

PHYSICS 1A / HIGHER PHYSICS 1A (PHYS1121/PHYS1131)

Textbook: 'Physics for Scientists and Engineers', Serway & Jewett, 7th Edition or 'Physics for Scientists and Engineers with Modern Physics', Serway & Jewett, 7th Edition.

TOPIC 1: Mechanics

- **PARTICLE KINEMATICS IN ONE DIMENSION** (§2.1-2.6)
Displacement, velocity and acceleration; motion with constant acceleration; non-uniform acceleration.
- **MOTION IN TWO AND THREE DIMENSIONS** (§3.1-3.4, 4.1-4.6)
Vectors; resolution and unit vectors; vector addition. Equations of motion in vector form; projectile motion; uniform circular motion; relative motion.
- **PARTICLE DYNAMICS** (§5.1-5.8, 6.1)
Newton's laws of motion; mass; applications; friction forces; dynamics of circular motion.
- **WORK AND ENERGY** (§7.1-7.4, 15.1, 7.5-7.8, 8.1-8.2, 8.5)
Mechanical work; vector dot product; variable forces inc. Hooke's Law and SHM (qualitative); kinetic energy and work-energy theorem; potential energy; conservative forces; conservation of mechanical energy; applications; power.
- **GRAVITATION** (§13.1, 13.4-13.6)
Newton's law of gravitation, motion of planets and satellites, g and variation.
- **MOMENTUM AND COLLISIONS** (§9.1, 9.3-9.6)
Conservation of linear momentum; collisions in 1 and 2 dimensions; centre of mass; many-particle systems.
- **ROTATION** (§10.1, 10.3-10.6)
Angular velocity and acceleration; angular quantities; rotational kinetic energy; moment of inertia; torque.

TOPIC 2: Thermal Physics
<ul style="list-style-type: none"> • TEMPERATURE (§19.1-19.2, 19.4) Temperature and thermal equilibrium; measuring temperature; thermal properties of matter.
<ul style="list-style-type: none"> • KINETIC THEORY AND THE IDEAL GAS (§19.5, 21.1) Macroscopic properties of a gas and the ideal gas law; molecular model of the ideal gas; kinetic interpretation of temperature.
<ul style="list-style-type: none"> • HEAT AND THE FIRST LAW OF THERMODYNAMICS (§20.1-20.7) Heat and internal energy of ideal gas; heat capacity and specific heat for solids and ideal gas; latent heat; work done on an ideal gas. The First Law of Thermodynamics; applications; the transfer of heat.

TOPIC 3: Waves
<ul style="list-style-type: none"> • <i>OSCILLATIONS</i> (§15.1-15.7) Oscillating systems; SHM, including energy of oscillations; examples, inc. uniform circular motion, pendulums. Damped and forced oscillations (qualitative only).
<ul style="list-style-type: none"> • <i>WAVE MOTION</i> (§16.1-16.3, 18.1-18.3) Propagation of a disturbance; travelling waves; wave speed; power and intensity in wave motion; the principle of superposition; interference of waves; standing waves.
<ul style="list-style-type: none"> • <i>SOUND WAVES</i> (§17.1-17.4, 18.4-18.7) The speed of sound; travelling longitudinal waves, power and intensity of sound waves, the Doppler effect. Resonance. Standing longitudinal waves; beats.

Week 1-6: Mechanics

Weeks 7-12: Thermal Physics; Waves