

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

NPTEL Video Course - Physics - NOC:Solid State Physics (2021)

Subject Co-ordinator - Prof. Nirmal Ganguli

Co-ordinating Institute - IISER - Bhopal

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

Lecture 1 - What is solid?
Lecture 2 - Bravais lattice
Lecture 3 - Indexing of crystal planes
Lecture 4 - Simple crystal structures
Lecture 5 - Diffraction of waves by crystals
Lecture 6 - Fourier analysis of diffraction
Lecture 7 - Diffraction condition
Lecture 8 - Laue equations and Ewald construction
Lecture 9 - Introduction to Brillouin zone
Lecture 10 - Brillouin zones for bcc and fcc lattice
Lecture 11 - Fourier analysis of the basis and structure factor
Lecture 12 - Atomic form factor
Lecture 13 - Van der Waals attraction
Lecture 14 - Repulsive interaction
Lecture 15 - Equilibrium lattice constant and cohesive energy
Lecture 16 - Ionic crystals
Lecture 17 - Evaluation of the Madelung constant
Lecture 18 - Covalent crystals: Linear combination of atomic orbitals
Lecture 19 - Electron tunneling in covalent bonds
Lecture 20 - Metallic bonds
Lecture 21 - The Drude theory of metals
Lecture 22 - Hall effect and magnetoresistance
Lecture 23 - AC electrical conductivity
Lecture 24 - Thermal conductivity
Lecture 25 - Introduction to Sommerfeld theory - I
Lecture 26 - Introduction to Sommerfeld theory - II
Lecture 27 - Electronic states at finite temperature
Lecture 28 - Fermi-Dirac distribution
Lecture 29 - Thermal properties of the free electron gas

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- Lecture 30 - The Sommerfeld theory for conduction in metals
- Lecture 31 - Thermal conductivity
- Lecture 32 - One dimensional chain of atoms
- Lecture 33 - One dimensional chain of atoms
- Lecture 34 - Periodic boundary condition
- Lecture 35 - Energy levels in periodic array of quantum wells
- Lecture 36 - Tunneling of electrons
- Lecture 37 - Reflection and transmission amplitudes and coefficients
- Lecture 38 - Transfer matrix for a rectangular barrier
- Lecture 39 - Electron tunneling through a periodic potential
- Lecture 40 - The tight-binding approximation
- Lecture 41 - Tridiagonal matrices and continued fraction
- Lecture 42 - Plane-wave basis for nearly free electrons
- Lecture 43 - Nearly free electron approximation
- Lecture 44 - Dynamical aspects of electrons in band theory
- Lecture 45 - Semiconductor crystals
- Lecture 46 - Effective mass
- Lecture 47 - Carrier concentration
- Lecture 48 - Mobility, impurity conductivity, and Fermi surface
- Lecture 49 - Vibration of crystals with monatomic basis
- Lecture 50 - Analyzing the dispersion relation
- Lecture 51 - Phonons with diatomic basis
- Lecture 52 - Quantization of elastic waves
- Lecture 53 - Phonon heat capacity
- Lecture 54 - Phonon density of states
- Lecture 55 - Introduction to diamagnetism
- Lecture 56 - Issues with the classical theory of diamagnetism
- Lecture 57 - Quantum theory of diamagnetism
- Lecture 58 - The quantum theory of paramagnetism
- Lecture 59 - Rare earth atoms, Hund's rule
- Lecture 60 - Crystal field splitting
- Lecture 61 - Quenching of orbital angular momentum
- Lecture 62 - Paramagnetic susceptibility of conduction electrons
- Lecture 63 - Ferromagnetism
- Lecture 64 - Antiferromagnetism and ferrimagnetism
- Lecture 65 - Introduction to superconductivity
- Lecture 66 - Thermodynamics of superconducting transition, London equation
- Lecture 67 - BCS theory of superconductivity
- Lecture 68 - Flux quantization in a superconducting ring

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Lecture 69 - Single particle tunneling and Josephson effect

Lecture 70 - AC Josephson effect and microscopic quantum interference