**Subject: Physics (PH 101)**

| No. of Classes | Contents for Class |
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| Lecture 1 | Introduction to Physics course syllabus, Introducing students to the evaluation/grading procedure, Mark distribution in each examination (Class test, mid-term, end-term) |
| Lecture 2 | Introduction to vibration and oscillation, simple harmonic oscillator: equation of motion, general solution, Characteristic of SHM: amplitude, time period, phase velocity, acceleration, total energy |
| Lecture 3,4 | Damped harmonic motion: damping forces, practical examples of damped oscillation, equation of motion for damped oscillation, solution at different damping conditions: weak, large and critical damping |
| Lecture 5 | Forced oscillation of a damped harmonic oscillator, general solution to equation of motion, |
| Lecture 6,7 | Steady state solution for forced oscillation, low frequency, high frequency and mid frequency conditions for forced oscillation, Resonance, power of forced oscillator |
| Lecture 8 | Coupled oscillation: equation of motion for coupled oscillation, solutions |
| Lecture 9 | Introduction of normal modes and normal coordinate |
| Lecture 10 | Maxwell's equation: Electrodynamics before Maxwell |
| Lecture 11 | Displacement current, Maxwell's equation in vacuum |
| Lecture 12 | Maxwell's equation in matter. Boundary conditions |
| Lecture 13 | Conservation laws: Continuity equation, Poynting's theorem |
| Lecture 14 | Electromagnetic waves: The wave equation, Sinusoidal waves, Polarization |
| Lecture 15, 16 | EM waves in vacuum, Monochromatic plane waves, Energy in electromagnetic waves, EM waves in matter, |
| Lecture 17, 18 | Reflection and transmission at normal incidence |
| Lecture 19,20 | Reflection and transmission at oblique incidence |
| Lecture 21 | EM waves in conductors, Reflection at a conducting surface |
| Lecture 22 | Origin and history of quantum mechanics, particle aspect of the wave and vice-versa, matrix and wave mechanics |
| Lecture 23 | Particle aspect of wave – blackbody radiation, photo-electric effect, Wave aspect of particle - de Broglie’s hypothesis, matter wave |
| Lecture 24 | Electron diffraction: Davison-Germer experiment, Particle vs wave: classical scenario & quantum scenario – double slit experiment |
| Lecture 25 | Wave particle duality, Heisenberg’s uncertainty principle, wavefunction, its properties and probabilistic interpretation |
| Lecture 26 | Wave packets, group velocity & phase velocity and relation between them in dispersive medium |

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| Lecture 27 | Development of the wave equation, Time dependent Schrödinger equation |
| Lecture 28 | Introduction to wave function, Probabilistic interpretation of wave function, Probability density |
| Lecture 29 | Quantum mechanical operators (position, momentum, energy), expectation value, correspondence principle, Eigen functions, Eigen value |
| Lecture 30 | Stationary states, Time independent Schrödinger equation |
| Lecture 31 | Infinite square well problem, allowed energies and wavefunctions, Normalization, expectation values |
| Lecture 32, 33 | Potential barrier problem, tunneling phenomena, example of α-particle decay |
| Lecture 34 | Classical theory of electrical conduction, Drude model; Success and failures of classical model; |
| Lecture 35 | Band theory of solid (Qualitative description); Classification of materials on the basis of band theory of solids (qualitative description); Bloch's quantum theory of electrical conduction (Qualitative); |
| Lecture 36 | Distribution of electrons between the energy states-the Fermi-Dirac distribution; temperature variation of Fermi-Dirac distribution function; |
| Lecture 37,38 | The density of energy states (using free electron model) of metal in 3-D; Estimation of Fermi energy for metals |
| Lecture 39 | Fermi surface and Fermi Velocity; Intrinsic and Extrinsic semiconductors; Charge carriers in semiconductor; Concepts of hole; Free electron model applied to semiconductors |
| Lecture 40 | The Hall effect, Magnetoresistance |

References


1. Quantum Physics, Resnick and Eisberg
2. Vibration and waves, A. P. French
3. Introduction to Electrodynamics, D. J. Griffiths
4. Quantum Mechanics, D. J. Griffiths
5. Solid State Physics, A J Dekker
6. The Physics of Solid, R Turton