

**NEWPORT-MESA UNIFIED SCHOOL DISTRICT
Course Description****PHYSICS 1AB**

Content covered in physics 1AB is described in this Course of Study. Based upon student needs, teachers select appropriate materials from the Instructional Materials List. Classroom presentations of course content are determined by the instructor and described under Teacher Activities.

Overview:

Physics 1 AB is a one-year course designed for the college bound student. General areas included within the course are mechanics, heat, waves, sound, light, electricity, magnetism, and modern physics.

Course of Study Objectives:

1. The student will demonstrate a conceptual understanding of kinematics and the general relationships among position, velocity, and acceleration.
 - 1.1 SUGGESTED STUDENT ACTIVITY:
 - The students will use a smart pulley or a timing mechanism to experience constant velocity and constant acceleration.
 - The student will solve equations of motion.
 - The students will interpret and generate graphs showing various types of motion.
 - 1.2 INSTRUCTIONAL MATERIALS USED:
 - Smart pulleys
 - Graphical analysis software
 - Merrill Principles and Problems
 - Graph paper and scientific calculators
 - Cinema Classics "Straight line kinematics" Video laser disk-also available in 16mm format
 - 1.3 TEACHER ACTIVITIES:
 - Demonstrations
 - Graphing activities
 - Lecture, deriving equations
 - Direct student activities
2. The student will apply Newton's Laws of motion and understand the four common forces (friction, gravity, normal, tension)
 - 2.1 SUGGESTED STUDENT ACTIVITY:
 - The students will conduct a laboratory investigation into Newton's second law.
 - The students will solve problems using Newton's second law and equilibrium.
 - 2.2 INSTRUCTIONAL MATERIALS USED:
 - "Mechanical Universe" laser disk
 - "Physics Cinema Classics" laser disk
 - "Teaching introductory Physics" by Arnold Aarons
 - 2.3 TEACHER ACTIVITIES:
 - Demonstrations in inertia, second and third law.
 - Direct student activities.

3. Students will apply vector algebra to forces in two dimensions, projectile motion and uniform circular motion.

3.1 SUGGESTED STUDENT ACTIVITY:

- Students will conduct a laboratory investigation on incline planes.
- Students will conduct a laboratory investigations on forces in equilibrium.
- Students will solve problems using vectors.
- Students will conduct a laboratory investigation on projectile motion.

3.2 INSTRUCTIONAL MATERIALS USED:

- Graphical analysis software
- Simulation software
- Equipment for labs
- "PSSC Frames of reference"-16mm or "Cinema Classics"

3.3 TEACHER ACTIVITIES:

- Demonstrations
- Computer simulations
- Graphical analysis
- Merrill Principles and Problems

4. Students will apply their knowledge of conservation of momentum and impulse.

4.1 SUGGESTED STUDENT ACTIVITY:

- Students will conduct a laboratory investigation on momentum in two dimensions.
- Students will solve problems using impulse and momentum and its conservation.

4.2 INSTRUCTIONAL MATERIALS USED:

- Air track
- "Mechanical Universe"-Conservation of momentum

4.3 TEACHER ACTIVITIES:

- Air track demonstrations
- Newton's five balls
- Dynamics carts demonstrations
- Explosion demonstrations
- Direct student activities
- Lecture

5. The student will demonstrate the law of conservation of energy and efficiency of machines.

5.1 SUGGESTED STUDENT ACTIVITY:

- Students will conduct a laboratory investigation on pendulum motion.
- Students will conduct a laboratory investigation on efficiency of pulleys.
- Students will conduct a laboratory investigation on incline plane efficiency.
- Students will conduct a laboratory investigation on Hooke's Law.

5.2 INSTRUCTIONAL MATERIALS USED:

- "Physics Cinema Classics"
- Demonstration materials
- Lab equipment

5.3 TEACHER ACTIVITIES:

- Demonstrations and lecture
- Bowling ball demonstration

6. The student will apply the concept of gravitational force to the orbit of planets and satellites.

6.1 SUGGESTED STUDENT ACTIVITY:

- The students will solve problems using the "Universal Law of Gravitation"
- The students will calculate the height of a "geosynchronous orbit"
- The students will calculate the weight of an object at any altitude.

6.2 INSTRUCTIONAL MATERIALS USED:

- "Mechanical Universe: Apple and the Moon, Kepler's Laws"
- "Explorer software" Gravity

6.3 TEACHER ACTIVITIES:

- Lecture
- Demonstrations

7. Students will demonstrate understanding of the difference between mechanical work, heat and temperature.**7.1 SUGGESTED STUDENT ACTIVITY:**

- Students will conduct a laboratory investigation on calorimetry including specific heat, heat of fusion and/or heat of vaporization
- Students will conduct a laboratory investigation on the coefficient of linear expansion.
- Students will conduct a laboratory investigation on the mechanical equivalent of heat.

7.2 INSTRUCTIONAL MATERIALS USED:

- Textbook
- Lab equipment

7.3 TEACHER ACTIVITIES:

- Computer demonstrations in phase changes.
- Computer simulation of mechanical energy conversion to heat.
- Demonstrations on thermal expansion (ring and ball, pulse glass).

8. Students will explain everyday electrostatic phenomena by applying their knowledge of the laws of electrostatics.**8.1 SUGGESTED STUDENT ACTIVITY:**

- Students will develop explanations of phenomena demonstrated by the teacher
- Students will conduct explore electrostatic phenomena using electroscopes, pith balls, static wands
- Students will solve problems using Coulomb's Law and electric field intensity
- Students will recognize electric field maps

8.2 INSTRUCTIONAL MATERIALS USED:

- Mechanical Universe
- Cinema Classics
- Van de Graff, dissectable Leyden jar
- Demonstration equipment

8.3 TEACHER ACTIVITIES:

- Lecture (lightning, xerox machine)
- Demonstrations in static electricity and capacitance (Leyden Jar)

9. Students will apply their knowledge of electricity in the building of several electric circuits and predicting the results.**9.1 SUGGESTED STUDENT ACTIVITY:**

- The student will conduct an experiment on the electric equivalent of heat
- The student will conduct an experiment using series and parallel circuits with capacitors and resistors.
- The student will apply Ohm's Law to series and parallel circuits.
- The students will apply concepts of parallel and series circuits to house circuitry and Christmas lights

9.2 INSTRUCTIONAL MATERIALS USED:

- Mechanical Universe
- Textbook
- Cinema Classics
- RETAC
- Lab equipment

9.3 TEACHER ACTIVITIES:

- Demonstrations in circuitry
- Lecture

10. Students will use their understanding of the connections between electricity and magnetism to explain how motors and other electromagnetic devices work.**10.1 SUGGESTED STUDENT ACTIVITY:**

- The student will make an electric motor.
- The student will conduct experiments with solenoids and transformers.
- The student will solve problems involving transformers.

10.2 INSTRUCTIONAL MATERIALS USED:

- Mechanical Universe "AC circuits"
- Cinema classics
- Textbook
- RETAC video "TV Ontario" Electromagnetism
- Genecon student generators

10.3 TEACHER ACTIVITIES:

- Demonstrate magnetic torpedo
- Generator demonstration
- Induction demonstrations
- Magnetic field demonstrations

11. Students will recognize and correctly identify wave phenomena and their causes.**11.1 SUGGESTED STUDENT ACTIVITY:**

- The student will conduct a laboratory experiment using a slinky
- The student will conduct a laboratory experiment using a wave tank
- Students will conduct a laboratory investigation using resonance speed of sound
- The student will apply the wave phenomena reflection, refraction, interference, diffraction, Doppler effect and resonance to sound, water and earthquake waves.

11.2 INSTRUCTIONAL MATERIALS USED:

- Textbook
- Cinema classics
- Mechanical Universe "Resonance"

11.3 TEACHER ACTIVITIES:

- Demonstrations on sound in a vacuum
- Demonstrate waves on a string
- Earthquake wave demonstration S, P, and L.
- Ultrasound, geophysics, sonar and radar connections

12. Students will apply their knowledge of light and optics to various optical devices and phenomena.**12.1 SUGGESTED STUDENT ACTIVITY:**

- Students will conduct a laboratory investigation with lenses and mirrors
- Students will conduct a laboratory investigation with diffraction gratings
- Students will conduct a laboratory investigation on the index of refraction.

12.2 INSTRUCTIONAL MATERIALS USED:

- Textbook
- Movie "Laser Light"

12.3 TEACHER ACTIVITIES:

- Demonstrate lens and mirror optics
- Laser demonstrations
- Measurement of wavelength of laser light

13. Students will describe and Interpret experiments which lead to the development of quantum theory.

13.1 SUGGESTED STUDENT ACTIVITY:

- Students will conduct a computer simulation on photoelectric effect and Compton effect.
- Students will conduct a laboratory investigation on black body radiation.

13.2 INSTRUCTIONAL MATERIALS:

- Computer simulation software
- Lab equipment
- Cinema Classics
- Mechanical Universe

13.3 TEACHER ACTIVITIES:

- Demonstrations
- Direct student activities
- Lecture

INSTRUCTIONAL MATERIALS:

TEXTBOOKS

Merrill Physics Principles and Problems

SUPPLEMENTARY MATERIALS

Demonstration lessons in physics

CD ROM Library of physics

Merril supplementary materials

Teaching Introductory Physics by Arnold Aarons

AUDIO-VISUAL MATERIALS

AAPT Physics Cinema Classics- Video Laser Disk -

Mechanical Universe - Video and Laser Disk

Hewett - Conceptual Physics Alive - Teacher resource

TV Ontario - Video tape

RETAC - Video tapes

Living Textbook - Laser Disk - Physical Science