Department Of Computer Science and Engineering
Kathmandu University
Dhulikhel, Kavre

Subject: General Physics I   **Course: PHYS 101**

Level: B.E./B.Sc/B. Tech. 1ˢᵗ Year/1ˢᵗ Semester   **Credit Hours: 3**

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 comprehen- sive 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 systems of particles: Work done by constant and variable forces, Work-energy theorem, conservative and non-conservative forces, force as negative gradient of potential en- ergy, 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, Mo- ment 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, Pois- son's ratio, work done per unit volume in stretched wire, Relation between elastic constants (without derivation). [2 Hrs.]

5. Viscosity: Streamline and turbulent flow, Continuity equation, Bernoulli's principle, Coef- ficient 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 in- terference, 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 dis- placement law, Rayleigh-Jeans law, limitation of classical law), Planck's law to explain black body radiation, Stefan-Boltzmann law. [2 Hrs.]

References
1. R. Resnick, 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.