**GENERAL PHYSICS (103)/ INTRODUCTORY MECHANICS (4 Cr.)**

**Pre-requisite:** Intermediate with Physics or O/A Level Physics

**For All Sections**

**Learning Objectives:**

Student will learn the fundamental physics of Mechanics and its applications in everyday life. Evaluations and exams will be based on analytical and conceptual problems. Students shall be made to solve question and exercises at the end of each chapter.

**Recommended books:**

1. **Fundamentals of Physics by Halliday/Resnick/Walker**
2. University Physics (Models and Applications) by William P. Crummett
3. The Feynman Lectures on Physics Volume I

**Course Outlines/Topics (Textbook of Halliday/Resnick/Walker):**

**Topic -1: Measurements**

Physical quantities, SI units, Changing units, Length, Time, Mass, Accuracy, Precision.

**Topic -2: Vectors**

Vector and Scalars, Adding vectors geometrically, Components of vectors, Unit vectors, Adding vectors by components, Multiplying vectors, Practice problems.

**Topic -3: Motion along a straight line**

Description of motion, Position and displacement, Average velocity and average speed, Instantaneous velocity and speed, Acceleration, Constant acceleration (a special case), Free fall acceleration.

**Topic -4: Motion in 2-D & 3-D**

Motion in two or three dimensions, Position and displacement, Average velocity and instantaneous velocity, Average acceleration and instantaneous acceleration, Projectile motion, Uniform circular motion.

**Topic -5: Force and Motion**

Newton’s first law, Force, Mass, Newton’s second law, Newton’s 3rd law, Applying Newton’s laws, Friction, The drag force and terminal speed, Uniform circular motion.

**Topic -6: Work and Energy**

Energy, work, Work-KE theorem, Work done by a gravitational force, Work done by a spring force, Work done by a general variable force, Power, Potential energy, Path independence of conservative forces, Conservation of mechanical energy and total energy.

**Topic -7: Systems of Particles**

Center of mass, Newton’s 2nd law for a system of particles, Linear momentum and its conservation, Elastic and inelastic collisions in one dimension.

**Topic -8: Rotation**

Rotational variables, Are angular quantities vectors, Rotation with constant angular acceleration, Relating the linear and angular variables, Kinetic energy of rotation, Rotational inertia, Torque, Newton’s 2nd law for rotation, Work and rotational KE, Angular momentum & its conservation.

**Topic -9: Oscillations**

Oscillations, Simple harmonic motion, Velocity, acceleration and energy in SHM, The force law of SHM, SHM and Uniform circular motion, Damped SHM, Forced oscillations and resonance.

**Topic -10: Gravitation**

Newton’s Gravitational Law, Gravitation near Earth’s surface, Gravitation inside Earth, Gravitational PE, Escape speed, Planets and satellites: Kepler’s laws,

**Course evaluation:**

Mid-term exam (25%), Final exam (25%), Quizzes (20%), Homework/assignments (15%) and Lab (15%).

**Syllabus**: MID Term Exam: Topic 1-5

FINAL Term Exam: Topic 6-10

**Attendance and Grading Scale policy:**

Students must attend all the lectures. If attendance of any student falls below 70%, he/she will not be allowed to sit in the final exam. FCCU grading scale policy will be followed to calculate grades and quality points.