

Course Title	MECHANICS
Course Code	MPHY-111
Credit Hours	CH3
Pre- requisites	FSc / A-Level (Physics) or equivalent
Learning outcomes	At attending this course student will be able to understand classical concepts of motion and apply their knowledge to mechanical systems.
Contents	<p>Vectors, Force, Newtons laws: Vectors and properties, gradient, divergence, curl, Force and mass, Newton’s laws of motion, weight, Applications of Newton’s laws of one dimension, Newton’s laws in three-dimensional vector form, projectile motion, drag force and motion of projectiles, uniform circular motion, relative motion.</p> <p>Applications of Newton’s laws and momentum: Force Laws, tensions and normal forces, frictional forces, dynamics of uniform circular motion, time dependent forces, non-inertial frames and pseudo forces, Limitations of Newton’s laws, Collisions, linear momentum, impulse and momentum, conservation of momentum, two-body collisions.</p> <p>System of particles and rotational kinematics: Two particles and many particle systems, center of mass of solid objects, conservation of momentum in system of particles, system of variable mass, rotational motion, rotational variables, rotational quantities as vectors, rotation with constant acceleration.</p> <p>Rotational dynamics and angular momentum: Torque, rotational inertia and Newton’s second law, rotational inertia of solid bodies, torque due to gravity, equilibrium application of Newton’s laws for rotation, non-equilibrium applications of Newton’s laws of rotation, combined rotational and translational motion, angular momentum for a system of particles, angular momentum and angular velocity, conservation of angular momentum, spinning top, gyroscope and precession.</p> <p>Work, kinetic energy, and potential energy: Work and energy, power, work done by a variable force in two dimensions, kinetic energy, work theorem, work and kinetic energy in rotational motion, kinetic energy in collisions, conservative forces, potential energy, conservation of mechanical energy, energy conservations in rotational motion, one dimensional conservative system, three dimensional conservative systems. Frictional work, conservation of energy in a system of particles, center of mass energy, reactions and decays, energy transfer by heat.</p> <p>Gravitation: Newton’s laws of gravitation, gravitation near earth surface, Shell theorems, gravitational potential energy, motion of planets and satellites, gravitational field, black holes and dark matter.</p>
Teaching-learning Strategies	Classroom teaching / Lecturing
Assignments- Types and Number	Problem/work sheets: 3-4
Assessment and Examinations	Mid-Term Assessment: 35% Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc. Final Term Assessment: 40%
Text Books	<ol style="list-style-type: none"> 1. Mechanics by C. Kittel, et al., Berkeley Physics Course Volume 1, Berkeley (1965). 2. Physics (Volume 1 & 2) by R. Resnick, D. Halliday and K. S. Krane (5th Edition), Wiley (2002). 3. University Physics with Modern Physics by H. D. Young, R. A. Freedman(14th Edition), Addison-Wesley (2015). 4. Fundamentals of Physics, D. Halliday, R. Resnick and J. Walker (9th Ed), Wiley (2011). 5. Physics: Classical and Modern by F. J. Keller W. E. Gettys and M. J. Skove (2nd Edition), McGraw Hill (1992).