Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT305	Physics I	5	3	0	0	3	5

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	The main objective of this course is to impart to students the fundamental principles of classical mechanics, the laws of kinematics and dynamics, with mathematical competence; and to develop their ability to model physical phenomena, perform vector analysis, and solve complex problems analytically using conservation law practices.
Content	-1. Mathematical Introduction • Vector analysis (Scalar/dot and vector/cross products) • Cartesian and cylindrical coordinate systems • Applications of differential and integral calculus • Differential equations (Fundamental level for mechanics) 2. Kinematics • Motion in one dimension (Position, velocity, and acceleration vectors) • Motion in two and three dimensions (Projectile motion) • Uniform circular motion 3. Dynamics • Concept of force and free-body diagrams • Newton's Laws of Motion • Friction force and dynamics of circular motion (Centripetal force) 4. Kinetics (Work and Energy) • Work-Kinetic Energy Theorem • Conservative and non-conservative forces • Potential energy • Conservation of mechanical energy 5. Linear Momentum and Collisions • Center of mass (Transition from point particles to rigid bodies) • Linear momentum and Impulse • Conservation of linear momentum • Elastic and inelastic collisions 6. Rotational Kinematics and Dynamics • Rotational kinematics of rigid bodies • Moment of inertia and rotational kinetic energy • Torque and Newton's 2nd Law for rotational motion • Angular Momentum and its conservation • Rolling motion (Combination of translation and rotation) 7. Oscillations and Simple Harmonic Motion (SHM) • Hooke's Law and restoring force • Kinematic equations of SHM (Time dependence of position, velocity, and acceleration) • Energy transformations and conservation in SHM • Applications: Simple pendulum and physical pendulum • Introduction to damped and driven oscillations, Resonance
References	

Theory Topics

Week	Weekly Contents
1	Basic notions, Mathematics, Physics and Measurements
2	Vectors
3	1 Dimensional Motion

Week	Weekly Contents
4	2 Dimensional Motion
5	Laws of Motion
6	Circular Motion and Other Applications of Newton’s Laws
7	Midterm 1
8	Energy of a system
9	Conservation of Energy
10	The Law of Gravitation
11	Midterm 2
12	Linear Momentum and Collision of 2 Bodies
13	Rotation of a rigid object about a fixed axis
14	Angular Momentum