# AP® Physics-1
# The Mississippi School for Mathematics & Science

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**TEXTBOOKS:** OpenStax College, *College Physics*. OpenStax College. 21 June 2012.
Enrichment Text: Hewitt, *Conceptual Physics 9ed*, Pearson, 2001.

**DESCRIPTION OF OBJECTIVES:** AP®Physics-1 is an algebra and trigonometry based course which provides a college-level introduction to the principles of Newtonian mechanics including kinematics, work, energy, power, mechanical waves and sound, and also an introduction to circuits. Critical thinking and reasoning skills are developed through inquiry-based laboratory experiences. The lab-based course is designed to prepare students to take the AP® Physics-1 examination, which is administered each May. In order to foster critical thinking skills necessary to pursue a career in science or engineering, the course includes two separate hands-on components (Labs and Extended Design Projects) which utilize guided inquiry and student-centered, team-based design of experiments, presentation of design, results, and scientific argumentation. The class will meet for lecture on Monday, Wednesday & Fridays for one hour each day, and the lab will meet on Tuesdays or Thursdays for 1.5 hours each week. (Lab time constitutes 33% of the total in-class contact hours for the course.)

**PREREQUISITE**: none

**COREQUISITE:** Trigonometry or Foundations of Math

**GRADING SCALE:** A: 90 – 100 B: 80 – 89 C: 70 – 79 NC: 0 – 69

**CHRONOLOGY OF OBJECTIVES:**
Week 1: 1D Kinematics
Week 2-4: 2D Kinematics
Weeks 5-7: Newton's Laws of Motion – Law of Inertia, F=ma, Law of Action/Reaction
Weeks 8-11: Work, Kinetic Energy, Potential Energy & Conservation of Energy
Weeks 12: Power
Weeks 13-16: Systems of Particles, Linear Momentum & Collisions, Impulse, Conservation of Linear Momentum
Weeks 17-18: Static Equilibrium
Weeks 19-21: Circular Motion & Rotation
Weeks 22-25: Oscillatory Motion, Rotational Kinematics, Rotational Dynamics, Angular Velocity, Acceleration & Momentum, Rotational Energy, Conservation of Angular Momentum, Torque
Weeks: 26-27: Universal Law of Gravitation and Planetary Motion
Weeks: 28-31: Mechanical Vibrations, Simple Harmonic Motion, Mass-Spring Systems, Mechanical Waves
Weeks: 32-34: Materials and Sound
Weeks: 35-36: Basic Electrostatics, Electric Charge, Conservation of Electric Charge, Electric Force, Simple DC Resistor Circuits, Ohm's Law, Kirchoff Laws,

**ASSESSMENT**
**Homework, Quizzes & Class-Work**: Homework will consist of reading, taking notes, answering conceptual questions and working problems. "Problem Sets" will be assigned from each chapter. Both the teacher and students will model many of these problems in class. In addition to lecture, class-work also will include "whiteboard problem solving" where each table is given its own 3'x4' whiteboard and one marker. When needed the teacher can offer suggestions, but the student teams must communicate effectively as a team and bring all their problem solving skills to bear upon the problem at hand. When completed, the team will present their solution before the classroom. The homework & class-work average will count 20**%** of the nine-weeks grade.

**Lab Activities**: In order to foster critical thinking skills necessary to pursue a career in science or engineering, students will complete a hands-on lab component which utilizes guided inquiry and student-centered, team-based design of experiments. Lab grades will consist primarily of an inquiry-based design of experiment, followed by a collection of data and writing up the methods, results and conclusions in a professionally acceptable format. By the semester's end, the student will have generated a portfolio of experimental designs and lab write-ups. The lab average will count 30**%** of the nine-weeks grade. At least twenty or more of the following investigations (labs) will be performed during the year:

1. String-racer Acceleration
2. Mathematical Modeling of Free Fall with Video Analysis
3. Carts & Pulleys with Newton's 2nd Law
4. Work and Power of a Potato Launcher
5. Projectile Wars
6. Mine Field Vector Mapping and Vector Addition
7. Oil Platform Stability at Sea and Vector Addition
8. Hooke's Law and Conservation of Energy in an Oscillating Mass-Spring Systems
9. Work Done by Friction to Stop a Projectile, Conservation Laws
10. 1D collisions Momentum, Recoil & Conservation Laws
11. 2D collisions, Impulse, Elastic & Inelastic Collisions
12. Simple Pendulum
13. Ballistic Pendulum
14. Rotational Inertia
15. Physical Pendulum
16. Center of Mass of Flat Disks of Varying Shapes
17. Standing Waves on a String
18. Speed of Sound in Air
19. Resonance Tubes and Speed of Mechanical Waves in a Fluid
12. Resistance & Resistivity in Simple Circuits
21. Electric Switches, 2-way, 3-way & 4-way
22. Experimental Procedure & Identification of Systematic Variances

**End of Year Projects**: In order to foster critical thinking skills necessary to pursue a career in science or engineering, students will complete team-based engineering design units which utilize guided inquiry and student-centered, team-based engineering design projects. These extended engineering design projects will require the student teams to bring all their physics knowledge to bear upon a problem of engineering design and also may incorporate the use of numerical methods, statistical methods and computer programming in order to complete the team-based designs. "Engineering Design Projects" will be leading to team-based PowerPoint presentations of engineering designs and classroom-collaborative scientific argumentation and critique of engineering designs. The Projects will be averaged into the lab average. At least two of the following design projects will be performed:

1. Optimization Design of Catapult: Design of Experiment
2. Optimization Design of a Trebuchet: Design of Experiment
3. Optimization Design of Rocket: Propulsion
4. Electrical DC Circuit Application Design
5. Other

**Unit Tests**: There will be 2 – 4 tests each nine-weeks. These tests will cover the material assigned for study on the particular topics. The average of these tests will count 50**%** of the nine-weeks grade. Missed unit tests will be made up no later than 5 days after the test is given.

**Semester Exam**: The semester exam shall count 20% of the semester grade. Each nine-weeks grade shall count 40% of the semester grade.

**Academic Dishonesty.** The Physics Department defines academic dishonesty to be any action in which a student claims any work done by another person or machine as his or her own work. Some examples of academic dishonesty are as follows:

- Copying another person's homework, lab report, etc.
- Putting a student's name on a project in which that student has not done an equal part
- Reporting on an assignment that has not been read, such as a book report, extra-credit reading etc.
- Using unauthorized notes or another person's work on tests
- Discussing material on test with others who have not yet taken the test
- Plagiarism

**Honor Code.** In this course, anything the student turns in for a grade must be "pledged" according to the following honor code:

**"I promise that I have neither given nor received any unauthorized help on this assignment."**

Simply writing "**I promise**" near your name will serve as shorthand for the full pledge. To clear up any confusion, note that any help at all on a test is unauthorized. On homework and labs, students are urged to give and receive help from others and to work in small groups in order to learn, as long as copying is not the result. Help each other and compare answers on homework and other assignments done outside of class. Discuss those answers on which you disagree, changing your answer if you choose. The goal is for you to become an independent learner, capable of group interaction. However, after receiving help on a problem outside of class from another student, keep in mind that if you have the answer but do not understand how to get it yourself, then you have been helped to cheat and not to learn.