

Details of B.Tech.

Syllabus Offered by

Department of Physics

Details of Courses Offered by Department of Physics for B.Tech Program

Fundamentals of Physics

PHL 1011

3 - 0 - 0 = 3

UNIT I: Force and electric field due to continuous charge distribution, Field lines–Flux–Gauss’s Law (differential and integral forms) and its applications, Electric potential, Work done in assembling a charge distribution. [8]

UNIT II: Force Law–line current, surface current and volume current densities (Equation of Continuity), Biot-Savart law, Properties of B, Magnetic flux–Div B, Curl B, Magnetic vector potential A, Ampere’s law (differential and integral forms), Faraday’s laws of electromagnetic induction, displacement current, Modified Ampere’s law, Four Maxwell’s equations in differential and integral forms. [10]

UNIT III: Electromagnetic Spectrum, Brief introduction to black body radiation, Photo-electric Effect and Compton Effect, Wave particle duality (de–Broglie waves), Davisson-Germer Experiment, Concept of wave function and its physical significance, Phase and Group velocities, Uncertainty Principle. [10]

UNIT IV: Bohr Theory of atom (with finite and infinite nuclear mass), Derivation of time dependent and time independent Schrödinger wave equations, Expectation values and operators (momentum, energy and angular momentum operators) and commutators, Particle in a box of infinite height (One dimensional). [10]

UNIT V: Free electron theory–Free electron gas, Energy levels and density of states in one dimension, Band theory of solids, Classification of metals, semiconductors and insulators on the basis of band theory. [7]

Recommended Books

1. Introduction to Electrodynamics, D. J. Griffiths, Pearson.
2. Electromagnetics, B. B. Laud, New Age International Publisher.
3. Perspectives of Modern Physics , Arthur Beiser, Tata McGraw Hills
4. Introduction to Solid State Physics, Charles Kittel, Wiley
5. Solid State Physics, S.O. Pillai, Wiley
6. Fundamentals of Physics, Resnick Halliday, Wiley

Physics Laboratory

PHP 1011

0 - 0 - 2 = 1

The laboratory begins with a hands-on (pre-laboratory) training to learn the use of measuring instruments like vernier callipers, screw gauge and spherometer. The list of experiments include

1. (a) To find the angle of prism by rotating the telescope method.
(b) To find the refractive index of the material of the given prism using a spectrometer.
2. To determine the refractive index of given liquid (water) using a hollow prism and spectrometer.
3. To study the Newton’s interference rings and determine the wavelength of sodium light.
4. To determine the wavelength of sodium light using a plane diffraction grating.
5. To study the dependence of Refractive Index (μ) of the material of the prism on the Wavelength (λ) of light; and hence
 - (a) to determine the Dispersive Power of the material of prism
 - (b) to verify the Cauchy Relationship $\mu=a+b/\lambda^2$, and to estimate the values of ‘a’ and ‘b’.
 - (c) to plot a graph of $d\mu/d\lambda$ versus λ .
6. To determine the frequency of A.C. mains with a Sonometer using non-magnetic wire.
7. To draw the characteristics curves of a Semiconductor Diodes (Si or Ge)
8. To study the V-I characteristics of a Zener Diode.
9. To study the performance of a Half-wave, Full-wave & Bridge wave rectifiers without filters.
10. To determine the band gap by measuring the resistance of a Thermistor at different temperatures.

11. To determine the energy band gap of a semiconductor diode (Ge) using Four Probe Method.
12. To verify Stefan's law by estimating the temperature of a torch bulb filament from resistance measurement.
13. To study the Hall Effect and calculate the Hall Coefficient and Charge Carrier Concentration of a given sample.
14. To find the wavelength of He-Ne laser using transmission diffraction grating.

Note: Apart from above listed experiments, course coordinator can also pick any other experiments meant for demonstrating proof-of-concept and to impart training and help the students learn the subject matter of "fundamentals of physics", in general.