

I. COURSE CONTENT – This course will consist of the following units of study:

- Introduction to AP Physics
 - Measurement and Problem Solving: Introduction; Standard units of Measurements; Angular Measure; Dimensional Analysis; Significant Figures; Unit Conversions; Problem Solving Techniques.
- Mechanics
 - Kinematics: Description of Motion: Scalar Quantities-Distance and Speed; Vector Quantities-Displacement, Velocity and Acceleration; Free Fall; Kinematic Equations.
 - Motion in Two Dimensions: Components of Motion; Vector Addition and Subtraction; Projectile Motion; Relative Velocity.
 - Force and Motion: Dynamics; Concept of Force and Net Force; Inertia and Newton's First Law of Motion; Newton's Second Law of Motion; Newton's Third Law of Motion; Free body Diagrams; Friction.
 - Work and Energy: Work Done by a Constant and Variable Force: Kinetic Energy; Potential Energy; Work-Energy Theorem; Conservation of Energy; Power.
 - Linear Momentum and Collisions: Linear momentum; Impulse; Conservation of Linear Motion; Elastic and Inelastic Collisions; Center of Mass.
 - Circular Motion and Gravitation: Angular Speed and Velocity; Uniform Circular Motion; Centripetal Acceleration; Angular Acceleration; Newton's Law of Gravitation; Kepler's Laws of Planetary Motion.
 - Rotational Motion and Equilibrium: Rigid Bodies; Translations and Rotations; Torque, Equilibrium and Stability; Rotational Dynamics; Rotational Work and Kinetic Energy; Angular Momentum.
 - Solids and Fluids: Solids and Elastic Moduli; Pressure and Pascal's Principle of Fluids; Buoyancy and Archimedes Principle; Fluid Dynamics and Bernoulli's Equation.
- Thermodynamics
 - Temperature and Kinetic Theory: Temperature and Heat; Celsius and Fahrenheit Scales; Gas Laws, Absolute Temp. and Kelvin Scale; Thermal Expansion; Kinetic Theory of Gases.
 - Heat: Definition and units of Heat; Specific Heat and Calorimetry; Phase Changes and Latent Heat; Heat Transfer.
 - Thermodynamics: Thermodynamic Systems, States and Processes; The First law of Thermodynamics; Thermodynamic Processes for an Ideal Gas; The Second Law of Thermodynamics and Entropy.
- Electricity and Magnetism
 - Electric Charge, Forces and Fields: Electric Charge, Electrostatic Charging; Electric Force; Electric Field; Conductors and Electric Fields; Gauss's Law.
 - Electric Potential, Energy and Capacitance: Electric Potential Energy and Electric Potential Difference; Equipotential Surfaces and the Electric Field; Capacitance; Dielectrics.
 - Electric Current and Resistance: Batteries and Direct Current; Current and drift Velocity; Resistance and Ohm's Law; Electric Power.
 - Basic Electric Circuits: Resistances in Series, Parallel and series-Parallel Combinations; Kirchhoff's Law, RC Circuits, Ammeters and Voltmeters; Household Circuits.
 - Magnetism: Magnets, Magnetic Poles and Field Direction; Magnetic Field Strength and Force; Charged particles in a Magnetic Field; Magnetic Forces in a Current Carrying Wire; Electromagnetism; Geomagnetism.
 - AC Circuits: Resistance in an AC Circuit; Capacitance Reactance; Inductive Reactance; Impedance; Circuit Resonance.
- Oscillations, Waves and Optics
 - Vibrations and Waves: Simple Harmonic Motion; Wave Motion; Wave Properties; Standing Waves and Resonance.
 - Sound: Sound Waves; The Speed of Sound; Sound Intensity and Level; Sound Phenomena; The Doppler Effect.

- *Reflection and Refraction of Light*: Wave Fronts and rays; Reflection; Refraction; Total Internal Reflection and Fiber Optics; Dispersion.
 - *Mirrors and Lenses*: Plane Mirrors; Spherical Mirrors; Lenses; Lens Makers Equations; Lens Aberrations.
 - *Wave Nature of Light*: Young's Double-Slit Experiment; Thin-Film Interference; Diffraction; Polarization.
 - *Optical Instruments*: The Human Eye; Microscopes; Telescopes; Diffraction and Resolution; Color.
- Modern Physics
- *Relativity*: Classical Relativity; The Postulates of special Relativity; The Relativity of Length and Time; Relativistic Kinetic Energy, Momentum, Total Energy and Mass-Energy Equivalence.
 - *Quantum Physics*: Quantization: Planck's Hypothesis; Quanta of Light; Quantum "Particles": The Compton Effect.
 - *Quantum Mechanics and Atomic Physics*: Matter waves; The de Broglie Hypothesis; The Schrodinger wave Equation; The Heisenberg Uncertainty Principle; Particles and Antiparticles.
 - *The Nucleus*: Nuclear Structure and Nuclear Force; Radioactivity; Decay Rate and Half Life; Nuclear Stability and Binding Energy.
 - *Nuclear Reactions and Elementary Particles*: Nuclear Reactions; Fission; Fusion; Beta Decay and Neutrino; Fundamental Forces and Exchange Particles; The Quark Model; Force Unification Theories, the Standard Model and the Early Universe.

II. COURSE REQUIREMENTS – To complete this course successfully, students will be required to demonstrate a satisfactory, or higher, level of proficiency in:

- Understand how measurement and problem solving are key components of physics.
- Understanding the kinematics and dynamics of objects in one dimension and two dimensional motion.
- Understand the concepts of force, work, energy and momentum as related to physics.
- Understand how objects move in oscillated and circular motion both accelerated and non-accelerated frames.
- Understand how fluid dynamics and bernoulli's equation relate as well as Buoyancy and Archimedes Principle.
- Understand the systems, states and processes of thermodynamics
- Understand how electricity and magnetism relate to each other and act as a combined force.
- Understand the properties of waves and that they are a transfer of energy in many forms.
- Understand the 20th century concepts in physics, including relativity and quantum physics.

III. EVALUATION PROCESS – Throughout the length of this course, students will be evaluated on the basis of:

- Tests
- Quizzes
- Lab Reports
- Midterm and Finals Examination