Course Modules:

The course is divided up into four broad themes and each theme is further subdivided into modules. Roughly one module per week will be covered during the term. The Modules that will be covered are as follows:

THEME 1: INTRODUCTION AND CORE CONCEPTS

T1M1 – The predictable universe; from measurements to models
- Units, unit conversion
- Vectors, dimensional analysis, proportionality

T1M2 – Precision and estimation
- measurement precision, significant figures, scientific notation
- Fermi questions (estimation)

THEME 2: MECHANICS

T2M1 – Kinematics
- motion, position, displacement, velocity, speed, acceleration
- position, velocity, acceleration versus time graphs
- kinematic equations (1D and 2D)

T2M2 – Forces
- examples of forces, gravity,
- force body diagrams
- friction
- action/reaction forces

T2M3 – Energy
- types of energy
- kinetic energy, potential energy, work & power
- conservative and non-conservative forces
- conservation of energy

T2M4 – Momentum
- examples of momentum
- conservation of momentum
- momentum and energy
- types of collisions (elastic & inelastic)

THEME 3: WAVES

T3M1 – Wave motion
- what is a wave
- pulses and oscillations
- graphing wave motion
- periodic waves

- phase and phase difference
- waves on a string
- energy of a wave
- waves at a boundary (change of medium)

T3M2 – Superposition and sound

- interaction between waves, interference, superposition
- standing waves
- longitudinal waves
- sound waves
- resonance & beats

T3M3 – The wave nature of light

- light as a wave
- reflection, refraction and dispersion
- thin film interference
- waves in 2D
- double slit, diffraction, single slit

THEME 4: FLUIDS

T4M1 – Fluids statics

- pressure
- Pascal's principle
- buoyant force
- surface tension, contact angle

T4M2 – Fluid dynamics

- laminar flow
- incompressibility, continuity equation
- Bernoulli's equation
- Poiseuille flow
- turbulence