KATHMANDU UNIVERSITY
SCHOOL OF SCIENCE
Department of Natural Sciences (Physics)

Course Title: **General Physics I**
Course Code: **PHYS 101**
Level: B.Sc./B. E./ B. Tech.
Year: I
Semester: I

**MECHANICS**

1. **Dynamics of system of particles**: Work done by constant and variable forces, Work-energy theorem, conservative and non-conservative forces, force as negative gradient of potential energy, conservation of linear momentum, Center of mass, System of variable mass, particle collision: one dimensional and two dimensional (relation between the scattering angle in CM and L system not required). [8 Hrs.]

2. **Rotational Dynamics**: Angular momentum of a single particle and system of particles, torque, Conservation of angular momentum, Rotation about fixed axis: K. E. of rotation, Moment of inertia and Radius of gyration, Theorem of parallel and perpendicular axes, calculation of rotational inertia for slender rod, circular disc and solid sphere. [3 Hrs.]

3. **Wave and Oscillation**: Simple harmonic oscillator, Compound pendulum, loaded spring, Time average of energy, Damped harmonic oscillator, forced vibration and resonance in light damped system. [4 Hrs.]

4. **Motion of particle under central force field**: Central force, Angular momentum conservation, one-body problem, two-body problem and its reduction to one body problem, Concept of reduced mass. [1 Hrs.]

5. **Elasticity**: Stress, strain, elastic limit, Elastic and plastic behavior, Types of elasticity, Poisson’s, work done per unit volume in stretched wire, Relation between elastic constants (without derivation), bending of bar (without derivation). [2 Hrs.]

6. **Viscosity**: Stream line and turbulent flow, Continuity equation, Bernoulli’s principle, Coefficient of viscosity, Newton’s formula, Poiseuille’s equation for flow of liquid through a tube, Reynold’s number. [2 Hrs.]

**OPTICS**

1. **Interference**: Monochromatic radiation, Coherent sources, Constructive and destructive interference, Young’s double-slit experiment, Intensity distribution, Interference in thin films due to reflected light, Newton’s rings. [3 Hrs.]

2. **Diffraction**: Rectilinear propagation of light, Distinction between Fresnel and Fraunhoffer diffraction, Diffraction at single slit, Diffraction grating. [2 Hrs.]

3. **Polarization**: Polarization and transverse nature of light, Polaroid, Double refraction, Polarization by reflection, Brewster’s law, Malus’ law, Nicol prism as polarizer and analyzer, Optically active substances, Specific rotation. [3 Hrs.]

4. **Laser**: Properties of laser radiation, the laser process, including stimulated and spontaneous emission and population inversion, optical and electrical pumping, Gas and semiconductor lasers, Applications of lasers. [2 Hrs.]
HEAT AND THERMODYNAMICS

1. **Heat transfer**: Heat flux and thermal conductivity, convection and radiation (Wien’s displacement law, Rayleigh-Jean’s law, limitation of classical law), Plank’s law to explain black body radiation, Boltzman, Stafan’s law. [2 Hrs.]

2. **Thermodynamics**: Thermodynamic system and thermodynamic variables, Equation of state of ideal gas, p-v diagram, First law of thermodynamics and applications, Conversion of heat into work and vice versa, Energy from fossil fuels. [2 Hrs.]

3. **Second law of thermodynamics**: Heat engines, Refrigerators, Efficiency of ideal and practical heat engines, Statements, Kevin-Planck and Clausius statements, Entropy. [2 Hrs.]

References