B. Tech First Year, Semester-I
Course: Classical Physics

- Course Number: **PY111**
- Credits: **11 [3(L)-1(T)-0(P)]**

Course Objective

This course is structured to introduce the basic principles and fundamentals of Classical mechanics, Thermal physics, Electromagnetic waves and the Special Theory of Relativity in Physics. The first part, Classical mechanics is devoted to the understanding of the motion of particles and the system of particles in different coordinate systems and reference frames with a focus on Lagrange's and Hamiltonian mechanics to model their motion. The second part of the course is devoted to thermal and statistical physics which considers how the collective behaviour of a system of many particles is related to the properties of the particles themselves. The third part focuses on the understanding of electromagnetic theory that forms the basis for communications-electronics. The fourth part focuses on the special theory of relativity that connects space and time, matter, and energy-links that are crucial to our understanding of the physical universe.

Course content

Topics	No. of sessions	Pedagogy
Unit-I: Classical Mechanics Co-ordinate systems, plane polar, cylindrical and spherical polar co-ordinate systems, Gradient, Divergence, Curl, frame of reference, rotational frame, Newton's Second Law in the rotational frame, Coriolis and Euler forces. Constraints and degrees of freedom, Generalized co-ordinates, Virtual Work Theorem, D'Alembert's Principle and Applications, Lagrange's formulation and Applications, Legendre's Transformation, Hamilton's formulations and Applications.	12	Quizzes and Assignments
Unit-II: Statistical and Thermal Physics Concepts of distribution of molecular velocities; distribution laws and statistics-MB, FD, and BE; mean free path; Transport phenomena – viscosity, diffusion; thermal conductivity; Wiedemann-Franz law. Black body radiation, Planck's distribution law, and its application to classical distribution (Rayleigh-Jeans and Wiens) and total radiation (Stefan-Boltzmann) laws.	08	
Unit-III: Wave Motion and Introduction to Electromagnetic Waves Longitudinal and transverse waves, wave equation, plane waves, phase, superposition of waves and beats, standing waves, sound waves. Electromagnetic Waves: Electric and magnetic fields in a medium, Maxwell's equations- Gauss's Law(electrostatics), Gauss's law for magnetism, Faraday's Law, modified Ampere's Law. EM wave equation, plane electromagnetic waves, Electromagnetic (EM) waves in vacuum and media, Energy of EM waves, Poynting's theorem.	12	
Unit-IV: Relativistic Mechanics Michelson – Morley experiment, Postulates of Special theory of Relativity, Galilean and Lorentz transformation equations and its application, Time Dilation, Length Contraction, Relativistic mass, energy and momentum, Addition of velocities, Equivalence of mass & energy.	08	

TEXT BOOKS:

1. Introduction to Electrodynamics, D.J. Griffiths.
2. Classical Mechanics by John R. Taylor
3. Concepts of Modern Physics by Arthur Beiser
4. Classical Mechanics by J C Upadhyay

REFERENCE BOOKS:

1. Physics for Scientists and Engineers Raymond A. Serway and John W. Jewett
2.An Introduction to Mechanics, D. Kleppner and R. J. Kolenkow, Tata McGraw-Hill,
3. Classical Dynamics, D T Greenwood, Prentice Hall of India, Pvt. Ltd., New Delhi
4. Physics: Principles with Applications Douglas C. Giancoli
5. Introduction to special relativity, Robert Resnick.
6. Introduction to Electricity & Magnetism by Liao, Dourmashkin, and Belcher
7. Classical Mechanics, by H. Goldstein.