Physics II (PHY 156)
Tribhuvan University
Soch College of Information Technology
Bachelor of Science in Computer Science and Information Technology

Course Title: Physics II ----------Course no: PHY-156
Full Marks: ---------- 60+20+20
Credit hours:---------- 3
Pass Marks:---------- 24+8+8
Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)
Course Synopsis:
a) Basic concepts of probability, entropy, classical and quantum statistics.
b) Simple concepts of quantum mechanics leading to Schrödinger equation and its application to simple cases.
c) Methods of solid state physics - crystal structure, band theory of solids, free electron theory of metals and band theory of semiconductors.
Goal: The course aims at providing fundamental physical concepts needed to understand information processing and related devices.

Course Contents:

Unit 1. Statistical Physics ---------- 9 Hrs.
1.1 Macroscopic and microscopic description of a thermodynamic system; ensemble, phase space.
1.2 Thermodynamic probability, fundamental postulates of stat. physics.
1.3 Entropy and probability Bolltzmann theorem, statistical equilibrium
1.4 Maxwell-Boltzmann distribution for ideal gas
1.5 Quantum Statistics:
1.5.1 Bose-Einstein statistics-Photon Gas, Planck's law for Black Body Radiation
1.5.2 Fermi - Dirac statistics- application to electron gas
Unit 2. Modern Physics ---------- 23 Hrs.
2.1 Introduction to Quantum mechanics
2.1.1 Wave particle duality, de Broglie's matter Waves, phase-velocity and group velocity
2.1.2 Heisenberg's uncertainty principle.
2.1.3 Basic postulates of q m
- dynamical variable - linear operator
- eigen values of linear hermitian operator
- measurement of a dynamical variable
- Schrödinger equation
- interpretation of wave function
2.1.4 Simple applications of Schrödinger equation
- particle in a box, infinite potential well
- barrier penetration

- square potential well
- linear harmonic oscillator
- hydrogen atom - rigid rotator

2.2 Band Theory of Solids

2.2.1 Crystalline structure of solids, Bravais lattice miller indices, reciprocal lattice, examples

2.2.2 Band theory of solids: origin of Bands

2.2.3 Classification of solid conductor, insulator and semi conductors

2.2.4 Free electron theory of metal: Fermi energy, electron energy distribution, thermo ionic emission Schottky effect, contact potential.

Unit 3. Semi Conductors ---------- 13 Hrs.

3.1 Band structure of semiconductors, energy gap

3.2 Electrons and holes, electric conduction in semiconductors, effective mass, extrinsic and extrinsic semiconductors

3.3 n-type and p-type semiconductors, carrier concentration, mobility, temperature dependence.

3.4 p-n junction

3.5 Metal semiconductor junction, Schottky junction, Ohmic contact.

Laboratory works:

· To determine inter planer spacing of given crystal by electron diffraction method.
· To determine the band gap of given sample
· To determine the nature of charge carrier of a given simple by hall apparatus
· Study NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates
· To study the temperature dependency of a given sample.
· To study the characteristic of simple and zener diode
· To construct and study CE amplifier
· To construct and study CC amplifier
· To construct and study CB amplifier
· To study output input and transfer characteristics of NPN transistor.

Text books:

1. Thermal physics: C. Kittel
2. Modern Physics: Murgeshan
3. Introduction to solid state physics: C. Kittel.

References books:

1. Elementary Solid State Physics - M.A. Omar Addison-Wesley
2. Heat, Thermodynamics and Statistical Physics:- Singhal, Agrawal and Satya Prakash, Pragati Prakashan, Meerut, India