

CLUSTER UNIVERSITY SRINAGAR, KASHMIR

SYLLABUS– SEMESTER 6th (CBCS)-PHYSICS

DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSE - Theory)

Title: - Solid State Physics and Devices

Course Code: PHY 616D

Credits: 04, Lectures 60

Total: 60 Marks

Unit-I

Crystal lattice, Unit cell, Bravais lattice and seven crystal systems; Reciprocal Lattice. Elastic waves, density of states of continuous medium; Specific heat; Einstein and Debye models; Lattice waves; One-dimensional monoatomic lattice; Quantum mechanical free electron gas; Electrical conductivity; Electrical resistivity versus temperature.

Unit-II

The Fermi surface; Electrical conductivity (effects of the Fermi surface); Thermal conductivity in metals. Electrons in one dimensional periodic potential; Kronig-Penney model; Concept of Brillouin zones; Explanation of energy bands on the basis of Brillouin zones; Metals, insulators and semiconductors. Band structure; intrinsic semiconductors; Temperature dependence of Carrier concentration; Impurity states (acceptor and donor);

Unit-III

Extrinsic semiconductors; the electron-hole concentration product; Electrical conductivity; temperature dependence; the effect of magnetic field on a semiconductor; The Hall effect. p-n junction: working (on the basis of energy band diagram); Rectification property; Derivation of rectification equation; Zener diode. Zener diode as voltage regulator; The junction transistor, Its working (on the basis of energy band diagram), Tunnel diode.

Unit-IV

Transistor load line; Transistor biasing techniques (Voltage divider); bias stability; Thermal runaway. **h**-parameters; **h**-parameter equivalent circuit for CE configuration; FET and its characteristics, MOSFET; types and characteristics, Transistor amplifiers, Two-stage RC coupled amplifier; Equivalent circuit at mid-frequency, Gain at mid –frequency.

Text Books:

1. Elementary Solid State Physics: Principle and applications by M. A. Omar (Pearson Education), 2001.
2. Electronic Devices and Circuit Theory by R. Boylestad and L. Nashelsky (Prentice Hall India).
3. Solid State Physics, M. A. Wahab, Narosa Publishing House

References:

1. Integrated Electronics by Millman and Halkias Tata McGraw Hill.
2. Introduction to Solid State Physics by Charles Kittel, John Wiley & Sons
3. Principles of Electronics, V. K. Metha, S. Chand & Co. Ltd

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SYLLABUS – SEMESTER 6th (CBCS) PHYSICS

DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSE - Practical

Title: - Solid State Physics and Devices (Lab)

Course Code:

Credits: 02

Total: 30 Marks

1. To measure the dielectric constant of a dielectric material with frequency.
2. Hysteresis curve of a ferromagnetic substance.
3. Hall-probe method for measurement of magnetic field.
4. To study IV characteristics of PN diode and Zener Diode.
5. Specific resistance and energy gap of a semiconductor by four probe method.
6. Energy band gap in a semiconductor using a PN junction diode.
7. Characteristics of a transistor in common base and common emitter arrangement
8. Characteristics of a tunnel diode.
9. Characteristics of a JFET
10. Characteristics of a MOSFET.
11. Measurement of h-parameters of a transistor.
12. Study of voltage regulation and ripple factor of a half-wave rectifier with L and π filter circuits.
13. Study of voltage regulation and ripple factor of a full-wave rectifier with L and π filter circuits.
14. Study of Zener diode as voltage regulator.
15. Study of a regulated power supply.
16. Study of Lissajous figure using CRO.
17. Study of VTVM.
18. Study of two stage RC coupled amplifier.
19. Study of AF and RF oscillators.

Reference Books:

1. Advanced Practical Physics for students, B.L Flint and H. T. Workshop, 1977. Asia Publishing House.
2. Advanced Practical Physics, Vol. I & Vol. II, S. P. Singh, Pragati Prakashan, Meerut

Text Books:

1. B. Sc. Practical Physics, C. L. Arora, S. Chand & Co. Ltd
2. Practical Physics, Harnam Singh, S. Chand & Co. Ltd
3. Practical Physics, S. L. Gupta & V. Kumar, Pragati Prakashan, Meerut