requisite: Advanced Pre-calculus**

**Course Description:**

Honors Physics is an algebra based course which provides a rigorous and thorough examination of physical concepts such as motion, forces, energy, light, electricity and magnetism. It includes applications that give insight into the relevance of physics in our everyday world and provides a strong foundation for future study. Paced for the highly motivated science and math oriented student, the course develops thinking and problem solving skills through the use of lab activities and challenging problems.

*II. Materials & Equipment*

**Text used:** Giancoli, Physics, 5th edition. Prentice Hall  
Scientific or graphing calculator, ruler and protractor

*III. Course Goals & Objectives*

1. To apply basic principles of physics to real-life applications
2. To enable students to understand and quantify the physical world
3. To prepare students to perform experiments
4. To prepare students to interpret the experiment results and communicate their understanding of the results.

*IV. Course Topics (Summary Outline)*

0. Mathematical Concepts
  - A. Metric system, significant figures and unit analysis
  - B. Graphical analysis
  - C. Vector addition and subtraction
  - D. Trigonometry
  - E. Error analysis

## I. Newtonian Mechanics

### A. Kinematics

1. Motion in one dimension
2. Graphing motion
3. Projectile motion
4. Relative velocity

### B. Newton's Laws of motion

1. First law
2. Second law and Free body diagrams
3. Third law
4. Applications of Newton's Laws including friction and incline planes

### C. Circular motion and Gravitation

1. Uniform circular motion including vertical circles
2. Newton's Law of universal gravitation
3. Kepler's Laws and planetary motion
4. Origin of the universe and solar system
5. Life cycle of a star

### D. Work, Power and Energy

1. Work and energy relationship
2. Work done by springs
3. Conservation of energy including springs
4. Power
5. Conservative and non-conservative forces
6. Simple machines and mechanical efficiency

### E. Momentum

1. Impulse and momentum relationship
2. Conservation of momentum in one and two dimensions
3. Elastic vs. inelastic collisions

### F. Torque and static equilibrium

## II. Electricity and Magnetism

### A. Electrostatics

1. Coulomb's law in one and two dimensions
2. Electric field and parallel plates
3. Parallel plate capacitors in series and parallel

### B. Electric Circuits

1. Ohm's Law
2. Resistors in series and parallel circuits
3. Electric power and cost of operating appliances
4. Efficiency

### C. Magnetic fields

1. Relationship between electricity and magnetism
2. Forces on charges, current carrying wires and parallel wires
3. Magnetic field strength calculations
4. Applications of magnetism

- D. Electromagnetic induction
  - 1. Induced emf and Lenz's law
  - 2. Generators
- E. Alternative energy sources

### III. Waves and Optics

- A. Vibrations and waves
  - 1. Properties and types of waves
  - 2. Electromagnetic waves and spectrum
  - 3. Pendulums
  
- B. Geometric Optics
  - 1. Reflection and refraction
  - 2. Mirrors and lenses
  
- C. Physical optics
  - 1. Diffraction by a single slit
  - 2. Interference -Young's double slit experiment
  - 3. Diffraction grating

### *V. Assignments & Grading*

- A. Lab Topics
  - 1. Motion of the dune buggy
  - 2. Motion down the incline plane
  - 3. Free fall
  - 4. Map Exercise
  - 5. Projectile motion
  - 6. Newton's 2<sup>nd</sup> law of motion
  - 7. Equilibrium
  - 8. Torque
  - 9. Friction
  - 10. Circular motion
  - 11. Kepler's Laws
  - 12. Hooke's Law
  - 13. Conservation of Energy
  - 14. Simple machines and mechanical efficiency
  - 15. Conservation of Momentum and Kinetic energy
  - 16. Conservation of Momentum in two dimensions
  - 17. Mapping electric field lines
  - 18. Ohm's Law
  - 19. Series and Parallel circuits
  - 20. Electric devices
  - 21. Reflection
  - 22. Snell's Law

- 23. Lenses
- 24. SHM and the pendulum
- 25. Interference and diffraction

B. There will be a comprehensive department midterm and final exam.