PHYSICS 1A / HIGHER PHYSICS 1A/(SPECIAL) HIGHER PHYSICS 1A (PHYS1121/PHYS1131/PHYS1141)

Textbook: 'Fundamentals of Physics', Halliday & Resnick 10th Edition

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TOPIC 1: Mechanics

- **MOTION ALONG A STRAIGHT LINE** (§2.1 – 2.6)
  Displacement, velocity and acceleration; motion with constant acceleration. (Much of this will be assumed knowledge with revision resources supplied.)

- **VECTORS** (§3.1 – 3.3)
  Vectors; resolution and unit vectors; vector addition; dot and scalar products

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- **MOTION IN TWO AND THREE DIMENSIONS** (§4.1 – 4.7)
  Equations of motion in vector form; average and instantaneous velocities and accelerations; projectile motion; uniform circular motion; relative motion.

- **FORCE AND MOTION** (§5.1 - 5.3, 6.1 – 6.3)
  Newton's laws of motion; mass; contact forces (normal and frictional components); dynamics of circular motion. Applications of all of these in mechanics.

- **WORK AND ENERGY** (§7.1 – 7.6, §8.1 – 8.5)
  Mechanical work; vector dot product; variable forces inc. Hooke's Law. Kinetic energy and the work-energy theorem; potential and internal energies, power.

- **CENTRE OF MASS AND LINEAR MOMENTUM** (§9.1 – 9.8)
  Extended objects and many particle systems, centre of mass; linear momentum; collisions in 1 and 2 dimensions.

- **ROTATION AND TORQUE** (§10.1 – 10.8, §11.1-11.8)
  Angular velocity and acceleration; rotational kinetic energy; moment of inertia; torque, rotational kinematics and mechanics. *Note: Parts of this section will be covered in the lab and problem solving classes and may not be covered in lectures. They are examinable.*
  PHYS 1141 only §11.9 on gyroscopes in problem solving classes

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- **GRAVITATION** (§13.1 – 13.3, 13.5 – 13.7)
  Newton's law of gravitation; Gravitation, g and its variation; the Principle of Superposition; Gravitational Potential Energy; Kepler's laws; motion of planets and satellites.

TOPIC 2: Thermal Physics

- **TEMPERATURE** (§18.1 – 18.3)
  Heat, temperature and thermal equilibrium; absolute zero; thermal properties of matter; measuring temperature, specific and latent heats.

- **KINETIC THEORY OF GASES** (§19.1 – 19.9)
  Macroscopic properties of a gas and the ideal gas law; molecular model of the ideal gas; kinetic interpretation of temperature; mean free path; the distribution of molecular speeds; molar specific heats; adiabatic processes; equipartition of energy.

- **HEAT AND THE FIRST LAW OF THERMODYNAMICS** (§18.4 – 18.6)
  Energy transfer mechanisms in thermal processes; work and internal energy; work and heat in thermodynamic processes; the First Law of Thermodynamics.

- **1141 ONLY: ENTROPY AND THE SECOND LAW OF THERMODYNAMICS** (§20.1-20.4)
  This will be covered in problem solving classes

TOPIC 3: Waves

- **OSCILLATIONS** (§15.1 – 15.6)
  Oscillating systems; Simple Harmonic Motion, including energy of oscillations; Examples, including uniform circular motion, pendulums; Damped and forced oscillations (qualitative only).

- **WAVE MOTION** (§16.1 – 16.5, 16.7)
  Propagation of a disturbance; travelling waves; wave speed; reflection and transmission; power and intensity in wave motion; the principle of superposition; interference of waves; standing waves.

- **SOUND WAVES** (§17.1 – 17.8)
  The speed of sound; pressure variations; travelling longitudinal waves; power, intensity and level of sound waves; interference; the Doppler effect; resonance; standing longitudinal waves; beats; shock waves

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Weeks 1-6:   Mechanics

Weeks 7-12:   Thermal Physics; Waves