

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

Couse Title: **General Physics I**
Level : B.Sc./B. E./ B. Pharm./B. Tech.
Year : I

Course Code: **PHYS 101**
Cr. Hrs : 2 (32 Hrs)
Semester : I

Course Objectives: This course is especially prepared for first- year undergraduate students of all branches of science and engineering to help them develop physical intuition through a comprehensive understanding of fundamental concepts emphasizing physical concept rather than complicated mathematical treatments. The contents of the course include fundamentals of mechanics, Optics, and Heat. The topics are so chosen as to address the need of engineering and applied sciences.

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), two-body problem and reduced mass. [9 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. **Elasticity:** Stress, strain, elastic limit, Elastic and plastic behavior, Types of elasticity, Poisson's ratio, work done per unit volume in stretched wire, Relation between elastic constants (without derivation). [2 Hrs.]
5. **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 Fraunhofer diffraction, Diffraction at single slit and N-slits, Diffraction grating. [2 Hrs.]
3. **Polarization:** Polarization and transverse nature of light, 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, stimulated and spontaneous emission and population inversion, optical and electrical pumping, Applications of lasers. [2 Hrs.]

HEAT

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

References

1. R. Resnick and D. Halliday, *Physics part 1 and part 2*. John Wiley and Sons.
2. J. W. Jewett and R. A. Serway, *Physics for Scientists and Engineers*, Cengage Learning
3. W. M. Steen, *Laser Material Processing*.