(L:T:P= 4:0:0) 100 Marks

M SC SEM-III
Paper OET3.1: MECHANICS

Unit 1: Classical Mechanics [16 hours]

Newtonian mechanics: Single and many particle systems-Conservation laws of linear momentum, angular momentum and energy. Kepler's laws of planetary motion.

Lagrangian formalism: Constrains in motion, generalised co-ordinates, virtual work and D'Alembert's principle. Lagrangian equation of motion form D'Alembert's principle. Symmetry and cyclic co-ordinates. Hamiltonian formalism: Hamilton's equations of motion-from Legendre transformations and the variational Principle. Simple applications.Canonical transformations. Poisson brackets-Canonical equations of motion in Poisson bracket notation.

Unit 2: Relativity [16 hours]

Galilean transformations, Covariance of physical laws, Michelson-Morley experiment, Ether hypothesis, Postulates of special theory of relativity, Lorentz transformations and their consequences; length contraction, simultaneity, time dilation, relativistic Doppler's effect.

Four dimensional formulation: Minkowski space and Lorentz transformations. four vector, four velocity, four momentum, conservation four momentum-application of four momentum.

Unit 3: Quantum Mechanics [16 hours]

Inadequacy of classical physics, postulates of quantum mechanics. Wave function, Uncertainty Principle, complimentarity, interpretation of wave function, normalization, Schrodinger wave equation in one dimension and three dimensions, expectation value and Ehrenfest's theorem. Energy eigen values and eigen functions. Exactly solvable one dimensional problems: One dimensional: Square well and rectangular step potentials, Harmonic oscillator.

Unit 4: Statistical Mechanics [16 hours]

Laws of thermodynamics, concept of entropy, Statistical ideas in physics, Phase space, ensemble, ensemble average, probable and most probable distributions, Gibb's paradox, Boltzman equipartition theorem (derivation), Stirling's approximation, Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac distribution laws and their comparison, Blackbody radiation and photons.

References

1. Introduction to Classical Mechanics: R G Takwale and P.S .Puranik (TMH, 1979)
2. Classical Mechanics by J.C.Upadhyaya, Himalaya Publishing house.
3. Classical Mechanics: N C Rana and P S Joag (Tata McGraw, 1991)
4. Classical Mechanics: H Goldstein, (Addision-Wesley, 1950)
5. A Text Book of Quantum Mechanics by P.M. Mathews and K Venkateshan.
6. Advanced Quantum mechanics by Satyaprakash, Meerut publication.
7. Statistical Mechanics: K Huang (Wiley Eastern)
8. Statistical Mechanics and Properties of matter: E S R Gopal (Macmillan)

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Paper OEP 3.1: PRACTICAL 3.4

(L:T:P = 0:0:2) 50 Marks

1. Experiment in Solid state lab.
2. Experiment in Optics/General lab.
3. Experiment in Nuclear lab.
4. Experiment in Electronics lab.

Assignments/ Computations

n developed.