

**Haverford College - Physics Department**  
**Physics 101a: Classical and Modern Physics I**  
**Regular Section (F. Crawford)**  
**Fall 2004 Course Topics**

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**Introduction to Physics (Hecht Ch. 1):** Measurement; Length/Distance; Mass and Weight; Time; Units; Graphs; Derivatives and Integrals; Vector Calculus

**Kinematics: Speed, Velocity, and Acceleration (Hecht Ch. 2, 3):** Speed; Velocity; Vector Addition; Inertial Reference Frames; Relative Motion; Acceleration; Gravitational Free Fall; Projectiles

**Newton's Laws (Hecht Ch. 4):** Inertia; Momentum; Action/Reaction; Free Body Diagrams; Weight; Inclined Planes; Coupled Motions; Friction; Translational Equilibrium

**Centripetal Force and Acceleration (Hecht Ch. 5):** Centripetal Acceleration; Circular Motion; Law of Gravitation; Gravity of a Sphere; Terrestrial Gravity; Kepler's Laws of Planetary Motion; Satellite Orbits; Gravitational Fields

**Energy (Hecht Ch. 6):** Work; Conservative Forces; Kinetic and Potential Energy; Conservation of Energy; Escape Velocity; Power

**Momentum and Collisions (Hecht Ch. 7):** Momentum; Impulse; Conservation of Momentum; Elastic and Inelastic Collisions; Two-dimensional Collisions

**Rotational Motion (Hecht Ch. 8):** Angular Displacement, Velocity, and Acceleration; Torque; Center of Gravity; Moment of Inertia; Center of Mass; Rotational Kinetic Energy; Angular Momentum; Conservation of Angular Momentum

**Fluid Statics and Dynamics (Hecht Ch. 9):** Mass Density; Hydrostatic Pressure; Atmospheric and Gauge Pressure; Buoyant Force; Fluid Flow; The Continuity Equation; Bernoulli's Equation; Viscous Flow

**Thermal Properties of Matter (Hecht Ch. 12):** Temperature; Linear and Volumetric Thermal Expansion; Ideal Gas Law; Phase Diagrams; Kinetic Theory

**Heat and Thermal Energy (Hecht Ch. 13):** Heat and Temperature; Specific Heat; Changes of State; Radiation, Convection, and Conduction

**Thermodynamics (Hecht Ch. 14):** Work; Heat and Internal Energy; Isothermal and Adiabatic Changes; Carnot Engine and Efficiency; Entropy; Microstates and Macrostates

**Special Relativity (Hecht Ch. 26):** Postulates; Simultaneity; Time Dilation; Length Contraction; Twin Effect; Relativistic Velocity Addition; Relativistic Momentum; Relativistic Energy