

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Physics - NOC:Introduction to Solid State Physics

Subject Co-ordinator - Prof. Satyajit Banerjee

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Drude's theory of electrons in a metal - Part 1  
Lecture 2 - Introduction to Drude's theory of electrons in a metal - Part 2  
Lecture 3 - Postulates of Drude's theory  
Lecture 4 - Calculating electrical conductivity of metal using Drude's theory of electrons in metal - Part 1  
Lecture 5 - Calculating the electrical conductivity of metal using Drude's Model - Part 2  
Lecture 6 - Introduction to Hall effect in Metals - Part 1  
Lecture 7 - Introduction to Hall effect in metals - Part 2  
Lecture 8 - Introduction to Hall effect in metals - Part 3  
Lecture 9 - Understanding thermal conductivity of a metal using Drude's model - Part 1  
Lecture 10 - Understanding thermal conductivity of a metal using Drude's model - Part 2  
Lecture 11 - Introduction to Sommerfeld's Theory of electrons in a metal - Part 1  
Lecture 12 - Introduction to Sommerfeld's Theory of electrons in a metal - Part 2  
Lecture 13 - Introduction to Sommerfeld's Theory of electrons in a metal - Part 3  
Lecture 14  
Lecture 15  
Lecture 16  
Lecture 17  
Lecture 18  
Lecture 19 - Electronic Contribution to the Specific heat of a Solid - Part 1  
Lecture 20 - Electronic Contribution to the Specific heat of a Solid - Part 2  
Lecture 21 - Electronic Contribution to the Specific heat of a Solid - Part 3  
Lecture 22 - Electronic Contribution to the Specific heat of a Solid - Part 4  
Lecture 23 - Understanding Thermal conductivity of Metals  
Lecture 24 - Introduction to Magnetism in Metal - Part 1  
Lecture 25 - Introduction to Magnetism in Metal - Part 2  
Lecture 26  
Lecture 27 - Introduction to crystals and bonding in crystals  
Lecture 28 - Understanding crystal structure using Bravais Lattice  
Lecture 29 - Bravais Lattice Types - Part 1

---

Get Digi-MAT (Digital Media Access Terminal) For High-Speed Video Streaming of NPTEL and Educational Video Courses in LAN

[www.digimat.in](http://www.digimat.in)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

- Lecture 30 - Bravais Lattice Types - Part 2
- Lecture 31 - Introduction to different crystal types - Part 1
- Lecture 32 - Introduction to different crystal types - Part 2
- Lecture 33 - Indexing crystal planes
- Lecture 34 - Scattering of X rays from crystals - Part 1
- Lecture 35 - Scattering of X rays from crystals - Part 2
- Lecture 36 - Reciprocal lattice vectors - Part 1
- Lecture 37 - Reciprocal lattice vectors - Part 2
- Lecture 38 - Reciprocal lattice vectors and Laue's condition for diffraction of waves in crystals - Part 1
- Lecture 39 - Reciprocal lattice vectors and Laue's condition for diffraction of waves in crystals - Part 2
- Lecture 40 - Reciprocal lattice vectors, Laue's condition and Bragg's law for diffraction of waves by a crystal
- Lecture 41 - Wave equation in a continuous medium and generalization to a discrete medium
- Lecture 42 - Derivation of wave equation for motion of atoms in a crystal
- Lecture 43 - Solution of the wave equation for a crystal and the relation between frequency  $\omega$  and wavevector  $k$
- Lecture 44 - Group velocity of waves and speed of sound in a crystal
- Lecture 45 - Waves in a crystal considering interaction among atoms beyond their nearest neighbours
- Lecture 46 - Normal modes in a crystal
- Lecture 47 - Experimental determination of Phonon dispersion curves
- Lecture 48 - Lattice with two atom basis
- Lecture 49 - Displacement of the atoms for the acoustic and optical Phonons
- Lecture 50 - Density of states of phonons
- Lecture 51 - Calculating the density of states of Phonons
- Lecture 52 - Average energy of Phonons at Temperature T
- Lecture 53 - Debye's Model of specific heat of crystals
- Lecture 54 - Anharmonic effects in crystals
- Lecture 55 - Going beyond free electron model
- Lecture 56 - Applying perturbation theory to free electron wavefunctions and nearly free electron model
- Lecture 57 - Applying perturbation theory to free electron wavefunctions and creation of energy gap at zone boundary
- Lecture 58 - Mixing of plane waves to get Bloch Wavefunction - I
- Lecture 59 - Mixing of plane waves to get Bloch Wavefunction - II
- Lecture 60 - Equivalence of wave vectors  $k$  and  $k+G$  and reduced zone scheme
- Lecture 61 - Applying periodic boundary condition to Bloch wavefunction and counting the number of states
- Lecture 62 - Band theory of metals, insulators and semiconductors
- Lecture 63 - Kronig- Penney model
- Lecture 64 - Bloch wavefunction as a linear combination of atomic orbitals
- Lecture 65 - Tight Binding Model - II
- Lecture 66 - Semiclassical dynamics of a particle in a band and Bloch oscillations
- Lecture 67 - Experimental observations of Bloch oscillations
- Lecture 68 - Concept of hole as a current carrier in semiconductors - I

---

Get Digi-MAT (Digital Media Access Terminal) For High-Speed Video Streaming of NPTEL and Educational Video Courses in LAN

[www.digimat.in](http://www.digimat.in)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

---

- Lecture 69 - Concept of hole as a current carrier in semiconductors - II
- Lecture 70 - Calculating carrier density in semiconductors - I
- Lecture 71 - Calculating carrier density in semiconductors - II
- Lecture 72 - Donor and acceptor energy levels in a semiconductor
- Lecture 73 - charge carrier density in n-type and p-type semiconductors
- Lecture 74 - Electrical conductivity and hall coefficient in semiconductors
- Lecture 75 - Paramagnetism in solids I - Magnetic moment and Lande g factor for atoms
- Lecture 76 - Paramagnetism in solids II - temperature dependence of paramagnetic susceptibility and Curie's Law
- Lecture 77 - Hund's rule for calculating the total angular momentum J, orbital angular momentum L and spin angular momentum S
- Lecture 78 - Examples of performing paramagnetic susceptibility calculations
- Lecture 79 - Diamagnetism in Solids
- Lecture 80 - Understanding quenching of orbital angular momentum in transition metal ions
- Lecture 81 - Ferromagnetism in solids
- Lecture 82 - Introduction to Meissner state of superconductors and levitation
- Lecture 83 - Superconducting materials and Type-I and Type-II superconductors
- Lecture 84 - London's equation for superconductors
- Lecture 85 - Application of London's equation, behavior
- Lecture 86 - A qualitative introduction to BCS theory of superconductivity
- Lecture 87 - Josephson's effect in superconductors and tunneling current across barriers