momentum and angular momentum, system of variabl mass, elastic and inelastic collisions, rigid body degrees of freedom, Euler's theorem.

UNIT – IV

Molecular rotations (as rigid bodies), moment o inertia, di and tri atomic molecules, intrinsic spin precessional motion, motion of a top, gyroscope.

Elastic constants for an isotropic solid, their inte relation, torsion of a cylinder, bending of beam applications to cantilever.

UNIT – V

Kinematics of moving fluid, equation of continuity Euler's law for fluidity.

Viscous fluids, streamline and turbulent flow, flo through a capillary tube, Poisvilles law, Reynold' number, Stoke's law, theory of rotation viscometer effect of temperature and pressure on the viscosity o liquids.

Text and Reference books :

1. E.M. Purcell, Editor, Berkeley Physics Course Vol. 1, Mechanics, McGraw Hill.

2. R.P. Feynmann, R.B. Leighton, M. Sands, Th Feynmann Lectures in Physics, Vol. 1. B publications, Bombay, Delhi, Calcutta, Madras

PAPER-II

OSCILLATIONS, WAVES AND ACOUSTICS

UNIT - I

Free oscillations of simple systems: Equilibrium; concept of potential well, small oscillations approximation, solutions, linear and transverse oscillations of a mass between two springs, diatomic molecule, reduced mass concept.

Damped and forced oscillations: Damped oscillations; critical damping, Q of an oscillator. Forced oscillator with one degree of freedom; Transient and steady state oscillations, resonance energy absorption, low and high frequency responses.

UNIT - II

Free oscillations of system with two degrees of freedom: Two dimensional oscillator; normal modes, longitudinal and transverse oscillation of coupled masses, energy transfer between modes, coupled pendulum.

Fourier analysis: Fourier series and Fourier coefficients; simple examples (square wave, saw-tooth wave, half and full wave rectifier), use of exponential representation for harmonic oscillations, expression for Fourier coefficients. Non-periodic disturbance; representation by Fourier integral, Fourier transform. Case of a wave train of finite length, constancy of D**x** D**k** (the uncertainty product).

UNIT - III

Wave equation: Waves in a one-dimensional chain of particles; classical wave equation; wave velocity, boundary conditions and normal modes, dispersion relations, dispersion waves, acoustic and optical modes.

Waves in continuous media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical measurements, dispersion in waves, group velocity and phase velocity, their measurements.

Superposition of waves: Linear homogenous equations and the superposition principle, interference in space and energy distribution; beats and combination tones.

UNIT -IV

Ultrasonics: Production, detection, and applications of ultrasonic waves

Vibrations in bounded systems: Normal modes of a bounded system; harmonics, the quality of sound, Chladni's figures, Vibration of a drum. Noise and Music; Limits of human audibility; intensity and loudness, bel and decibel. Music scale and musical instruments.

UNIT - V

Reflection, refraction, and diffraction of sound: Acoustic impedance of a medium, percentage reflection, and refraction at a boundary, impedance matching for transducers. Diffraction of sound; principle of a sonar system, sound ranging.

Applied acoustics: Transducers and their characteristics, recording and reproduction of sound, measurement of frequency, velocity, waveform, and intensity. The acoustics of halls, reverberation period, Sabine's formula.

Text and Reference Books :

1. Waves and Oscillations, Berkley Physics Course Vol. III
2. Vibrations and waves, I.G. Main (Cambridge University Press)
3. The Physics of Vibrations and Waves, H.J. Pain, McMillan (1975).
4. Oscillations, Waves and Acoustics (In Hindi) by Kakani, Bhandari & Kalra