PHYSICS 241

PHY 241 General Physics I is the first course in the calculus-based PHY 241/242 sequence. It provides an introduction to mechanics, heat, and sound. It is designed for majors in physics, chemistry, mathematics and engineering. There are four 1-hour lectures, one 1-hour tutorial and one 3-hour lab each week. Prerequisite: MAT 241. Co-requisite: MAT 242.

The syllabus below is a general guide and will vary from semester to semester.

Week 1
Units, Uncertainty and Significant Figures, Vectors, and Vectors Products, Displacement, Average and Instantaneous Velocity and Acceleration, Constant Acceleration motion, Freely Falling Bodies, Velocity and Position by Integration

Week 2
Position, Velocity and Acceleration Vectors, Projectile Motion, Motion in a Circle, and Relative Velocity, Newton's Laws of Motion, Mass and Weight, Free-Body Diagrams

Week 3
Applying Newton's Laws - Particles in Equilibrium and Dynamics of Particles
Frictional Forces, Dynamics of Circular Motion

Week 4
Work, Kinetic Energy and the Work–Energy Theorem, Work and Energy with Varying Forces, Power

Week 5
Gravitational Potential Energy, Elastic Potential Energy, Conservative and Nonconservative Forces, Force and Potential Energy

Week 8
Momentum and Impulse, Conservation of Momentum, Momentum Conservation and Collisions, Elastic Collisions, Center of Mass

Week 7
Angular Velocity and Acceleration, Constant Angular Acceleration, Linear and Angular Kinematics, Energy in Rotational Motion, Parallel-Axis Theorem, Moment-of-Inertia, Dynamics of Rotational Motion, Torque and Angular Acceleration for a Rigid Bodies, Work and Power

in Rotational Motion, Angular Momentum, Conservation of Angular Momentum, Precession

Week 9
Conditions for Equilibrium, Rigid-Body Equilibrium Problems, Stress, Strain, and Elastic Moduli, Newton's Law of Gravitation, Weight, Gravitational Potential Energy, Motion of Satellites

Week 10
Oscillations, Simple Harmonic Motion, Energy in Simple Harmonic Motion, The Simple and Physical Pendulums, Damped Oscillations, Forced Oscillations and Resonance

Week 11
Density, Pressure in a Fluid, Buoyancy, Fluid Flow, Bernoulli's Equation

Week 12
Mechanical Waves, Periodic Waves, Energy in Wave Motion, Wave Interference and Superposition, Standing Waves and Normal Modes on a String, Sound Waves

Week 13
Sound Intensity, Sound Waves and Normal Modes, Resonance and Sound, Interference and Beats, The Doppler Effect

Week 14
Temperature and Heat, Thermal Equilibrium, Thermometers and Temperature Scales, Thermal Expansion, Quantity of Heat, Calorimetry and Phase Changes, Mechanisms of Heat Transfer, Equations of State, Kinetic-Molecular Model of an Ideal Gas, Heat Capacities, Phases of Matter

Week 15
Thermodynamic Systems, Work, Internal Energy and the First Law of Thermodynamics, Thermodynamic Processes, Internal Energy, Heat Capacities, and Adiabatic Processes of an Ideal Gas, Second Law of Thermodynamics, Heat Engines, Refrigerators, Second Law of Thermodynamics and the Carnot Cycle, Entropy