

7 th Semester	RMM7D006	Physics of Metals	L-T-P 3-0-0	3 Credits
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Module-I: (10hours)

Introduction and Approach, Properties of materials and some important relationships, Free electron theory of metals, Drude model Electronic Conductivity, Drude model Thermal Conductivity - Ratio the Wiedemann Franz Law.

Module-II: (8 hours)

Maxwell Boltzmann Statistics, Limitations of the Drude model, Elementary quantum mechanics: History and Significant concepts, The Drude Sommerfeld model, Fermi Dirac statistics, Density of states, Fermi Energy and Fermi Surface, Improvements over Drude model, remaining limitations.

Module-III: (10hours)

Specific heat, phonons, Real space Vs Reciprocal space, Diffraction condition and its significance for electron energy, Wigner Seitz cells, Brillouin zones, Band Theory, Density of occupied states, the origin of anisotropy.

Module-IV: (10hours)

Electrons and Holes, Classification of semiconductors, Direct Band gap, indirect Band gap, opto electronic materials, Magnetic properties, superconductivity, Meissner effect, BoseEinstein Statistics, BCS theory, High temperature superconductors, physics of nano scale materials.

Books:

1. Introduction to electronic properties of materials by David Jiles - (Chapman and Hall 1994)
2. Structure and Properties of Materials (Vol.iv) - Electronic Properties by John Wulf, R.M. Rose and L.A. Shepard - (Wiley Eastern, 1964)
3. Introduction to the Modern Theory of Metals by Alan Cottrell - (Ashgate Publishing Company, 1988)
4. Lectures on the Electrical Properties of Materials by Laszlo Solymar and D. Walsh - (Oxford Univ. Press, June 1988)
5. Atomic Theory for students of Metallurgy by William Hume-Rothery and B.R. Coles - (Inst. Of Materials Ashgate Publishing Company, Sept. - 1988)
6. Principles of Electrical Engineering Materials by S.O. Kasap - (McGraw - Hill, 1977)

Digital Learning Resources:

Course Name: Physics of Materials
 Course Link: <https://nptel.ac.in/courses/113/106/113106040/>
 Course Instructor: Dr.PrathapHaridoss