

Annexure II

Syllabus of first year B Tech common courses, Department of Physics

PH101: Physics - I (2-1-0-6)

Calculus of variation: Fermat's principle, Principle of least action, Euler-Lagrange equations and its applications.

Lagrangian mechanics: Degrees of freedom, Constraints and constraint forces, Generalized coordinates, Lagrange's equations of motion, Generalized momentum, Ignorable coordinates, Symmetry and conservation laws, Lagrange multipliers and constraint forces.

Hamiltonian mechanics: Concept of phase space, Hamiltonian, Hamilton's equations of motion and applications.

Special Theory of Relativity: Postulates of STR. Galilean transformation. Lorentz transformation. Simultaneity. Length Contraction. Time dilation. Relativistic addition of velocities. Energy momentum relationships.

Quantum Mechanics: Two-slit experiment. De Broglie's hypothesis. Uncertainty Principle, wave function and wave packets, phase and group velocities. Schrödinger Equation. Probabilities and Normalization. Expectation values. Eigenvalues and eigenfunctions.

Applications in one dimension: Infinite potential well and energy quantization. Finite square well, potential steps and barriers - notion of tunnelling, Harmonic oscillator problem zero point energy, ground state wavefunction and the stationary states.

Texts:

1. *Introduction to Classical Mechanics* by Takwale R and Puranik P (McGraw Hill Education, 1 st Ed., 2017).
2. *Classical mechanics* by John Taylor (University Science Books, 2005).
3. *Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles* by R. Eisberg and R. Resnick (John-Wiley, 2 nd Ed., 2006)

References:

1. *A Student's Guide to Lagrangians and Hamiltonians* by Patrick Hamill (Cambridge University Press, 1st edition, 2013).
2. *Theoretical Mechanics* by M. R. Spiegel (Tata McGraw Hill, 2008).
3. *The Feynman Lectures on Physics, Vol. I* by R. P. Feynman, R. B. Leighton, and M. Sands, (Narosa Publishing House, 1998).