

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

NPTEL Video Course - Physics - Electromagnetic Theory (Prof. D.K. Ghosh)

Subject Co-ordinator - Prof. D.K. Ghosh

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Scalar field and its Gradient  
Lecture 2 - Line and Surface Integrals  
Lecture 3 - Divergence and Curl of Vector Fields  
Lecture 4 - Conservative Field, Stoke's Theorem  
Lecture 5 - Laplacian  
Lecture 6 - Electric Field Potential  
Lecture 7 - Gauss's Law, Potential  
Lecture 8 - Electric Field and Potential  
Lecture 9 - Potential and Potential Energy - I  
Lecture 10 - Potential and Potential Energy - II  
Lecture 11 - Potential and Potential Energy - III  
Lecture 12 - Coefficients of Potential and Capacitance  
Lecture 13 - Poission and Laplace Equation  
Lecture 14 - Solutions of Laplace Equation - I  
Lecture 15 - Solutions of Laplace Equation - II  
Lecture 16 - Solutions of Laplace Equation - III  
Lecture 17 - Special Techniques - I  
Lecture 18 - Special Techniques - II  
Lecture 19 - Special Techniques - III  
Lecture 20 - Dielectrics - I  
Lecture 21 - Dielectrics - II  
Lecture 22 - Dielectrics - III  
Lecture 23 - Equation of Continuity  
Lecture 24 - a) Force between current loops b) Magnetic Vector Potential  
Lecture 25 - Magnetic Vector Potential  
Lecture 26 - Boundary Conditions  
Lecture 27 - Magnetized Material  
Lecture 28 - Magentostatics (Continued...), Time Varying Field (Introduction)  
Lecture 29 - Faraday's Law and Inductance

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- Lecture 30 - Maxwell's Equations
- Lecture 31 - Maxwell's Equations and Conservation Laws
- Lecture 32 - Conservation Laws
- Lecture 33 - a) Angular Momentum Conservation b) Electromagnetic Waves
- Lecture 34 - Electromagnetic Waves
- Lecture 35 - Propagation of Electromagnetic Waves in a metal
- Lecture 36 - Waveguides - I
- Lecture 37 - Waveguides - II
- Lecture 38 - Resonating Cavity
- Lecture 39 - Radiation - I
- Lecture 40 - Radiation - II

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

NPTEL Video Course - Physics - Special Theory of Relativity

Subject Co-ordinator - Prof. Shiva Prasad

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Problem with Classical Physics

Lecture 2 - Michelson-Morley Experiment

Lecture 3 - Postulates of Special Theory of Relativity and Galilean Transformation

Lecture 4 - Look out for a New Transformation

Lecture 5 - Lorentz Transformation

Lecture 6 - Length Contraction and Time Dilation

Lecture 7 - Examples of Length Contraction and Time Dilation

Lecture 8 - Velocity Transformation and Examples

Lecture 9 - A Three Event Problem

Lecture 10 - A Problem involving Light and Concept of Casuality

Lecture 11 - Problems involving Casuality and Need to Redefine Momentum

Lecture 12 - Minkowski Space and Four Vectors

Lecture 13 - Proper Time a Four Scalar

Lecture 14 - Velocity Four Vector

Lecture 15 - Momentum Energy Four Vector

Lecture 16 - Relook at Collision Problems

Lecture 17 - Zero Rest Mass Particle and Photon

Lecture 18 - Doppler Effect in Light

Lecture 19 - Example in C-Frame

Lecture 20 - Force in Relativity

Lecture 21 - Force Four-Vector

Lecture 22 - Electric & Magnetic Field Transformation

Lecture 23 - Example of EM Field Transformation

Lecture 24 - Current Density Four Vector and Maxwell Equation

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

NPTEL Video Course - Physics - NOC:Quantum Information and Computing

Subject Co-ordinator - Prof.Dipan Ghosh

Co-ordinating Institute - IIT - Bombay

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

- Lecture 1 - Why Quantum Computing?
- Lecture 2 - Postulates of Quantum Mechanics - I
- Lecture 3 - Postulates of Quantum Mechanics - II
- Lecture 4 - Qubit - The smallest unit
- Lecture 5 - Qubit - Bloch sphere representation
- Lecture 6 - Multiple Qubit States and Quantum Gates
- Lecture 7 - Quantum Gates
- Lecture 8 - Quantum Circuits
- Lecture 9 - No-Cloning Theorem and Quantum Teleportation
- Lecture 10 - Super Dense Coding
- Lecture 11 - Density Matrix - I
- Lecture 12 - Density Matrix - II
- Lecture 13 - Bloch Sphere and Density Matrix
- Lecture 14 - Measurement Postulates - I
- Lecture 15 - Measurement Postulates - II
- Lecture 16 - Simple Algorithms-Deutsch Algorithm
- Lecture 17 - Deutsch-Josza and Bernstein - Vazirani Algorithms
- Lecture 18 - Simon Problem
- Lecture 19 - Grover's Search Algorithm - I
- Lecture 20 - Grover's Search Algorithm - II
- Lecture 21 - Grover's Search Algorithm - III
- Lecture 22 - Grover's Search Algorithm - IV
- Lecture 23 - Quantum Fourier Transform
- Lecture 24 - Period Finding and QFT
- Lecture 25 - Implementing QFT
- Lecture 26 - Implementing QFT-3 qubits (and more)
- Lecture 27 - Shor's Factorization Algorithm
- Lecture 28 - Shor's Factorization Algorithm-Implementation
- Lecture 29 - Shor's Algorithm-Continued Fraction

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- Lecture 30 - Quantum Error Correction - I
- Lecture 31 - Quantum Error Correction - II Three Qubit Code
- Lecture 32 - Quantum Error Correction - III Shor's 9 Qubit Code - I
- Lecture 33 - Quantum Error Correction - IV Shor's 9 Qubit Code - II
- Lecture 34 - Classical Information Theory
- Lecture 35 - Shannon Entropy
- Lecture 36 - Shannon's Noiseless Coding Theorem
- Lecture 37 - Von Neumann Entropy
- Lecture 38 - EPR and Bell's Inequalities - I
- Lecture 39 - EPR and Bell's Inequalities - II
- Lecture 40 - EPR and Bell's Inequalities - III
- Lecture 41 - Cryptography-RSA Algorithm - I
- Lecture 42 - Cryptography-RSA Algorithm - II
- Lecture 43 - Quantum Cryptography - I
- Lecture 44 - Quantum Cryptography - II
- Lecture 45 - Experimental Aspects of Quantum Computing - I
- Lecture 46 - Experimental Aspects of Quantum Computing - II

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

NPTEL Video Course - Physics - NOC:Theory of Groups for Physics Applications

Subject Co-ordinator - Prof. Urjit A. Yajnik

Co-ordinating Institute - IIT - Bombay

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

- Lecture 1 - Introduction
- Lecture 2 - Algebraic Preliminaries
- Lecture 3 - Basic Group Concepts and Low Order Groups - I
- Lecture 4 - Basic Group Concepts and Low Order Groups - II
- Lecture 5 - Lagrange's Theorem and Cayley's Theorem - I
- Lecture 6 - Lagrange's Theorem and Cayley's Theorem - II
- Lecture 7 - Factor Group Conjugacy Classes - I
- Lecture 8 - Factor Group Conjugacy Classes - II
- Lecture 9 - Cycle Structures and Molecular Notation - I
- Lecture 10 - Cycle Structures and Molecular Notation - II
- Lecture 11 - Cycle Structures and Classification - I
- Lecture 12 - Cycle Structures and Classification - II
- Lecture 13 - Point Group Notation and Factor Group - I
- Lecture 14 - Point Group Notation and Factor Group - II
- Lecture 15 - Representation Theory - I
- Lecture 16 - Representation Theory - II
- Lecture 17 - Representation Theory - III
- Lecture 18 - Representation Theory - IV
- Lecture 19 - Schur's Lemma and Orthogonality Theorem - I
- Lecture 20 - Schur's Lemma and Orthogonality Theorem - II
- Lecture 21 - Orthogonality For Characters - I
- Lecture 22 - Orthogonality For Characters - II
- Lecture 23 - Character Tables and Molecular Applications - I
- Lecture 24 - Character Tables and Molecular Applications - II
- Lecture 25 - Preliminaries About The Continuum - I
- Lecture 26 - Preliminaries About The Continuum - II
- Lecture 27 - Classical Groups - I
- Lecture 28 - Classical Groups - II
- Lecture 29 - Classical Groups-Topology - I

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

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- Lecture 30 - Classical Groups-Topology - II
- Lecture 31 -  $SO(3)$  And Matrix Exponent - I
- Lecture 32 -  $SO(3)$  And Matrix Exponent - II
- Lecture 33 - Generators, Discussion Of Lie's Theorems - I
- Lecture 34 - Generators, Discussion Of Lie's Theorems - II
- Lecture 35 - Group Algebras;  $SO(3)$ - $SU(2)$  Correspondence - I
- Lecture 36 - Group Algebras;  $SO(3)$ - $SU(2)$  Correspondence - II
- Lecture 37 -  $SO(3)$ ,  $SU(2)$  Representations - I
- Lecture 38 -  $SO(3)$ ,  $SU(2)$  Representations - II
- Lecture 39 - Representation On Function Spaces - I
- Lecture 40 - Representation On Function Spaces - II
- Lecture 41 - Lorentz Boosts,  $SO(3,1)$  Algebra - I
- Lecture 42 - Lorentz Boosts,  $SO(3,1)$  Algebra - II
- Lecture 43 - Representation Of Lorentz Group And Clifford Algebra - I
- Lecture 44 - Representation Of Lorentz Group And Clifford Algebra - II
- Lecture 45 -  $SU(3)$  And Lie's Classification - I
- Lecture 46 -  $SU(3)$  And Lie's Classification - II
- Lecture 47 - Fundamental Symmetries Of Physics - I
- Lecture 48 - Fundamental Symmetries Of Physics - II

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

NPTEL Video Course - Physics - NOC:Quantum Mechanics-I

Subject Co-ordinator - Prof. Ramadevi

Co-ordinating Institute - IIT - Bombay

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

Lecture 1 - Introduction to Quantum Mechanics - I  
Lecture 2 - Introduction to Quantum Mechanics - II  
Lecture 3 - Review of Particle in Box, Potential Well, Barrier, Harmonic Oscillator - I  
Lecture 4 - Review of Particle in Box, Potential Well, Barrier, Harmonic Oscillator - II  
Lecture 5 - Tutorial 1 - Part I  
Lecture 6 - Tutorial 1 - Part II  
Lecture 7 - Bound States - I  
Lecture 8 - Bound States - II  
Lecture 9 - Conditions and Solutions for one Dimensional Bound States - I  
Lecture 10 - Conditions and Solutions for one Dimensional Bound States - II  
Lecture 11 - Tutorial 2  
Lecture 12 - Linear Vector Space (LVS) - I  
Lecture 13 - Linear Vector Space (LVS) - II  
Lecture 14 - Linear Vector Space (LVS) - III  
Lecture 15 - Basis for Operators and States in LVS - I  
Lecture 16 - Basis for Operators and States in LVS - II  
Lecture 17 - Tutorial 3 - Part I  
Lecture 18 - Tutorial 3 - Part II  
Lecture 19 - Function Spaces - I  
Lecture 20 - Function Spaces - II  
Lecture 21 - Postulates of Quantum Mechanics - I  
Lecture 22 - Postulates of Quantum Mechanics - II  
Lecture 23 - Tutorial 4 - Part I  
Lecture 24 - Tutorial 4 - Part II  
Lecture 25 - Classical vs Quantum Mechanics - I  
Lecture 26 - Classical vs Quantum Mechanics - II  
Lecture 27 - Compatible vs Incompatible Observable - I  
Lecture 28 - Compatible vs Incompatible Observable - II  
Lecture 29 - Tutorial 5 - Part I

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

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- Lecture 30 - Tutorial 5 - Part II
- Lecture 31 - Tutorial 5 - Part III
- Lecture 32 - Schrodinger and Heisenberg Pictures - I
- Lecture 33 - Schrodinger and Heisenberg Pictures - II
- Lecture 34 - Solutions to other Coupled Potential Energies - I
- Lecture 35 - Solutions to other Coupled Potential Energies - II
- Lecture 36 - Tutorial 6 - Part I
- Lecture 37 - Tutorial 6 - Part II
- Lecture 38 - Hydrogen Atom and Wave Functions, Angular Momentum Operators, Identical Particles - I
- Lecture 39 - Hydrogen Atom and Wave Functions, Angular Momentum Operators, Identical Particles - II
- Lecture 40 - Identical Particles and Quantum Computer - I
- Lecture 41 - Identical Particles and Quantum Computer - II
- Lecture 42 - Tutorial 7 - Part I
- Lecture 43 - Tutorial 7 - Part II
- Lecture 44 - Harmonic Oscillator - I
- Lecture 45 - Harmonic Oscillator - II
- Lecture 46 - Ladder Operators - I
- Lecture 47 - Ladder Operators - II
- Lecture 48 - Tutorial 8 - Part I
- Lecture 49 - Tutorial 8 - Part II
- Lecture 50 - Stern-Gerlach Experiment - I
- Lecture 51 - Stern-Gerlach Experiment - II
- Lecture 52 - Oscillator Algebra
- Lecture 53 - Tutorial 9 - Part I
- Lecture 54 - Tutorial 9 - Part II
- Lecture 55 - Angular Momentum - I
- Lecture 56 - Angular Momentum - II
- Lecture 57 - Rotations Groups - I
- Lecture 58 - Rotations Groups - II
- Lecture 59 - Tutorial 10 - Part I
- Lecture 60 - Tutorial 10 - Part II
- Lecture 61 - Addition of Angular Momentum - I
- Lecture 62 - Addition of Angular Momentum - II
- Lecture 63 - Clebsch-Gordan Coefficients - I
- Lecture 64 - Clebsch-Gordan Coefficients - II
- Lecture 65 - Tutorial 11 - Part I
- Lecture 66 - Tutorial 11 - Part II
- Lecture 67 - Clebsch-Gordan Coefficients - III
- Lecture 68 - Tensor Operators and Wigner-Eckart Theorem - I

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- Lecture 69 - Tensor Operators and Wigner-Eckart Theorem - II
- Lecture 70 - Tensor Operators and Wigner-Eckart Theorem - III
- Lecture 71 - Tutorial 12

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

NPTEL Video Course - Physics - Electronics

Subject Co-ordinator - Prof. D.C. Dube

Co-ordinating Institute - IIT - Delhi

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

- Lecture 1 - p-n diode
- Lecture 2 - p-n Junction/Diode (Continued...)
- Lecture 3 - p-n diode (Continued...)
- Lecture 4 - Diode Application
- Lecture 5 - Transistors
- Lecture 6 - Reverse - bias (Continued...)
- Lecture 7 - Transistors (Continued...)
- Lecture 8 - Transistors (Continued...)
- Lecture 9 - Biasing a transistor unit 2 (Continued...)
- Lecture 10 - Biasing of transistor
- Lecture 11 - H and R Parameters and their use in small amplifiers
- Lecture 12 - Small signal amplifiers analysis using H - Parameters
- Lecture 13 - Small signal amplifiers analysis using R - Parameters
- Lecture 14 - R - analysis (Continued...)
- Lecture 15 - Common Collector(CC) amplifier (Continued...)
- Lecture 16 - Feedback in amplifiers, Feedback Configurations and multi stage amplifiers
- Lecture 17 - Reduction in non-linear distortion
- Lecture 18 - Input/Output impedances in negative feedback amplifiers (Continued...)
- Lecture 19 - RC Coupled Amplifiers
- Lecture 20 - RC Coupled Amplifiers (Continued...)
- Lecture 21 - RC Coupled Amplifiers (Continued...)
- Lecture 22 - FETs ans MOSFET
- Lecture 23 - FETs ans MOSFET (Continued...)
- Lecture 24 - Depletion - MOSFET
- Lecture 25 - Drain and transfer characteristic of E - MOSFET
- Lecture 26 - Self Bias (Continued...) Design Procedure
- Lecture 27 - FET/MOSFET Amplifiers and their Analysis
- Lecture 28 - CMOS Inverter
- Lecture 29 - CMOS Inverter (Continued...)

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- Lecture 30 - Power Amplifier
- Lecture 31 - Power Amplifier (Continued...)
- Lecture 32 - Power Amplifier (Continued...)
- Lecture 33 - Power Amplifier (Continued...)
- Lecture 34 - Differential and Operational Amplifier
- Lecture 35 - Differential and Operational Amplifier (Continued...) dc and ac analysis
- Lecture 36 - Differential and Operational Amplifier dc and ac analysis (Continued...)
- Lecture 37 - Operational Amplifiers
- Lecture 38 - Operational amplifiers in open loop (Continued...)
- Lecture 39 - Summing Amplifiers
- Lecture 40 - Frequency response of an integration
- Lecture 41 - Filters
- Lecture 42 - Specification of OP Amplifiers

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

NPTEL Video Course - Physics - Plasma Physics: Fundamentals and Applications

Subject Co-ordinator - Prof. Vijayshri, Prof. V.K. Tripathi

Co-ordinating Institute - IIT - Delhi | IGNOU - Delhi

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

- Lecture 1 - Introduction to Plasmas
- Lecture 2 - Plasma Response to fields
- Lecture 3 - DC Conductivity and Negative Differential Conductivity
- Lecture 4 - RF Conductivity of Plasma
- Lecture 5 - RF Conductivity of Plasma (Continued...)
- Lecture 6 - Hall Effect, Cowling Effect and Cyclotron Resonance Heating
- Lecture 7 - Electromagnetic Wave Propagation in Plasma
- Lecture 8 - Electromagnetic Wave Propagation in Plasma (Continued...)
- Lecture 9 - Electromagnetic Wave Propagation Inhomogeneous Plasma
- Lecture 10 - Electrostatic Waves in Plasmas
- Lecture 11 - Energy Flow with an Electrostatic Wave
- Lecture 12 - Two Stream Instability
- Lecture 13 - Relativistic electron Beam- Plasma Interaction
- Lecture 14 - Cerenkov Free Electron Laser
- Lecture 15 - Free Electron Laser
- Lecture 16 - Free Electron Laser
- Lecture 17 - Free Electron Laser
- Lecture 18 - Weibel Instability
- Lecture 19 - Rayleigh Taylor Instability
- Lecture 20 - Single Particle Motion in Static Magnetic and Electric Fields
- Lecture 21 - Plasma Physics Grad B and Curvature Drifts
- Lecture 22 - Adiabatic Invariance of Magnetic Moment and Mirror confinement
- Lecture 23 - Mirror machine
- Lecture 24 - Thermonuclear fusion
- Lecture 25 - Tokamak
- Lecture 26 - Tokamak operation
- Lecture 27 - Auxiliary heating and current drive in tokamak
- Lecture 28 - Electromagnetic waves propagation in magnetise plasma
- Lecture 29 - Longitudinal electromagnetic wave propagation cutoffs, resonances and faraday rotation

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- Lecture 30 - Electromagnetic propagation at oblique angles to magnetic field in a plasma
- Lecture 31 - Low frequency EM waves magnetized plasma
- Lecture 32 - Electrostatic waves in magnetized plasma
- Lecture 33 - Ion acoustic, ion cyclotron and magneto sonic waves in magnetized plasma
- Lecture 34 - Vlasov theory of plasma waves
- Lecture 35 - Landau damping and growth of waves
- Lecture 36 - Landau damping and growth of waves (Continued...)
- Lecture 37 - Anomalous resistivity in a plasma
- Lecture 38 - Diffusion in plasma
- Lecture 39 - Diffusion in magnetized plasma
- Lecture 40 - Surface plasma wave
- Lecture 41 - Laser interaction with plasmas embedded with clusters
- Lecture 42 - Current trends and epilogue

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

NPTEL Video Course - Physics - Quantum Electronics

Subject Co-ordinator - Prof. K. Thyagarajan

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Introduction  
Lecture 2 - Anisotropic Media  
Lecture 3 - Anisotropic Media (Continued...)  
Lecture 4 - Anisotropic Media (Continued...)  
Lecture 5 - Nonlinear optical effects and nonlinear polarization  
Lecture 6 - Non - Linear Optics (Continued...)  
Lecture 7 - Non - Linear Optics (Continued...)  
Lecture 8 - Non - Linear Optics (Continued...)  
Lecture 9 - Non - Linear Optics (Continued...)  
Lecture 10 - Non - Linear Optics - Quasi Phase Matching  
Lecture 11 - Non - Linear Optics  
Lecture 12 - Non Linear Optics (Continued...)  
Lecture 13 - Non Linear Optics (Continued...)  
Lecture 14 - Non Linear Optics (Continued...)  
Lecture 15 - Non Linear Optics (Continued...)  
Lecture 16 - Non Linear Optics (Continued...)  
Lecture 17 - Non Linear Optics (Continued...)  
Lecture 18 - Non Linear Optics (Continued...)  
Lecture 19 - Non Linear Optics (Continued...)  
Lecture 20 - Third Order Non - Linear Effects  
Lecture 21 - Third Order Non - Linear Effects (Continued...)  
Lecture 22 - Third Order Non - Linear Effects (Continued...)  
Lecture 23 - Third Order Non - Linear Effects (Continued...)  
Lecture 24 - Review of Quantum Mechanics  
Lecture 25 - Review of Quantum Mechanics (Continued...)  
Lecture 26 - Review of Quantum Mechanics (Continued...)  
Lecture 27 - Quantization of EM Field  
Lecture 28 - Quantization of EM Field (Continued...)  
Lecture 29 - Quantization of EM Field (Continued...)

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- Lecture 30 - Quantum States of EM Field
- Lecture 31 - Quantum States of EM Field (Continued...)
- Lecture 32 - Quantization of EM Field (Continued...)
- Lecture 33 - Quantization of EM Field (Continued...)
- Lecture 34 - Quantization of EM Field (Continued...)
- Lecture 35 - Quantization of EM Field (Continued...)
- Lecture 36 - Quantization of EM Field (Continued...)
- Lecture 37 - Beam Splitter
- Lecture 38 - Beam Splitter (Continued...)
- Lecture 39 - Beam Splitter and Balanced Homodyning
- Lecture 40 - Balanced Homodyning
- Lecture 41 - Quantum Picture of Parametric Down Conversion
- Lecture 42 - Questions



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

NPTEL Video Course - Physics - Quantum Mechanics and Applications

Subject Co-ordinator - Prof. Ajoy Ghatak

Co-ordinating Institute - IIT - Delhi

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

- Lecture 1 - Basic Quantum Mechanics I
- Lecture 2 - Basic Quantum Mechanics II
- Lecture 3 - Dirac Delta Function & Fourier Transforms
- Lecture 4 - The Free Particle
- Lecture 5 - Physical Interpretation of The Wave Function
- Lecture 6 - Expectation Values & The Uncertainty Principle
- Lecture 7 - The Free Particle (Continued...)
- Lecture 8 - Interference Experiment & The Particle in a Box Problem
- Lecture 9 - On Eigen Values and Eigen Functions of the 1 Dimensional Schrodinger Equation
- Lecture 10 - Linear Harmonic Oscillator
- Lecture 11 - Linear Harmonic Oscillator (Continued...1)
- Lecture 12 - Linear Harmonic Oscillator (Continued...2)
- Lecture 13 - Linear Harmonic Oscillator (Continued...3)
- Lecture 14 - Tunneling through a Barrier
- Lecture 15 - The 1-Dimensional Potential Wall & Particle in a Box
- Lecture 16 - Particle in a Box and Density of States
- Lecture 17 - The Angular Momentum Problem
- Lecture 18 - The Angular Momentum Problem (Continued...)
- Lecture 19 - The Hydrogen Atom Problem
- Lecture 20 - The Two Body Problem
- Lecture 21 - TheTwo Body Problem
- Lecture 22 - Two Body Problem
- Lecture 23 - 3d Oscillator & Dirac's Bra and Ket Algebra
- Lecture 24 - Dirac's Bra and Ket Algebra
- Lecture 25 - Dirac's Bra and Ket Algebra
- Lecture 26 - The Linear Harmonic Oscillator using Bra and Ket Algebra (Continued...)
- Lecture 27 - The Linear Harmonic Oscillator
- Lecture 28 - Coherent State and Relationship with the Classical Oscillator
- Lecture 29 - Angular Momentum Problem using Operator Algebra

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- Lecture 30 - Angular Momentum Problem (Continued...)
- Lecture 31 - Pauli Spin Matrices and The Stern Gerlach Experiment
- Lecture 32 - The Larmor Precession and NMR Spherical Harmonics using Operator Algebra
- Lecture 33 - Addition of Angular Momentum
- Lecture 34 - Clebsch Gordon Coefficients
- Lecture 35 - The JWKB Approximation
- Lecture 36 - The JWKB Approximation
- Lecture 37 - The JWKB Approximation
- Lecture 38 - The JWKB Approximation
- Lecture 39 - The JWKB Approximation
- Lecture 40 - Time Independent Perturbation Theory
- Lecture 41 - Time Independent Perturbation Theory (Continued...1)
- Lecture 42 - Time Independent Perturbation Theory (Continued...2)

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

NPTEL Video Course - Physics - Semiconductor Optoelectronics

Subject Co-ordinator - Prof. M.R. Shenoy

Co-ordinating Institute - IIT - Delhi

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

Lecture 1 - Context and Scope of the Course

Lecture 2 - Energy Bands in Solids

Lecture 3 - E-K Diagram

Lecture 4 - The Density of States

Lecture 5 - The Density of States (Continued...)

Lecture 6 - The Density of states in a Quantum well Structure

Lecture 7 - Occupation Probability and Carrier Concentration

Lecture 8 - Carrier Concentration and Fermi Level

Lecture 9 - Quasi Fermi Levels

Lecture 10 - Semiconductor Materials

Lecture 11 - Semiconductor Hetrostructures-Lattice-Matched Layers

Lecture 12 - Strained -Layer Epitaxy and Quantum Well Structures

Lecture 13 - Bandgap Engineering

Lecture 14 - Hetrostructure p-n junctions

Lecture 15 - Schottky Junction and Ohmic Contacts

Lecture 16 - Fabrication of Heterostructure Devices

Lecture 17 - Interaction of Photons with Electrons and Holes in a Semiconductor

Lecture 18 - Optical Joint Density of States

Lecture 19 - Rates of Emission and Absorption

Lecture 20 - Amplification by Stimulated Emission

Lecture 21 - The Semiconductor (Laser) Amplifier

Lecture 22 - Absorption Spectrum of Semiconductor

Lecture 23 - Gain and Absorption Spectrum of Quantum Well Structures

Lecture 24 - Electro-absorption Modulator

Lecture 25 - Electro-absorption Modulator - II Device Configuration

Lecture 26 - Mid-Term Revision Question and Discussion

Lecture 27 - Part - III Semiconductor Light Sources

Lecture 28 - Light Emitting Diode-I Device Structure and Parameters

Lecture 29 - Light Emitting Diode-II Device Characteristics

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- Lecture 30 - Light Emitting Diode-III Output Characteristics
- Lecture 31 - Light Emitting Diode-IV Modulation Bandwidth
- Lecture 32 - Light Emitting Diode-V materials and Applications
- Lecture 33 - Laser Basics
- Lecture 34 - Semiconductor Laser-I Device Structure
- Lecture 35 - Semiconductor Laser-II Output Characteristics
- Lecture 36 - Semiconductor Laser-III Single Frequency Lasers
- Lecture 37 - Vertical Cavity Surface Emitting Laser (VCSEL)
- Lecture 38 - Quantum Well Laser
- Lecture 39 - Practical Laser Diodes and Handling
- Lecture 40 - General Characteristics of Photodetectors
- Lecture 41 - Responsivity and Impulse Response
- Lecture 42 - Photoconductors
- Lecture 43 - Semiconductor Photo-Diodes
- Lecture 44 - Semiconductor Photo-Diodes-II
- Lecture 45 - Other Photodectors
- Lecture 46 - Photonic Integrated Circuits

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

NPTEL Video Course - Physics - NOC:Semiconductor Optoelectronics

Subject Co-ordinator - Prof. M. R. Shenoy

Co-ordinating Institute - IIT - Delhi

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

- Lecture 1 - Context, Scope and Contents of the Course
- Lecture 2 - Energy Bands in Solids
- Lecture 3 - E-k Diagram - The Band Structure
- Lecture 4 - The Density of States
- Lecture 5 - The Density of States  $\rho(k)$ ,  $\rho(E)$
- Lecture 6 - Density of States in a Quantum Well Structure
- Lecture 7 - Occupation Probability and Carrier Concentration
- Lecture 8 - Carrier Concentration and Fermi Level
- Lecture 9 - Quasi Fermi Levels
- Lecture 10 - Semiconductor Materials
- Lecture 11 - Semiconductor Heterostructures-Lattice-Matched Layers
- Lecture 12 - Strained-Layer Epitaxy and Quantum Well Structures
- Lecture 13 - Bandgap Engineering
- Lecture 14 - Heterostructure p-n junctions
- Lecture 15 - Schottky Junctions and Ohmic Contacts
- Lecture 16 - Fabrication of Heterostructure Devices
- Lecture 17 - Interaction of Photons with Electrons and Holes in a Semiconductor
- Lecture 18 - Optical Joint Density of States, and Probabilities of Emission and Absorption
- Lecture 19 - Rates of Emission and Absorption
- Lecture 20 - Amplification by Stimulated Emission
- Lecture 21 - The Semiconductor (Laser) Amplifier
- Lecture 22 - Absorption Spectrum of Semiconductors
- Lecture 23 - Gain and Absorption Spectrum of Quantum Well Structures
- Lecture 24 - Electro-absorption Modulator-I Principle of Operation
- Lecture 25 - Electro-absorption Modulator-II Device Configuration
- Lecture 26 - Injection Electroluminescence
- Lecture 27 - Light emitting diode-I Device structure and parameters
- Lecture 28 - Light emitting diode-II Device Characteristics
- Lecture 29 - Light emitting diode-III Output Characteristics

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

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- Lecture 30 - Light emitting diode-IV Modulation Bandwidth
- Lecture 31 - Light emitting diode-V Material and Applications
- Lecture 32 - Laser Basics
- Lecture 33 - Semiconductor Laser-I Device Structure
- Lecture 34 - Semiconductor Laser-II Output Characteristics
- Lecture 35 - Semiconductor Laser-III Single Frequency Lasers
- Lecture 36 - Vertical cavity Surface Emitting Laser (VCSEL)
- Lecture 37 - Quantum Well Laser
- Lecture 38 - Practical Laser Diodes and Handling
- Lecture 39 - General Characteristics of Photodetectors
- Lecture 40 - Responsivity and Impulse Response
- Lecture 41 - Photoconductors
- Lecture 42 - Semiconductor Photo-Diodes-I
- Lecture 43 - Semiconductor Photo-Diodes-II
- Lecture 44 - Other Photodetectors
- Lecture 45 - Photonic Integrated Circuits

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

NPTEL Video Course - Physics - NOC:Nuclear and Particle Physics

Subject Co-ordinator - Dr. P. Poullose

Co-ordinating Institute - IIT - Guwahati

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

Lecture 1 - Introduction  
Lecture 2 - Nuclear Properties  
Lecture 3 - Properties of Nuclear Force  
Lecture 4 - Deuteron  
Lecture 5 - Nucleons Scattering  
Lecture 6 - Nuclear Models - I  
Lecture 7 - Nuclear Models - II  
Lecture 8 - Radioactive Decay - General Properties  
Lecture 9 - Nuclear Alpha Decay  
Lecture 10 - Nuclear Beta decay  
Lecture 11 - Beta-decay details  
Lecture 12 - Gamma decay  
Lecture 13 - Nuclear Scattering - Preliminaries  
Lecture 14 - Types of Reactions  
Lecture 15 - Particle Accelerators - I  
Lecture 16 - Particle Accelerators - II  
Lecture 17 - Detectors  
Lecture 18 - Elementary Particles - Introduction and Overview  
Lecture 19 - Quark Model - I  
Lecture 20 - Quark Model - II  
Lecture 21 - Quark Model - III  
Lecture 22 - Structure of the Hadron - Nucleus  
Lecture 23 - Structure of the Hadron - Proton  
Lecture 24 - Deep Inelastic Scattering  
Lecture 25 - Relativistic Kinematics  
Lecture 26 - Klein-Gordon Equation  
Lecture 27 - Interaction of charged scalar with EM field  
Lecture 28 - Relativistic Electrodynamics  
Lecture 29 - Quantum Electrodynamics

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

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- Lecture 30 - Interaction between charged scalars
- Lecture 31 - Dirac Equation - 1
- Lecture 32 - Dirac Equation - 2
- Lecture 33 - Interacting charged fermions - 1
- Lecture 34 - Interacting charged fermions - 2
- Lecture 35 - Interacting charged fermions - 3
- Lecture 36 - Scattering Cross Section Revisited - 1
- Lecture 37 - Scattering Cross Section Revisited - 2
- Lecture 38 - Weak Interactions - 1
- Lecture 39 - Weak Interactions - 2
- Lecture 40 - Lagrangian Framework
- Lecture 41 - Gauge Symmetry - U(1)
- Lecture 42 - Electroweak Theory - 1
- Lecture 43 - Electroweak Theory - 2
- Lecture 44 - SSB and the Higgs Mechanism



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

NPTEL Video Course - Physics - NOC:Advanced Condensed Matter Physics

Subject Co-ordinator - Dr. Saurabh Basu

Co-ordinating Institute - IIT - Guwahati

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

- Lecture 1 - Propagators - I
- Lecture 2 - Propagators - II
- Lecture 3 - Second quantization - I
- Lecture 4 - Second quantization - II
- Lecture 5 - Second quantized Hamiltonian
- Lecture 6 - Tight Binding Hamiltonian, Hubbard model
- Lecture 7 - Magnetism
- Lecture 8 - Singlet and Triplet State
- Lecture 9 - Antiferromagnetism in Hubbard model
- Lecture 10 - Green's function and representations in quantum mechanics
- Lecture 11 - S matrix and free electron Green's function
- Lecture 12 - Wick's theorem and normal ordering
- Lecture 13 - Green's function and Feynman diagrams
- Lecture 14 - Feynman diagram
- Lecture 15 - phonon Green' function and Hartree Fock approximation
- Lecture 16 - Finite temperature Green's function and Matsubara frequencies
- Lecture 17 - Dyson's equation and disorder in electronic systems
- Lecture 18 - Introduction to electrodynamics, Meissner effect
- Lecture 19 - London penetration depth, Type I and II superconductors
- Lecture 20 - Cooper's problem, BCS gap equation
- Lecture 21 - BCS theory, Transition temperature
- Lecture 22 - Ginzburg Landau Theory, Coherence length and penetration depth
- Lecture 23 - Quantum Hall Effect
- Lecture 24 - Spin Hall effect, 2D topological insulator
- Lecture 25 - Bose-Einstein condensation

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

NPTEL Video Course - Physics - NOC:Advanced Quantum Mechanics with Applications

Subject Co-ordinator - Dr. Saurabh Basu

Co-ordinating Institute - IIT - Guwahati

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

- Lecture 1 - Introduction, Postulates of Quantum Mechanics
- Lecture 2 - Stern Gerlach Experiment, Spin Quantization, Young's Double Slit Experiment
- Lecture 3 - The Mathematical Formalism of Quantum Mechanics, Uncertainty Principle
- Lecture 4 - The Density Matrix Formalism, Expectation values of Operators
- Lecture 5 - Quantum Harmonic Oscillator, Creation and annihilation Operators
- Lecture 6 - Coherent States and their Properties
- Lecture 7 - Applications of Coherent States, squeezed states
- Lecture 8 - Symmetries and Conservation Principles in Quantum Mechanics
- Lecture 9 - Rotation Operator and Invariance of Angular Momentum, Parity
- Lecture 10 - Spherically Symmetric System and Applications to quantum dots
- Lecture 11 - Spin Angular Momentum, Addition of Angular Momentum, Clebsch gordan coefficients
- Lecture 12 - Magnetic Hamiltonian, Heisenberg Model
- Lecture 13 - Nuclear Magnetic Resonance (NMR)
- Lecture 14 - Applications of NMR, time evolution of Magnetic Moments
- Lecture 15 - Introduction to Quantum Computing
- Lecture 16 - Qubits, EPR Paradox
- Lecture 17 - Quantum Entanglement (QE)
- Lecture 18 - Teleportation, Quantum Teleportation for one spin
- Lecture 19 - Entangled state for two spins
- Lecture 20 - Quantum Gates, Walsh Hadamard Transportation, No cloning theorem
- Lecture 21 - Perturbation Theory
- Lecture 22 - Stark Effect
- Lecture 23 - Stark Effect
- Lecture 24 - Variational method, Variation of constants, Upper bound on ground state energy
- Lecture 25 - Application of Variational method, Hydrogen, Helium atom, Comparison with perturbation theory
- Lecture 26 - WKB Approximation, Bohr Sommerfeld quantization condition
- Lecture 27 - Summary of Approximation methods, Time dependent Perturbation Theory
- Lecture 28 - Time dependent Perturbation Theory, Fermi's Golden rule, Einstein's A and B coefficients
- Lecture 29 - Scattering Theory

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

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- Lecture 30 - Linear Response Theory
- Lecture 31 - Quantum Dynamics
- Lecture 32 - Examples
- Lecture 33 - Interaction of Radiation with matter, Landau levels

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

NPTEL Video Course - Physics - NOC:A Brief Course on Superconductivity

Subject Co-ordinator - Dr. Saurabh Basu

Co-ordinating Institute - IIT - Guwahati

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

- Lecture 1 - Historical introduction of superconductivity
- Lecture 2 - Meissner effect, Electrodynamics of Superconductors, coherence length and penetration depth
- Lecture 3 - Electron Pairing, Basics of BCS Theory
- Lecture 4 - BCS ground state, variational calculation, expression for  $T_c$
- Lecture 5 - Order parameter, Free energy functional, Ginzburg-Landau (GL) Theory, GL equations
- Lecture 6 - London Equations, Flux quantization
- Lecture 7 - Thermodynamic properties of superconductors, specific heat
- Lecture 8 - Experimental determination of Superconducting properties
- Lecture 9 - Unconventional Superconductivity, Uemura plot, High- $T_c$  superconductivity, d-wave pairing, ARPES
- Lecture 10 - Singlet and triplet states of two  $s = 1/2$ , magnetic Hamiltonian
- Lecture 11 -  $t$ - $J$  model, discrete symmetry groups, example square lattice
- Lecture 12 - Cuprate Superconductors, electron vs hole doped superconductors
- Lecture 13 - Non-Fermi Liquid Theory, Adiabatic continuity
- Lecture 14 - Quasiparticle lifetime, breakdown of Fermi Liquid Theory in cuprate superconductors
- Lecture 15 - Josephson junctions, Josephson equations
- Lecture 16 - Numerical Differentiation
- Lecture 17 - Richardson's extrapolation

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

NPTEL Video Course - Physics - Nuclear Physics: Fundamentals and Applications

Subject Co-ordinator - Prof. H.C. Verma

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Brief Overview of the course

Lecture 2 - Nuclear Size

Lecture 3 - Nuclear Size (Continued...)

Lecture 4 - Nuclear Size (Continued...)

Lecture 5 - Semi empirical Mass Formula

Lecture 6 - Semi empirical Mass Formula (Continued...)

Lecture 7 - Semi empirical Mass Formula (Continued...)

Lecture 8 - Semi empirical Mass Formula (Continued...)

Lecture 9 - Semi empirical Mass Formula (Continued...)

Lecture 10 - How are Neutron stars bound

Lecture 11 - Deuteron

Lecture 12 - Deuteron (Continued...)

Lecture 13 - Deuteron (Continued...)

Lecture 14 - Scattering of nucleons

Lecture 15 - Low energy n-p scattering

Lecture 16 - Theories of nuclear forces

Lecture 17 - Shell model

Lecture 18 - Shell model (Continued...)

Lecture 19 - Shell model (Continued...)

Lecture 20 - Shell model (Continued...)

Lecture 21 - Shell model (Continued...)

Lecture 22 - Collective models

Lecture 23 - Vibrational and Rotational levels

Lecture 24 - Radioactivity, Alpha Decay

Lecture 25 - Alpha decay (Continued...)

Lecture 26 - Beta decay

Lecture 27 - Beta decay (Continued...)

Lecture 28 - Beta decay (Continued...)

Lecture 29 - Gamma decay

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

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- Lecture 30 - Nuclear Reactions
- Lecture 31 - Nuclear reaction (Continued...)
- Lecture 32 - Nuclear reaction (Continued...)
- Lecture 33 - Nuclear Fission basics
- Lecture 34 - Nuclear fission of uranium
- Lecture 35 - Nuclear Fission Reactor
- Lecture 36 - Nuclear Energy Programme of India
- Lecture 37 - Nuclear Fusion
- Lecture 38 - Nuclear fusion (Continued...)
- Lecture 39 - Thermonuclear fusion reactors
- Lecture 40 - Fusion reactions in Stars and stellar neutrinos
- Lecture 41 - Nucleosynthesis of elements in Stars
- Lecture 42 - Mossbauer Spectroscopy
- Lecture 43 - RBS, PIXE, NAA, Summary

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

NPTEL Video Course - Physics - NOC:Introduction to Electromagnetism

Subject Co-ordinator - Prof. Manoj K Harbola

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Coloumb's Law

Lecture 2 - Coloumb's Force due to several Point charges

Lecture 3 - Force due to distribution of Charges

Lecture 4 - What is an Electric Field?

Lecture 5 - Electric Field due to a Charged Distribution

Lecture 6 - Helmholtz's Theorem for Electric Field

Lecture 7 - Divergence of a Field

Lecture 8 - Divergence of Electric Field & Gauss's Law

Lecture 9 - Curl Of a Field - I

Lecture 10 - Curl of a Field - II & Stokes' Theorem

Lecture 11 - Line surface area & volume elements in Cartesian & Cylindrical Coordinates

Lecture 12 - Line surface area & volume elements in Spherical Polar Coordinates

Lecture 13 - Examples of application of the divergence and stokes' theorems

Lecture 14 - Electrostatic Potential

Lecture 15 - Electric field as the gradient of electrostatic potential

Lecture 16 - Laplace's and Poisson's equations for electrostatic potential

Lecture 17 - Elecrostatic potential due to a charge distribution - I; a line charge of finite length

Lecture 18 - Elecrostatic potential due to a charge distribution - II;a ring and a spherical shell of charge

Lecture 19 - Uniqueness of the solution of Laplace's and Poisson's equations

Lecture 20 - Method of images I

Lecture 21 - Method of imagesII

Lecture 22 - Laplaces equations in some other physical phenomena

Lecture 23 - Energy of a charge distribution - I

Lecture 24 - Energy of a charge distribution - II An example

Lecture 25 - Energy of a charge distribution - III Energy density in terms of electric field

Lecture 26 - Electric field and potential in a conductor

Lecture 27 - Reciprocity theorem for conductors - I

Lecture 28 - Reciprocity theorem for conductors - II

Lecture 29 - Electric polarization and bound charges - I

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

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- Lecture 30 - Electric polarization and bound charges - II
- Lecture 31 - Electric Displacement
- Lecture 32 - Electrostatics in presence of Dielectric Materials - I
- Lecture 33 - Electrostatics in presence of Dielectric Materials - II
- Lecture 34 - Introduction to Magnetostatics; The BiO-Savart law
- Lecture 35 - Divergence and curl of Magnetic Field
- Lecture 36 - Amperes law for Magnetic Fields
- Lecture 37 - Vector Potential for Magnetic Fields
- Lecture 38 - Calculation of Vector Potential for a given magnetic field
- Lecture 39 - Equation for the Vector Potential in terms of current density
- Lecture 40 - Vector potential from Current Densities - I
- Lecture 41 - Vector potential from Current Densities - II
- Lecture 42 - Magnetic Materials - I
- Lecture 43 - Magnetic Materials - II Bound Current Densities
- Lecture 44 - The Auxiliary Field - H
- Lecture 45 - Solving for Magnetic Field of a magnet - I
- Lecture 46 - Solving for Magnetic Field of a magnet in presence of Magnetic Materials
- Lecture 47 - Faradays Law
- Lecture 48 - Induced Electric field due to changing Magnetic Field
- Lecture 49 - Demonstrations on faradays law, Lenzs law and Nonconservative nature of Induced electric field
- Lecture 50 - Energy stored in a magnetic Field-I
- Lecture 51 - Energy stored in a magnetic Field-I;solved examples
- Lecture 52 - Displacement Current
- Lecture 53 - Quasistatic approximation
- Lecture 54 - Energy transport by electromagnetic fields; The Poynting Vector
- Lecture 55 - The Poynting Vector;solved examples
- Lecture 56 - Linear Momentum and Angular Momentum carried by Electromagnetic Fields
- Lecture 57
- Lecture 58
- Lecture 59
- Lecture 60
- Lecture 61
- Lecture 62
- Lecture 63
- Lecture 64
- Lecture 65
- Lecture 66 - Solution Assignment 1 - Problems 1 to 3
- Lecture 67 - Solution Assignment 1 - Problems 4 to 9
- Lecture 68 - Solution Assignment 2 - Problems 1 to 4

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

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Lecture 69 - Solution Assignment 2 - Problems 5 to 11  
Lecture 70 - Solution Assignment 3 - Problems 1 to 5  
Lecture 71 - Solution Assignment 3 - Problems 6 to 10  
Lecture 72 - Solution Assignment 4- Problems 1 to 5  
Lecture 73 - Solution Assignment 4- Problems 6 to 10  
Lecture 74 - Solution Assignment 5- Problems 6 to 11  
Lecture 75 - Solution Assignment 5- Problems 1to 5  
Lecture 76 - Solution Assignment 6- Problems 1 to 4  
Lecture 77 - Solution Assignment 6- Problems 5 to 8  
Lecture 78 - Solution Problem Set 7

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

NPTEL Video Course - Physics - NOC:Engineering Mechanics

Subject Co-ordinator - Prof. Manoj K Harbola

Co-ordinating Institute - IIT - Kanpur

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

- Lecture 1 - Introduction to Vectors
- Lecture 2 - Addition and subtraction of vectors
- Lecture 3 - Multiplying vectors
- Lecture 4 - Introduction to vectors
- Lecture 5 - Transformation of vectors under rotation
- Lecture 6 - Vector products and their geometric interpretation
- Lecture 7 - Vector Product
- Lecture 8 - Vector Product
- Lecture 9 - Introduction to vectors
- Lecture 10 - Equilibrium of rigid bodies & Forces and torques
- Lecture 11 - Calculating torques and couple moments - I
- Lecture 12 - Calculating torques and couple moments - II
- Lecture 13 - Finding a force and a couple equivalent to an applied force
- Lecture 14 - Different elements and associated forces and torques - I
- Lecture 15 - Different elements and associated forces and torques - II
- Lecture 16 - Solved examples; equilibrium of bodies & I
- Lecture 17 - Solved examples; equilibrium of bodies & II
- Lecture 18 - Forces in different geometric configuration
- Lecture 19 - Plane trusses I - building a truss and condition for it to be statically determinate
- Lecture 20 - Plane trusses II - calculating forces in a simple truss and different types of trusses
- Lecture 21 - Plane trusses III - calculating forces in a simple truss by method of joints
- Lecture 22 - Plane trusses IV- Solved examples for calculating forces in a simple truss by method of joints
- Lecture 23 - Plane trusses V - Solved examples for calculating forces in a simple truss by method of joints
- Lecture 24 - Plane trusses VI - method of sections for calculating forces in a simple truss
- Lecture 25 - Dry friction I - introduction with an example
- Lecture 26 - Dry friction II - a solved example
- Lecture 27 - Dry friction III - Dry thrust bearing and belt friction with demonstration
- Lecture 28 - Dry friction IV - Screw friction and rolling friction
- Lecture 29 - Dry friction V - Solved examples

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

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- Lecture 30 - Properties of plane surfaces I - First moment and centroid of an area
- Lecture 31 - Properties of plane surfaces II - Centroid of an area made by joining several plane surfaces
- Lecture 32 - Properties of plane surfaces III - Centroid of a distributed force and its relation with centre
- Lecture 33 - Properties of plane surfaces IV - solved examples of calculation of first moment and centroid of
- Lecture 34 - Properties of plane surfaces V- Second moment and product of an area and radius of gyration
- Lecture 35 - Properties of plane surfaces VI - Parallel axis transfer theorem for second moment and product of
- Lecture 36 - Properties of plane surfaces VII - transformation of second moment and product of an area under
- Lecture 37 - Properties of plane surfaces VIII - second moment and product of an area, solved examples
- Lecture 38 - Method of virtual work I - degrees of freedom, constraints and constraint forces
- Lecture 39 - Method of virtual work II - virtual displacement, virtual work and equilibrium condition in term
- Lecture 40 - Method of virtual work III - solved examples
- Lecture 41 - Motion of a particle in a plane in terms of planar polar coordinates
- Lecture 42 - Planar polar coordinates
- Lecture 43 - Description of motion in cylindrical and spherical coordinate systems
- Lecture 44 - Using planar polar, cylindrical and spherical coordinate systems
- Lecture 45 - Motion with constraints, constraint forces and free body diagram
- Lecture 46 - Motion with constraints  $\hat{A}$  solved examples
- Lecture 47 - Motion with dry friction  $\hat{A}$  solved examples
- Lecture 48 - Motion with drag  $\hat{A}$  solved examples
- Lecture 49 - Equation of motion in terms of linear momentum and the principle of conservation of linear momen
- Lecture 50 - Linear momentum and centre of mass
- Lecture 51 - Momentum transfer, impulse and force due to a stream of particles hitting an object
- Lecture 52 - Momentum and the variable mass problem
- Lecture 53 - Linear momentum  $\hat{A}$  solved examples
- Lecture 54 - Work and energy I - work energy theorem; conservative and non-conservative force fields
- Lecture 55 - Work and energy II - Definition of potential energy for conservative forces; total mechanical en
- Lecture 56 - Work and energy III - Two solved examples using conservation principles
- Lecture 57 - Work and energy IV  $\hat{A}$  Further discussion on potential energy
- Lecture 58 - Work and energy V - Solved examples
- Lecture 59 - Work and energy VI  $\hat{A}$  Applying conservation principles to solve a collision problem
- Lecture 60 - Work and energy VII - Solved examples
- Lecture 61 - Rigid body motion I - degrees of freedom and number of variables required to describe motion of
- Lecture 62 - Rigid body motion II - Equation of motion for a single particle in terms of angular momentum and
- Lecture 63 - Rigid body motion III - Conservation of angular momentum; angular momentum for a collection of p
- Lecture 64 - Rigid body motion IV - applying angular momentum conservation, a solved example
- Lecture 65 - Rigid body motion V (fixed axis rotation) - some demonstrations of conservation of angular momen
- Lecture 66 - Rigid body motion VI (fixed axis rotation) - Some more demonstrations and related problems
- Lecture 67 - Rigid body motion VII (fixed axis rotation) - Kinetic energy and moment of inertia for fixed axi
- Lecture 68 - Rigid body motion VIII (fixed axis rotation) - solved examples for calculating moment of inertia

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

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- Lecture 69 - Rigid body motion IX (fixed axis rotation) - solved examples
- Lecture 70 - Rigid body motion X - rotation and translation with axis moving parallel to itself
- Lecture 71 - Rigid body motion XI - solved examples for rotation and translation with axis moving parallel to itself
- Lecture 72 - Rigid-body dynamics XII - Some demonstrations on general motion of rigid bodies
- Lecture 73 - Rigid-body dynamics XIII - Infinitesimal angles as vector quantities and change of a vector when rotated
- Lecture 74 - Rigid-body dynamics XIV - Angular velocity and the rate of change of a rotating vector; relating angular velocity to angular displacement
- Lecture 75 - Rigid-body dynamics XV - Relationship between angular momentum and angular velocity  $\hat{A}$  the moment of inertia
- Lecture 76 - Rigid-body dynamics XVI - Solved examples
- Lecture 77 - Rigid body motion XVII  $\hat{A}$  A review of the relation between angular momentum and angular velocity
- Lecture 78 - Rigid body motion XVIII- Solved examples for calculating rate of change of angular momentum and angular velocity
- Lecture 79 - Rigid body dynamics XIX - understanding demonstrations shown earlier using equation of motion (Euler's equations)
- Lecture 80 - Rigid body dynamics XX - understanding demonstrations shown earlier using equation of motion (Euler's equations)
- Lecture 81 - Rigid body dynamics XXI - Euler equations, solved examples
- Lecture 82 - Simple harmonic motion I - expanding potential energy about the equilibrium point and the corresponding simple harmonic motion
- Lecture 83 - Simple harmonic motion II - solving the equation of motion with given initial conditions
- Lecture 84 - Simple harmonic motion III - solved examples
- Lecture 85 - Simple harmonic motion IV - representing simple harmonic motion on a phasor diagram; energy of a simple harmonic oscillator
- Lecture 86 - Simple harmonic motion V - solved examples
- Lecture 87 - Simple harmonic motion VI - solving the equation of motion with constant friction in the system
- Lecture 88 - Simple harmonic motion VII - harmonic oscillator with velocity-dependent damping (heavy damping)
- Lecture 89 - Simple harmonic motion VIII - harmonic oscillator with velocity-dependent damping (critical damping)
- Lecture 90 - Simple harmonic motion IX - solved examples
- Lecture 91 - Simple harmonic motion X - harmonic oscillator with velocity-dependent damping (light damping)
- Lecture 92 - Simple harmonic motion XI - solved examples
- Lecture 93 - Simple harmonic motion XII - oscillations of an un-damped harmonic oscillator subjected to an oscillating force
- Lecture 94 - Simple harmonic motion XIII - oscillations of a forced damped harmonic oscillator - I
- Lecture 95 - Simple harmonic oscillator XIV - oscillations of a forced damped harmonic oscillator - II
- Lecture 96 - Simple harmonic oscillator XV - Energy and power in a forced damped harmonic oscillator
- Lecture 97 - Simple harmonic oscillator XVI - Solved examples
- Lecture 98 - Equation of motion in a uniformly accelerating frame
- Lecture 99 - Motion described in a uniformly accelerating frame; solved examples - I
- Lecture 100 - Motion described in a uniformly accelerating frame; solved examples - II

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

NPTEL Video Course - Physics - NOC:Computational Science and Engineering Using Python

Subject Co-ordinator - Prof. Mahendra Verma

Co-ordinating Institute - IIT - Kanpur

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

Lecture 1 - Lecture 1 - About Computers  
Lecture 2 - Lecture 2 - Python  
Lecture 3 - Lecture 3 - Python  
Lecture 4 - Lecture 4 - Python  
Lecture 5 - Lecture 5A - Python packages; Programming  
Lecture 6 - Lecture 5B - Some suggestions on programming  
Lecture 7 - Lecture 6 - Plotting in Python  
Lecture 8 - Lecture 7 - Errors and Nondimensionalization  
Lecture 9 - Lecture 8 - Data I/O and Mayavi  
Lecture 10 - Lecture 9 - Lagrange interpolation  
Lecture 11 - Lecture 10 - Interpolation II  
Lecture 12 - Lecture 11 - Integration I  
Lecture 13 - Lecture 12 - Integration II  
Lecture 14 - Lecture 13 - Gaussian quadrature continued  
Lecture 15 - Lecture 14 - Numerical Differentiation  
Lecture 16 - Lecture 15 - ODE solvers  
Lecture 17 - Lecture 16 - ODE solvers continued  
Lecture 18 - Lecture 17 - Fourier transform  
Lecture 19 - Lecture 18 - PDE solver  
Lecture 20 - Lecture 19A - PDE solver  
Lecture 21 - Lecture 19B - PDE solver  
Lecture 22 - Lecture 20 - Linear algebra  
Lecture 23 - Lecture 21 - Summary

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

NPTEL Video Course - Physics - NOC: Introductory Quantum Mechanics

Subject Co-ordinator - Prof. Manoj K Harbola

Co-ordinating Institute - IIT - Kanpur

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

- Lecture 1 - Black Body Radiation I - Relevant Definitions and Black Body as cavity
- Lecture 2 - Black Body Radiation II - Intensity of radiation in terms of energy density
- Lecture 3 - Black Body Radiation III - Spectral energy density and radiation pressure inside a black body rad
- Lecture 4 - Black Body Radiation IV - Stephen's Boltzman law
- Lecture 5 - Black Body Radiation V - Wein's Displacement law and analysis for spectral density
- Lecture 6 - Black Body Radiation VI - Wein's distribution law and rayleigh - Jeans distribution law
- Lecture 7 - Black Body Radiation VII - Quantum Hypothesis and plank's distribution Formula
- Lecture 8 - Radiation as a collection of particles called photons
- Lecture 9 - Quantum Hypothesis and specific heat of solids
- Lecture 10 - Bohr's Model of hydrogen spectrum
- Lecture 11 - Wilson Sommerfeld quantum condition I - Harmonic oscillator and particle in a box
- Lecture 12 - Wilson Sommerfeld quantum condition II - Particle moving in a coulomb potential in a plane and r
- Lecture 13 - Wilson Sommerfeld quantum condition III - Particle moving in a coulomb potential in 3D and relat
- Lecture 14 - Quantum conditions and atomic structure, electron spin and Pauli exclusion principle
- Lecture 15 - Interaction of atoms with radiation
- Lecture 16 - Stimulated emission and amplification of light in a LASER
- Lecture 17 - Brief description of a LASER
- Lecture 18 - Introduction to the correspondence principle
- Lecture 19 - General nature of the correspondence principle
- Lecture 20 - Selection rules (for transitions) through the correspondence principle
- Lecture 21 - Applications of the correspondence principle
- Lecture 22 - Heisenberg's formulations of quantum mechanics
- Lecture 23 - Heisenberg's formulation of quantum mechanics
- Lecture 24 - Heisenberg's formulation of the quantum mechanics
- Lecture 25 - Brief introduction to matrix mechanics and the quantum condition in matrix form
- Lecture 26 - Introduction to waves and wave equation
- Lecture 27 - Stationary waves eigen values and eigen functions
- Lecture 28 - Matter waves and their experimental detection
- Lecture 29 - Representing a moving particle by a wave packet

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

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- Lecture 30 - Stationary-state Schrodinger equation and its solution for a particle in a box
- Lecture 31 - Solution of the stationary-state Schrodinger equation for a simple harmonic oscillator
- Lecture 32 - Equivalence of Heisenberg and the Schrodinger formulations
- Lecture 33 - Equivalence of Heisenberg and Schrodinger formulations
- Lecture 34 - Born interpretation of the wavefunction and expectation values of x and p operators
- Lecture 35 - Uncertainty principle and its simple applications
- Lecture 36 - Time dependent Schrodinger equation the probability current density and the continuity equation
- Lecture 37 - Ehrenfest theorem for the expectation values of x and p operators
- Lecture 38 - Solution of Schrodinger equation for a particle in one and two delta function potentials
- Lecture 39 - Solution of Schrodinger equation for a particle in a finite well
- Lecture 40 - Numerical solution of a one dimensional Schrodinger equation for bound states - I
- Lecture 41 - Numerical solution of a one dimensional Schrodinger equation for bound states - II
- Lecture 42 - Reflection and transmission of particles across a potential barrier
- Lecture 43 - Quantum-tunneling and its examples
- Lecture 44 - Solution of the Schrodinger for free particles and periodic boundary conditions
- Lecture 45 - Electrons in a metal
- Lecture 46 - Schrodinger equation for particles in spherically symmetric potential, angular momentum operator
- Lecture 47 - Angular momentum operator and its eigenfunctions
- Lecture 48 - Equation for radial component of the wavefunction in spherically symmetric potentials and general
- Lecture 49 - Solution for radial component of the wavefunction for the hydrogen atom
- Lecture 50 - Numerical solution for the radial component of wavefunction for spherically symmetric potentials
- Lecture 51 - Solution of the Schrodinger equation for one dimensional periodic potential
- Lecture 52 - Kroning-Penny model and energy bands
- Lecture 53 - Kroning-Penny model with periodic Dirac delta function and energy bands
- Lecture 54 - Discussion on bands
- Lecture 55 - Summary of the course

# 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

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

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- 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

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

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- 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 I
- Lecture 77 - Hund's rule for calculating the total angular momentum J, orbital angular momentum L and spin an
- 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

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

NPTEL Video Course - Physics - Astrophysics and Cosmology

Subject Co-ordinator - Prof. S. Bharadwaj

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Introduction  
Lecture 2 - Keplers Law  
Lecture 3 - The Solar System  
Lecture 4 - The Solar System (Continued...)  
Lecture 5 - Binary Systems  
Lecture 6 - Binary Systems (Continued...)  
Lecture 7 - Tidal Forces and the Earth Moon System  
Lecture 8 - Fluid Mechanics  
Lecture 9 - Hydrostatics and the Solar Wind  
Lecture 10 - Radiative Transfer  
Lecture 11 - Radiative Transfer (Continued...)  
Lecture 12 - Thermal Radiation  
Lecture 13 - Thermal Radiation and the Sun  
Lecture 14 - Virial Theorem and Its Application to Stars  
Lecture 15 - Stars  
Lecture 16 - Stellar Physics - I  
Lecture 17 - Stellar Physics - II  
Lecture 18 - Stellar Physics - III  
Lecture 19 - Stellar Physics - IV  
Lecture 20 - Stellar Physics - V  
Lecture 21 - White Dwarfs  
Lecture 22 - White Dwarfs and Neutron Stars  
Lecture 23 - Galaxies  
Lecture 24 - Galaxies and the Expanding Universe  
Lecture 25 - The Expanding Universe  
Lecture 26 - Dynamics of the Expanding Universe  
Lecture 27 - Dynamics of the Expanding Universe (Continued...)  
Lecture 28 - The Expanding Universe and the Cosmological Metric  
Lecture 29 - The Cosmological Space - Time

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

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- Lecture 30 - Distances
- Lecture 31 - Distances (Continued...)
- Lecture 32 - Distances and the Hubble Parameter
- Lecture 33 - Distances, the Hubble Parameter and Dark Energy (Continued...)
- Lecture 34 - CMBR and Thermal History
- Lecture 35 - CMBR and Thermal History (Continued...1)
- Lecture 36 - CMBR and Thermal History (Continued...2)
- Lecture 37 - Thermal History, Expansion Rate and Neutrino Mass
- Lecture 38 - Thermal History
- Lecture 39 - Big Bang Nucleosynthesis

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

NPTEL Video Course - Physics - NOC:Mathematics Methods in Physics - I

Subject Co-ordinator - Prof. Samudra Roy

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Set, Group, Field, Ring

Lecture 2 - Vector Space

Lecture 3 - Span, Linear combination of vectors

Lecture 4 - Linearly dependent and independent vector, Basis

Lecture 5 - Dual Space

Lecture 6 - Inner Product

Lecture 7 - Schwarz Inequality

Lecture 8 - Inner product space, Gram-Schmidt Ortho-normalization

Lecture 9 - Projection operator

Lecture 10 - Transformation of Basis

Lecture 11 - Transformation of Basis (Continued...)

Lecture 12 - Unitary transformation, Similarity Transformation

Lecture 13 - Eigen Value, Eigen Vectors

Lecture 14 - Normal Matrix

Lecture 15 - Diagonalization of a Matrix

Lecture 16 - Hermitian Matrix

Lecture 17 - Rank of a Matrix

Lecture 18 - Cayley - Hamilton Theorem, Function space

Lecture 19 - Metric Space, Linearly dependent - independent functions

Lecture 20 - Linearly dependent & independent functions (Continued...), Inner Product of functions

Lecture 21 - Orthogonal functions

Lecture 22 - Delta Function, Completeness

Lecture 23 - Fourier

Lecture 24 - Fourier Series (Continued...)

Lecture 25 - Parseval Theorem, Fourier Transform

Lecture 26 - Parseval Relation, Convolution Theorem

Lecture 27 - Polynomial space, Legendre Polynomial

Lecture 28 - Monomial Basis, Factorial Basis, Legendre Basis

Lecture 29 - Complex Numbers

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

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- Lecture 30 - Geometrical interpretation of complex numbers
- Lecture 31 - de Moivre's Theorem
- Lecture 32 - Roots of a complex number
- Lecture 33 - Set of complex no, Stereographic projection
- Lecture 34 - Complex Function, Concept of Limit
- Lecture 35 - Derivative of Complex Function, Cauchy-Riemann Equation
- Lecture 36 - Analytic Function
- Lecture 37 - Harmonic Conjugate
- Lecture 38 - Polar form of Cauchy-Riemann Equation
- Lecture 39 - Multi-valued function and Branches
- Lecture 40 - Complex Line Integration, Contour, Regions
- Lecture 41 - Complex Line Integration (Continued...)
- Lecture 42 - Cauchy-Goursat Theorem
- Lecture 43 - Application of Cauchy-Goursat Theorem
- Lecture 44 - Cauchy's Integral Formula
- Lecture 45 - Cauchy's Integral Formula (Continued...)
- Lecture 46 - Series and Sequence
- Lecture 47 - Series and Sequence (Continued...)
- Lecture 48 - Circle and radius of convergence
- Lecture 49 - Taylor Series
- Lecture 50 - Classification of singularity
- Lecture 51 - Laurent Series, Singularity
- Lecture 52 - Laurent series expansion
- Lecture 53 - Laurent series expansion (Continued...), Concept of Residue
- Lecture 54 - Classification of Residue
- Lecture 55 - Calculation of Residue for quotient from
- Lecture 56 - Cauchy's Residue Theorem
- Lecture 57 - Cauchy's Residue Theorem (Continued...)
- Lecture 58 - Real Integration using Cauchy's Residue Theorem
- Lecture 59 - Real Integration using Cauchy's Residue Theorem (Continued...)
- Lecture 60 - Real Integration using Cauchy's Residue Theorem (Continued...)

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

NPTEL Video Course - Physics - NOC:Classical Mechanics - from Newtonian to Lagrangian Formulation

Subject Co-ordinator - Prof. Debamalya Banerjee

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1  
Lecture 2  
Lecture 3  
Lecture 4  
Lecture 5  
Lecture 6 - Systems with variable mass - 3  
Lecture 7 - Systems with variable mass - 4  
Lecture 8 - Central force - 1  
Lecture 9 - Central force - 2  
Lecture 10 - Central force - 3  
Lecture 11 - Central force - 4  
Lecture 12 - Central force - 5  
Lecture 13 - Central force - 6  
Lecture 14 - Central force - 7  
Lecture 15 - Central force - 8  
Lecture 16 - Central force - 9  
Lecture 17 - Central force - 10  
Lecture 18 - Central force - 11  
Lecture 19 - Central force - 12  
Lecture 20 - Central force - 13  
Lecture 21 - Central force - 14  
Lecture 22 - Central force - 15  
Lecture 23 - Mooring Co-ordinate Systems - 1  
Lecture 24 - Mooring Co-ordinate Systems - 2  
Lecture 25 - Mooring Co-ordinate Systems - 3  
Lecture 26 - Mooring Co-ordinate Systems - 4  
Lecture 27 - Rigid body dynamics - 1  
Lecture 28 - Rigid body dynamics - 2  
Lecture 29 - Rigid body dynamics - 3

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

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Lecture 30	- Rigid body dynamics	- 4
Lecture 31	- Rigid body dynamics	- 5
Lecture 32	- Rigid body dynamics	- 6
Lecture 33	- Rigid body dynamics	- 7
Lecture 34	- Rigid body dynamics	- 8
Lecture 35	- Rigid body dynamics	- 9
Lecture 36	- Rigid body dynamics	- 10
Lecture 37	- Rigid body dynamics	- 11
Lecture 38	- Rigid body dynamics	- 12
Lecture 39	- Rigid body dynamics	- 13
Lecture 40	- Rigid body dynamics	- 14
Lecture 41	- Rigid body dynamics	- 15
Lecture 42	- Rigid body dynamics	- 16
Lecture 43	- Lagrangian Formulation	- 1
Lecture 44	- Lagrangian Formulation	- 2
Lecture 45	- Lagrangian Formulation	- 3
Lecture 46	- Lagrangian Formulation	- 4
Lecture 47	- Lagrangian Formulation	- 5
Lecture 48	- Lagrangian Formulation	- 6
Lecture 49	- Lagrangian Formulation	- 7
Lecture 50	- Lagrangian Formulation	- 8
Lecture 51	- Lagrangian Formulation	- 9
Lecture 52	- Lagrangian Formulation	- 10
Lecture 53	- Small oscillation	- 1
Lecture 54	- Small oscillation	- 2
Lecture 55	- Small oscillation	- 3
Lecture 56	- Small oscillation	- 4
Lecture 57	- Small oscillation	- 5
Lecture 58	- Small oscillation	- 6
Lecture 59	- Small oscillation	- 7
Lecture 60	- Small oscillation	- 8



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

NPTEL Video Course - Physics - NOC:Solid State Physics

Subject Co-ordinator - Prof. Amal Kumar Das

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Atom to Solid Structure  
Lecture 2 - Atom to Solid Structure (Continued...)  
Lecture 3 - Structure of Solid  
Lecture 4 - Structure of Solid (Continued...)  
Lecture 5 - Crystal Structure  
Lecture 6 - Crystal Structure (Continued...)  
Lecture 7 - Crystal Structure (Continued...)  
Lecture 8 - Crystal Structure (Continued...)  
Lecture 9 - Crystal Structure (Continued...)  
Lecture 10 - Crystal Structure (Continued...)  
Lecture 11 - Crystal Structure (Continued...)  
Lecture 12 - Crystal Structure (Continued...)  
Lecture 13 - Crystal Structure (Continued...)  
Lecture 14 - Crystal Structure (Continued...)  
Lecture 15 - Crystal Structure (Continued...)  
Lecture 16 - Crystal Structure (Continued...)  
Lecture 17 - Crystal Structure (Continued...)  
Lecture 18 - X-ray Diffraction from Crystal  
Lecture 19 - X-ray Diffraction from Crystal (Continued...)  
Lecture 20 - X-ray Diffraction from Crystal (Continued...)  
Lecture 21 - X-ray Diffraction from Crystal (Continued...)  
Lecture 22 - X-ray Diffraction from Crystal (Continued...)  
Lecture 23 - X-ray Diffraction from Crystal (Continued...)  
Lecture 24 - X-ray Diffraction from Crystal (Continued...)  
Lecture 25 - Reciprocal Lattice  
Lecture 26 - Reciprocal Lattice (Continued...)  
Lecture 27 - Reciprocal Lattice (Continued...)  
Lecture 28 - Reciprocal Lattice (Continued...)  
Lecture 29 - Reciprocal Lattice (Continued...)

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

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- Lecture 30 - Intensity of Bragg Diffraction
- Lecture 31 - Intensity of Bragg Diffraction (Continued...)
- Lecture 32 - Electrical Properties of Metal
- Lecture 33 - Electrical Properties of Metal (Continued...)
- Lecture 34 - Electrical Properties of Metal (Continued...)
- Lecture 35 - Electrical Properties of Metal (Continued...)
- Lecture 36 - Electrical Properties of Metal (Continued...)
- Lecture 37 - Electrical Properties of Metal (Continued...)
- Lecture 38 - Electrical Properties of Metal (Continued...)
- Lecture 39 - Electrical Properties of Metal (Continued...)
- Lecture 40 - Band Theory of Solids
- Lecture 41 - Band Theory of Solids (Continued...)
- Lecture 42 - Band Theory of Solids (Continued...)
- Lecture 43 - Band Theory of Solids (Continued...)
- Lecture 44 - Band Theory of Solids (Continued...)
- Lecture 45 - Band Theory of Solids (Continued...)
- Lecture 46 - Band Theory of Solids (Continued...)
- Lecture 47 - Physics of Semiconductor
- Lecture 48 - Physics of Semiconductor (Continued...)
- Lecture 49 - Physics of Semiconductor
- Lecture 50 - Electrical Conduction
- Lecture 51 - Electrical Conduction
- Lecture 52
- Lecture 53
- Lecture 54 - Thermal Properties of Solid (Continued...)
- Lecture 55 - Thermal Properties of Solid (Continued...)
- Lecture 56 - Thermal Properties of Solid (Continued...)
- Lecture 57 - Thermal Properties of Solid (Continued...)
- Lecture 58 - Magnetic Property of Solid
- Lecture 59 - Magnetic Property of Solid (Continued...)
- Lecture 60 - Magnetic Property of Solid (Continued...)
- Lecture 61 - Magnetic Property of Solid (Continued...)
- Lecture 62 - Magnetic Property of Solid (Continued...)
- Lecture 63 - Magnetic Property of Solid (Continued...)
- Lecture 64 - Magnetic Property of Solid (Continued...)
- Lecture 65 - Magnetic Property of Solid (Continued...)
- Lecture 66 - Magnetic Property of Solid (Continued...)
- Lecture 67 - Magnetic Property of Solid (Continued...)
- Lecture 68 - Magnetic Property of Solid (Continued...)

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

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- Lecture 69 - Magnetic Property of Solid (Continued...)
- Lecture 70 - Magnetic Property of Solid (Continued...)
- Lecture 71 - Magnetic Property of Solids (Continued...)
- Lecture 72 - Dielectric Properties of Solid
- Lecture 73 - Dielectric Properties of Solid (Continued...)
- Lecture 74 - Dielectric Properties of Solid (Continued...)
- Lecture 75 - Superconductivity

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

NPTEL Video Course - Physics - NOC:Atomic and Molecular Physics

Subject Co-ordinator - Prof. Amal Kumar Das

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Experimental observations and theoretical development in discovery of constituents of an atom  
Lecture 2 - Experimental observations and theoretical development in discovery of constituents of an atom (C  
Lecture 3 - Experimental observations and theoretical development in discovery of constituents of an atom (C  
Lecture 4 - Experimental observations and theoretical development in discovery of constituents of an atom (C  
Lecture 5 - Experimental observations and theoretical development in discovery of constituents of an atom (C  
Lecture 6 - Structure of an atom  
Lecture 7 - Structure of an atom  
Lecture 8 - Structure of an atom (Continued...)  
Lecture 9 - Atomic structure of an atom  
Lecture 10 - Atomic structure of an atom  
Lecture 11 - Structure of an atom  
Lecture 12 - Atomic structure of an atom  
Lecture 13 - Atomic structure of an atom  
Lecture 14 - Structure of an atom  
Lecture 15 - Structure of an atom  
Lecture 16 - Structure of an atom  
Lecture 17 - Structure of an atom  
Lecture 18 - Structure of an atom  
Lecture 19 - Structure of an atom  
Lecture 20 - Structure of an atom  
Lecture 21 - Atomic spectra  
Lecture 22 - Atomic spectra  
Lecture 23 - Multielectron atoms  
Lecture 24 - Multielectron atoms (Continued...)  
Lecture 25 - Multielectron atoms (Continued...)  
Lecture 26 - Multielectron atoms (Continued...)  
Lecture 27 - Quantum mechanical treatment  
Lecture 28 - Quantum mechanical treatment (Continued...)  
Lecture 29 - Quantum mechanical treatment of H-like atom

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- Lecture 30 - Quantum mechanical treatment of H-like atom (Continued...)
- Lecture 31 - Quantum mechanical treatment of Hydrogen like atom
- Lecture 32 - Quantum mechanical treatment of Hydrogen like atom (Continued...)
- Lecture 33 - Quantum mechanical treatment of hydrogen like atom (Continued...)
- Lecture 34 - Quantum mechanical treatment of hydrogen like atom (Continued...)
- Lecture 35 - Quantum mechanical treatment of hydrogen like atom (Continued...)
- Lecture 36 - Quantum Mechanical treatment of Hydrogen like atom (Continued...)
- Lecture 37 - Quantum Mechanical treatment of Hydrogen like atom (Continued...)
- Lecture 38 - Hydrogen like atom in magnetic field
- Lecture 39 - Hydrogen like atom in magnetic field (Continued...)
- Lecture 40 - Hydrogen like atom in electric field
- Lecture 41 - Physics of molecules
- Lecture 42 - Rotation of a molecule
- Lecture 43 - Rotation of a molecule (Continued...)
- Lecture 44 - Rotation of a molecule (Continued...)
- Lecture 45 - Rotation of a molecule (Continued...)
- Lecture 46 - Vibration of a molecule
- Lecture 47 - Vibration of a molecule (Continued...)
- Lecture 48 - Vibration of a molecule (Continued...)
- Lecture 49 - Vibration of a molecule (Continued...)
- Lecture 50 - Vibration of a molecule (Continued...)
- Lecture 51 - Electronic spectra of a molecule
- Lecture 52 - Electronic spectra of a molecule (Continued...)
- Lecture 53 - Electronic structure of molecules
- Lecture 54 - Electronic structure of molecules (Continued...)
- Lecture 55 - Electronic structure of a molecule
- Lecture 56 - Atomic and Molecular Spectroscopy
- Lecture 57 - Raman Spectroscopy
- Lecture 58 - Raman Spectroscopy (Continued...)
- Lecture 59 - Raman Spectroscopy (Continued...)
- Lecture 60 - Resonance spectroscopy

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

NPTEL Video Course - Physics - NOC:Modern Optics

Subject Co-ordinator - Prof. Partha Roy Choudhuri

Co-ordinating Institute - IIT - Kharagpur

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

Lecture 1 - Maxwells equations and electromagnetic waves  
Lecture 2 - Maxwells equations and electromagnetic waves (Continued...)  
Lecture 3 - Maxwells equations and electromagnetic waves (Continued...)  
Lecture 4 - Maxwells equations and electromagnetic waves (Continued...)  
Lecture 5 - Maxwells equations and electromagnetic waves (Continued...)  
Lecture 6 - Maxwells equations and electromagnetic waves (Continued...)  
Lecture 7 - Maxwells equations and electromagnetic waves (Continued...)  
Lecture 8 - Wave propagation in anisotropic media  
Lecture 9 - Wave propagation in anisotropic media (Continued...)  
Lecture 10 - Wave propagation in anisotropic media (Continued...)  
Lecture 11 - Wave propagation in anisotropic media (Continued...)  
Lecture 12 - Wave propagation in anisotropic media (Continued...)  
Lecture 13 - Wave propagation in layered structures  
Lecture 14 - Wave propagation in layered structures (Continued...)  
Lecture 15 - Wave propagation in layered structures (Continued...)  
Lecture 16 - Wave propagation in layered structures (Continued...)  
Lecture 17 - Wave propagation in layered structures (Continued...)  
Lecture 18 - Waves in guided structures and modes  
Lecture 19 - Waves in guided structures and modes (Continued...)  
Lecture 20 - Waves in guided structures and modes (Continued...)  
Lecture 21 - Waves in guided structures and modes (Continued...)  
Lecture 22 - Waves in guided structures and modes (Continued...)  
Lecture 23 - Waves in guided structures and modes (Continued...)  
Lecture 24 - Coupling of waves and optical couplers  
Lecture 25 - Coupling of waves and optical couplers (Continued...)  
Lecture 26 - Coupling of waves and optical couplers (Continued...)  
Lecture 27 - Coupling of waves and optical couplers (Continued...)  
Lecture 28 - Coupling of waves and optical couplers (Continued...)  
Lecture 29 - Electro-optic Effect

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

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- Lecture 30 - Electro-optic Effect (Continued...)
- Lecture 31 - Electro-optic Effect (Continued...)
- Lecture 32 - Electro-optic Effect (Continued...)
- Lecture 33 - Electro-optic Effect (Continued...)
- Lecture 34 - Electro-optic Modulators and Devices
- Lecture 35 - Electro-optic Modulators and Devices (Continued...)
- Lecture 36 - Electro-optic Modulators and Devices (Continued...)
- Lecture 37 - Electro-optic Modulators and Devices (Continued...)
- Lecture 38 - Electro-optic Modulators and Devices (Continued...)
- Lecture 39 - Electro-optic Modulators and Devices (Continued...)
- Lecture 40 - Electro-optic Modulators and Devices (Continued...)
- Lecture 41 - Acousto-optic Effect
- Lecture 42 - Acousto-optic Effect (Continued...)
- Lecture 43 - Acousto-optic Effect (Continued...)
- Lecture 44 - Acousto-optic Effect (Continued...)
- Lecture 45 - Acousto-optic Effect (Continued...)
- Lecture 46 - Acousto-optic Effect (Continued...)
- Lecture 47 - Acousto-optic Effect (Continued...)
- Lecture 48 - Acousto-optic Effect (Continued...)
- Lecture 49 - Acousto-optic Effect (Continued...)
- Lecture 50 - Acousto-optic Effect (Continued...)
- Lecture 51 - Acousto-optic Effect (Continued...)
- Lecture 52 - Acousto-optic Effect (Continued...)
- Lecture 53 - Acousto-optic Effect (Continued...)
- Lecture 54 - Acousto-optic Modulators and Devices
- Lecture 55 - Acousto-optic Modulators and Devices (Continued...)
- Lecture 56 - Acousto-optic Modulators and Devices (Continued...)
- Lecture 57 - Acousto-optic Modulators and Devices (Continued...)
- Lecture 58 - Magneto-optic Effect
- Lecture 59 - Magneto-optic Effect (Continued...)

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

NPTEL Video Course - Physics - NOC:Introduction to Non-linear Optics and its Applications

Subject Co-ordinator - Prof. Samudra Roy

Co-ordinating Institute - IIT - Kharagpur

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

- Lecture 1 - Basic Linear Optics
- Lecture 2 - Basic Linear Optics (Continued...)
- Lecture 3 - Basic Linear Optics (Continued...)
- Lecture 4 - Basic Linear Optics (Continued...)
- Lecture 5 - Basic Linear Optics (Continued...)
- Lecture 6 - Basic Linear Optics (Continued...)
- Lecture 7 - Basic Linear Optics (Continued...)
- Lecture 8 - Basic Linear Optics (Continued...)
- Lecture 9 - Basic Linear Optics (Continued...)
- Lecture 10 - Nonlinear Optics
- Lecture 11 - Classical origin of optical nonlinearity
- Lecture 12 - Miller's Rule
- Lecture 13 - Second Harmonic Generation (SHG)
- Lecture 14 - Optical Rectification, Linear electro-optic effect
- Lecture 15 - Sum and Difference frequency generation
- Lecture 16 - Nonlinear Maxwell's equation
- Lecture 17 - Theory of SHG
- Lecture 18 - Phase matching
- Lecture 19 - Phase matching of SHG, Gain band width calculation
- Lecture 20 - Manley-Rowe Relation, Energy conservation in SHG,
- Lecture 21 - Birefringence phase-matching (BPM), Type I and Type II phase matching
- Lecture 22 - Type II phase matching, Symmetry in nonlinear susceptibility
- Lecture 23 - Kleinman's Symmetry, Neumann's Principle
- Lecture 24 - Neumann's Principle (Continued...) Centrosymmetric system
- Lecture 25 - Matrix form
- Lecture 26 - SHG in KDP crystal, Calculation of  $d_{eff}$
- Lecture 27 - SHG in LiNbO<sub>3</sub>
- Lecture 28 - Quasi phase matching (QPM)
- Lecture 29 - Quasi phase matching (QPM) (Continued...), Periodic  $d$  function

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

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- Lecture 30 - 1st, 2nd, 3rd order QPM, SHG under depleted pump
- Lecture 31 - Realistic calculation of SHG, 3 wave interaction
- Lecture 32 - 3 wave interaction, Equation for pump, signal and idler wave, Non-collinear phase matching
- Lecture 33 - Manley-Rowe Relation (3 wave mixing), Parametric down conversion
- Lecture 34 - Parametric down conversion (Continued...), Optical Parametric Amplification (OPA)
- Lecture 35 - Optical Parametric Amplification (OPA), Difference frequency generation under OPA
- Lecture 36 - Sum frequency generation under OPA
- Lecture 37 - OPA under non-phase matching condition, Expression of gain
- Lecture 38 - Optical parametric Oscillator (OPO), Singly resonant oscillator
- Lecture 39 - Doubly Resonant Oscillator (DRO)
- Lecture 40 - Doubly Resonant Oscillator (DRO) (Continued...)
- Lecture 41 - 3rd order nonlinear effect
- Lecture 42 - Optical Kerr effect and Self-focusing, Symmetry in 3rd order susceptibility
- Lecture 43 - Symmetry in 3rd order susceptibility (Continued...), Self Phase Modulation (SPM)
- Lecture 44 - Self Phase Modulation (Continued...), Frequency Shift
- Lecture 45 - Third Harmonic Generation(3HG), Energy conservation
- Lecture 46 - Third Harmonic Generation (Continued...)
- Lecture 47 - Third Harmonic Generation (Continued...), Cross Phase Modulation (XPM)
- Lecture 48 - Cross Phase Modulation (Continued...), Nonlinear Absorption
- Lecture 49 - Four Wave Mixing
- Lecture 50 - Four Wave mixing (Continued...)
- Lecture 51 - Parametric Amplification under FWM
- Lecture 52 - Parametric Amplification under FWM (Continued...)
- Lecture 53 - Optical Phase Conjugation
- Lecture 54 - Raman Scattering
- Lecture 55 - Stimulated Raman Scattering
- Lecture 56 - Raman Amplification
- Lecture 57 - Raman Amplification (Continued...)
- Lecture 58 - Linear pulse propagation
- Lecture 59 - Nonlinear Pulse propagation
- Lecture 60 - Optical Soliton

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

NPTEL Video Course - Physics - NOC:Upstream LNG Technology

Subject Co-ordinator - Prof. Pavitra Sandilya

Co-ordinating Institute - IIT - Kharagpur

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

- Lecture 1 - Introduction
- Lecture 2 - Concentration
- Lecture 3 - Sources and Process Overview of Natural Gas
- Lecture 4 - Pure Component Phase Behavior
- Lecture 5 - Mixture Phase Behavior
- Lecture 6 - Phase Behaviour of Natural Gas
- Lecture 7 - Dew Point and Bubble Point Calculations
- Lecture 8 - Vapor Liquid Equilibrium
- Lecture 9 - Problems on Vapor Pressure, Gibb's Phase Rule, Dew Point Bubble Point Temperatures
- Lecture 10 - Thermophysical Properties of Natural Gas - I
- Lecture 11 - Thermophysical Properties of Natural Gas - II
- Lecture 12 - Thermodynamic and Chemical Properties
- Lecture 13 - Combustion Properties
- Lecture 14 - Flow in Natural Gas Systems
- Lecture 15 - Flow Measurement In Natural Gas - I
- Lecture 16 - Flow Measurement In Natural Gas - II
- Lecture 17 - Temperature and Quality Measurement in Natural Gas Systems
- Lecture 18 - Pressure measurement in natural gas systems
- Lecture 19 - Tutorial on the estimation of thermophysical properties
- Lecture 20 - Tutorial on the combustion and thermodynamic properties of natural gas
- Lecture 21 - Tutorial on fluid mechanics
- Lecture 22 - Tutorial on flow and pressure measurement in natural gas systems
- Lecture 23 - Tutorial on temperature and quality measurement in natural gas
- Lecture 24 - Heat transfer in natural gas systems
- Lecture 25 - Tutorial on heat transfer in natural gas systems
- Lecture 26 - Heat exchangers in natural gas systems
- Lecture 27 - Analysis of heat exchangers in natural gas systems
- Lecture 28 - Tutorial on heat exchanger analysis
- Lecture 29 - Equilibrium vapour-liquid separation

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

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- Lecture 30 - Equilibrium in multicomponent systems
- Lecture 31 - Separation by distillation
- Lecture 32 - Design of distillation column
- Lecture 33 - Equilibrium fluid solid separation
- Lecture 34 - Membrane separation in natural gas systems
- Lecture 35 - Estimation of water content in natural gas
- Lecture 36 - Multistage single component equilibrium separation
- Lecture 37 - Tutorial on vapour liquid separation
- Lecture 38 - Tutorial on ideal binary distillation
- Lecture 39 - Tutorial on equilibrium gas- solid separation
- Lecture 40 - Tutorial on membrane gas separation
- Lecture 41 - Dehydration of natural gas
- Lecture 42 - Natural gas Processing - hydrate removal
- Lecture 43 - Acid gas removal in natural gas system - I
- Lecture 44 - Acid gas removal in natural gas system - II
- Lecture 45 - Nitrogen removal in natural gas system - I
- Lecture 46 - Nitrogen removal in natural gas system - II
- Lecture 47 - Compression in natural gas systems
- Lecture 48 - Compressors used in natural gas systems
- Lecture 49 - Tutorial on hydrate removal
- Lecture 50 - Multicomponent distillation column design
- Lecture 51 - Sulfur recovery in natural gas systems - I
- Lecture 52 - Tutorial on compression
- Lecture 53 - Pigging
- Lecture 54 - Sulfur recovery in natural gas systems - II
- Lecture 55 - Trace components in natural gas
- Lecture 56 - Helium recovery, upgradation and purification
- Lecture 57 - Fundamentals of absorption and stripping for natural gas processing
- Lecture 58 - Tutorial on absorption and stripping
- Lecture 59 - Gas liquid separation in natural gas systems - I
- Lecture 60 - Gas liquid separation in natural gas systems - II
- Lecture 61 - Tutorial on equilibrium in multicomponent systems
- Lecture 62 - Tutorial on multicomponent distillation - I
- Lecture 63 - Tutorial on multicomponent distillation - II
- Lecture 64 - Pumps in natural gas systems - I
- Lecture 65 - Pumps in natural gas systems - II
- Lecture 66 - Pumps in natural gas systems - III
- Lecture 67 - Tutorial on pumps - I
- Lecture 68 - Tutorial on pumps - II

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

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- Lecture 69 - Cryogenic refrigeration and liquefaction in natural gas systems - I
- Lecture 70 - Cryogenic refrigeration and liquefaction in natural gas systems - II
- Lecture 71 - Tutorial on refrigeration - I
- Lecture 72 - Tutorial on refrigeration - II
- Lecture 73 - Cryogenic refrigeration and liquefaction in natural gas systems - III
- Lecture 74 - Cryogenic refrigeration and liquefaction in natural gas systems - IV
- Lecture 75 - Cryogenic refrigeration and liquefaction in natural gas systems - V
- Lecture 76 - Tutorial on refrigeration - III
- Lecture 77 - Tutorial on refrigeration and liquefaction - IV
- Lecture 78 - Tutorial on refrigeration and liquefaction - V
- Lecture 79 - Hydrocarbon recovery in natural gas system - I
- Lecture 80 - Hydrocarbon recovery in natural gas system - II
- Lecture 81 - Hydrocarbon recovery in natural gas system - III
- Lecture 82 - Tutorial on hydrocarbon recovery in natural gas
- Lecture 83 - Piping in natural gas systems - I
- Lecture 84 - Piping in natural gas systems - II
- Lecture 85 - Tutorial on piping in natural gas systems - I
- Lecture 86 - Tutorial on piping in natural gas systems - II

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

NPTEL Video Course - Physics - NOC:Experimental Physics-I

Subject Co-ordinator - Prof. Amal Kumar Das

Co-ordinating Institute - IIT - Kharagpur

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

- Lecture 1 - Introduction
- Lecture 2 - Basic tools and apparatus
- Lecture 3 - Basic tools and apparatus (Continued...)
- Lecture 4 - Basic tools and apparatus (Continued...)
- Lecture 5 - Basic tools and apparatus (Continued...)
- Lecture 6 - Basic tools and apparatus (Continued...)
- Lecture 7 - Basic components
- Lecture 8 - Basic apparatus
- Lecture 9 - Basic apparatus (Continued...)
- Lecture 10 - Basic analysis
- Lecture 11 - Basics analysis (Continued...)
- Lecture 12 - Basics analysis (Continued...)
- Lecture 13 - Basics analysis (Continued...)
- Lecture 14 - Basics analysis (Continued...)
- Lecture 15 - Basics analysis (Continued...)
- Lecture 16 - Basics analysis (Continued...)
- Lecture 17 - Basics analysis (Continued...)
- Lecture 18 - Basics analysis (Continued...)
- Lecture 19 - Basics analysis (Continued...)
- Lecture 20 - Determination of Young's modulus
- Lecture 21 - Demonstration on the experiment of Young's modulus of mettalic bar and data collection
- Lecture 22 - Calculate the value of young's modulus of given metallic bar form the recorded datas
- Lecture 23 - Experimental demonstration to calculate the spring constant of a given spring
- Lecture 24 - Calculate the value of calculate the spring constant of a given spring form the recorded datas
- Lecture 25 - Theory regarding Moment of inertia of a flywheel
- Lecture 26 - Experimental demonstration to calculate the moment of inertia of a given flywheel
- Lecture 27 - How to calculate the value of moment of inertia of a flywheelform the recorded data
- Lecture 28 - Theory regarding surface tension of the liquid
- Lecture 29 - Demonstration on the experiment of surface tension and data collection

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

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- Lecture 30 - How to calculate the value of surface tension of water from the recorded data
- Lecture 31 - Theory regarding viscosity of liquid
- Lecture 32 - Demonstration on the experiment of viscosity
- Lecture 33 - Data analysis of recorded data on viscosity
- Lecture 34 - Forced Oscillations Pohls pendulum
- Lecture 35 - Coupled Pendulum
- Lecture 36 - Demonstration on the experiment of compound pendulum
- Lecture 37 - Theory regarding compound pendulum has been discussed
- Lecture 38 - Experimental demonstration on the standing Waves on a String has been shown clearly how to deter
- Lecture 39 - Linear expansion of metal
- Lecture 40 - Expt. to study linear expansion
- Lecture 41 - Determine the coefficient of thermal conductivity of a bad conductor
- Lecture 42 - Determination of electrical equivalent of heat
- Lecture 43 - Determination of specific heat of the given solid metals using Dulong-Petit's law
- Lecture 44 - Determination of the calibration curve of a given (Type K chromel- $\alpha$  alumel) thermocouple an
- Lecture 45 - Theorey and Demonstartion Platinum Resistance thermometer
- Lecture 46 - Experiment on Platinum Resistance thermometer
- Lecture 47 - To study the current-voltage relationship of an L-R circuit
- Lecture 48 - To study the variation in current and voltage in a series LCR circuit
- Lecture 49 - Sensitivity of Blastic Galvanometer
- Lecture 50 - Expt. for Sensitivity of Blastic Galvanometer
- Lecture 51 - Theory on RC Circuit
- Lecture 52 - Expt. on RC Circuit
- Lecture 53 - Theory regarding the magnetic field along the axis of a circular coil
- Lecture 54 - Experiment regarding the magnetic field along the axis of a circular coil
- Lecture 55 - Study the induced e.m.f of inductance coil
- Lecture 56 - Mutual inductance
- Lecture 57 - Theory regarding permeability of air
- Lecture 58 - Experiment to determination the permeability of air
- Lecture 59 - Devices around us
- Lecture 60 - Devices around us (Continued...)

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

NPTEL Video Course - Physics - Special Topics in Atomic Physics

Subject Co-ordinator - Prof. P.C. Deshmukh

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Introductory lecture about this course
- Lecture 2 - Quantum Mechanics and Symmetry of the Hydrogen Atom
- Lecture 3 - Hydrogen atom
- Lecture 4 - Hydrogen atom
- Lecture 5 - Degeneracy of the Hydrogen Atom
- Lecture 6 - Wavefunctions of the Hydrogen Atom
- Lecture 7 - Angular Momentum in Quantum Mechanics
- Lecture 8 - Angular Momentum in Quantum Mechanics
- Lecture 9 - Angular Momentum in Quantum Mechanics
- Lecture 10 - Angular Momentum in Quantum Mechanics Dimensionality of the Direct-Product (Composite) Vector Sp
- Lecture 11 - Angular Momentum in Quantum Mechanics CGC matrix, Wigner D Rotation Matrix, Irreducible Tensor C
- Lecture 12 - Angular Momentum in Quantum Mechanics - more on ITO, and the Wigner-Eckart Theorem
- Lecture 13 - Angular Momentum in Quantum Mechanics Wigner-Eckart Theorem - 2
- Lecture 14 - Relativistic Quantum Mechanics of the Hydrogen Atom - 1
- Lecture 15 - Relativistic Quantum Mechanics of the Hydrogen Atom - 2
- Lecture 16 - Relativistic Quantum Mechanics of the Hydrogen Atom - PAULI Equation - Foldy - Wouthysen Transfo
- Lecture 17 - Relativistic Quantum Mechanics of the Hydrogen Atom - Foldy - Wouthysen Transformations - 2
- Lecture 18 - Relativistic Quantum Mechanics of the Hydrogen Atom - Foldy - Wouthysen Transformations - 3
- Lecture 19 - Relativistic Quantum Mechanics of the Hydrogen Atom - Spherical Symmetry of the Coulomb Potentia
- Lecture 20 - Hartree-Fock Self-Consistent Field formalism - 1
- Lecture 21 - Hartree-Fock Self-Consistent Field formalism - 2
- Lecture 22 - Hartree-Fock Self-Consistent Field formalism - 3
- Lecture 23 - Hartree-Fock Self-Consistent Field formalism - 4
- Lecture 24 - Hartree-Fock Self-Consistent Field formalism - 5
- Lecture 25 - Perturbative treatment of relativistic effectsâ | Schrodinger's and Dirac QM
- Lecture 26 - Perturbative treatment of relativistic effectsâ | Schrodinger's and Dirac QM
- Lecture 27 - Probing the atom - Collisions and Spectroscopy - boundary conditions - 1
- Lecture 28 - Atomic Probes - Collisions and Spectroscopy - boundary conditions - 2
- Lecture 29 - Atomic Probes - Collisions and Spectroscopy - Scattering phase shifts and boundary conditions

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

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- Lecture 30 - Atomic Probes - Time reversal symmetry - applications in atomic collisions and photoionization p
- Lecture 31 - Atomic Photoionization cross sections, angular distributions of photoelectrons - 1
- Lecture 32 - Atomic Photoionization cross sections, angular distributions of photoelectrons - 2
- Lecture 33 - Atomic Photoionization cross sections, angular distributions of photoelectrons - 3
- Lecture 34 - Atomic Photoionization cross sections, angular distributions of photoelectrons - 4
- Lecture 35 - Atomic Photoionization cross sections, angular distributions of photoelectrons Cooper Zare Formu
- Lecture 36 - Stark- Zeeman Spectroscopy - Stark effect
- Lecture 37 - Stark- Zeeman Spectroscopy - Stark effect on n=2 excited state of the H atom Zeeman effect
- Lecture 38 - Stark- Zeeman Spectroscopy - Normal, Anomalous Zeeman effect; Paschen- Back effect
- Lecture 39 - Stark- Zeeman Spectroscopy - Anomalous Zeeman effect
- Lecture 40 - Zeeman effect Fine structure, Hyperfine structure - Elemental, rudimentary introduction to Laser



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

NPTEL Video Course - Physics - Classical Field Theory

Subject Co-ordinator - Prof. Suresh Govindarajan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - What is Classical Field Theory?
- Lecture 2 - Symmetries and Invariances - I
- Lecture 3 - Symmetries and Invariances - II
- Lecture 4 - Group Theory in Physics - I
- Lecture 5 - Group Theory in Physics - II
- Lecture 6 - Finite Groups - I
- Lecture 7 - Finite Groups - II
- Lecture 8 - Basics of CFT - I
- Lecture 9 - Basics of CFT - II
- Lecture 10 - Basics of CFT - III
- Lecture 11 - Green Functions - I
- Lecture 12 - Green Functions - II
- Lecture 13 - Noether's Theorem - I
- Lecture 14 - Noether's Theorem - II
- Lecture 15 - Kink Soliton
- Lecture 16 - Hidden Symmetry
- Lecture 17 - Local Symmetries
- Lecture 18 - The Abelian Higgs model
- Lecture 19 - Lie Algebras - I
- Lecture 20 - Lie Algebras - II
- Lecture 21 - Magnetic Vortices - I
- Lecture 22 - Magnetic Vortices - II
- Lecture 23 - Non-abelian gauge theories - I
- Lecture 24 - Non-abelian gauge theories - II
- Lecture 25 - Irreps of Lie algebras - I
- Lecture 26 - Irreps of Lie algebras - II
- Lecture 27 - The Standard Model - I
- Lecture 28 - The Standard Model - II
- Lecture 29 - Irreps of the Lorentz/Poincare algebras

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

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- Lecture 30 - The Dirac monopole
- Lecture 31 - The 't Hooft-Polyakov monopole
- Lecture 32 - Revisiting Derrick's Theorem
- Lecture 33 - The Julia-Zee dyon
- Lecture 34 - Instantons - I
- Lecture 35 - Instantons - II
- Lecture 36 - Instantons - III
- Lecture 37 - Instantons - IV
- Lecture 38 - Dualities
- Lecture 39 - Geometrization of Field Theory

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

NPTEL Video Course - Physics - Topics in Nonlinear Dynamics

Subject Co-ordinator - Prof. V. Balakrishnan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Overview
- Lecture 2 - Critical points of a dynamical system
- Lecture 3 - Two-dimensional flows
- Lecture 4 - Stable and unstable manifolds
- Lecture 5 - Hamiltonian dynamics - Part I
- Lecture 6 - Hamiltonian dynamics - Part II
- Lecture 7 - Hamiltonian dynamics - Part III
- Lecture 8 - Hamiltonian dynamics - Part IV
- Lecture 9 - Hamiltonian dynamics - Part V
- Lecture 10 - Elementary bifurcations
- Lecture 11 - Limit cycles
- Lecture 12 - Poincaré index
- Lecture 13 - Illustrative examples
- Lecture 14 - Quiz 1. Questions and answers
- Lecture 15 - Bead on a rotating hoop
- Lecture 16 - Types of dynamical behaviour
- Lecture 17 - Discrete time dynamics - Part I
- Lecture 18 - Discrete time dynamics - Part II
- Lecture 19 - Discrete time dynamics - Part III
- Lecture 20 - Discrete time dynamics - Part IV
- Lecture 21 - Coarse-grained dynamics in phase space - Part I
- Lecture 22 - Coarse-grained dynamics in phase space - Part II & Stochastic dynamics - Part I
- Lecture 23 - Stochastic dynamics - Part II
- Lecture 24 - Stochastic dynamics - Part III
- Lecture 25 - Coarse-grained dynamics in phase space - Part IV & Stochastic dynamics - Part IV
- Lecture 26 - Discrete time dynamics - Part V
- Lecture 27 - Quiz 2. Questions and answers
- Lecture 28 - Stochastic dynamics - Part V
- Lecture 29 - Stochastic dynamics - Part VI

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

NPTEL Video Course - Physics - Condensed Matter Physics

Subject Co-ordinator - Prof. G. Rangarajan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Principles of Condensed Matter Physics
- Lecture 2 - Symmetry in Perfect Solids
- Lecture 3 - Symmetry in Perfect Solids (Continued...)
- Lecture 4 - Symmetry in Perfect Solids - Worked Examples
- Lecture 5 - Diffraction Methods For Crystal Structures
- Lecture 6 - Diffraction Methods For Crystal Structures (Continued...)
- Lecture 7 - Diffraction Methods For Crystal Structures - Worked Examples
- Lecture 8 - Physical Properties of Crystals
- Lecture 9 - Physical Properties of Crystals (Continued...)
- Lecture 10 - Physical Properties of Crystals - Worked Examples
- Lecture 11 - Cohesion in Solids
- Lecture 12 - Cohesion in Solids - Worked Examples
- Lecture 13 - The Free Electron Theory of Metals
- Lecture 14 - The Free Electron Theory of Metals - Worked Examples
- Lecture 15 - The Free Electron Theory of Metals - Electrical Conductivity
- Lecture 16 - The Free Electron Theory of Metals - Electrical Conductivity - Worked Examples
- Lecture 17 - Thermal Conductivity of Metals
- Lecture 18 - Thermal Conductivity of Metals - Worked Examples
- Lecture 19 - The Concept of Phonons
- Lecture 20 - Debye Theory of Specific Heat, Lattice Vibrations
- Lecture 21 - Debye Theory of Specific Heat, Lattice Vibrations - Worked Examples
- Lecture 22 - Lattice Vibrations (Continued) Phonon thermal conductivity
- Lecture 23 - Lattice Vibrations (Continued) Phonon Thermal Conductivity - Worked Examples
- Lecture 24 - Anharmonicity and Thermal Expansion
- Lecture 25 - Dielectric (Insulating) Solids
- Lecture 26 - Dispersion and Absorption of Electromagnetic Waves in Dielectric Media, Ferro-and Antiferroelect
- Lecture 27 - Optical Properties of Metals; Ionic Polarization in Alkali Halides; Piezoelectricity
- Lecture 28 - Dielectric Solids - Worked Examples
- Lecture 29 - Dia - and Paramagnetism

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

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- Lecture 30 - Paramagnetism of Transition Metal and Rare Earth Ions
- Lecture 31 - Quenching of Orbital Angular Momentum; Ferromagnetism
- Lecture 32 - Exchange Interactions, Magnetic Order, Neutron Diffraction
- Lecture 33 - Hysteresis and Magnetic Domains; Spin Waves and Magnons
- Lecture 34 - Magnetic Resonance
- Lecture 35 - Magnetism and Magnetic Resonance - Worked Examples
- Lecture 36 - Magnetism - Worked Examples (Continued...)
- Lecture 37 - Pauli Paramagnetism and Landau Diamagnetism
- Lecture 38 - Band Magnetism; Itinerant Electrons; Stoner Model
- Lecture 39 - Superconductivity - Perfect Electrical Conductivity and Perfect Diamagnetism
- Lecture 40 - Type I and Type II Superconductors
- Lecture 41 - Ginsburg - Landau Theory, Flux Quantization
- Lecture 42 - Cooper Pairs
- Lecture 43 - Microscopic (BCS) Theory of Superconductivity
- Lecture 44 - BCS Theory (Continued...)
- Lecture 45 - Josephson Effect (Continued...); High Temperature Superconductors
- Lecture 46 - Superconductors - Worked Examples
- Lecture 47 - Energy Bands in Solids
- Lecture 48 - Electron Dynamics in a Periodic Solid
- Lecture 49 - Semiconductors
- Lecture 50 - Semiconductors (Continued...)
- Lecture 51 - Semiconductors - Worked Examples
- Lecture 52 - Defects in Solids - Point Defects
- Lecture 53 - Point Defects in Solids - Worked Examples
- Lecture 54 - Defects in Solids - Line and Surface Defects
- Lecture 55 - Dislocations in Solids - Worked Examples
- Lecture 56 - Quantum Fluids and Quantum Solids
- Lecture 57 - Quantum Liquids and Quantum Solids - Worked Examples
- Lecture 58 - Epilogue

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

NPTEL Video Course - Physics - Quantum Field Theory

Subject Co-ordinator - Dr. Prasanta Tripathy

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Introduction  
Lecture 2 - Introduction to Classical Field Theory  
Lecture 3 - Quantization of Real Scalar Field - I  
Lecture 4 - Quantization of Real Scalar Field - II  
Lecture 5 - Quantization of Real Scalar Field - III  
Lecture 6 - Quantization of Real Scalar Field - IV  
Lecture 7 - Quantization of Complex Scalar Field  
Lecture 8 - Interacting Field Theory - I  
Lecture 9 - Interacting Field Theory - II  
Lecture 10 - Interacting Field Theory - III  
Lecture 11 - Interacting Field Theory - IV  
Lecture 12 - Interacting Field Theory - V  
Lecture 13 - Interacting Field Theory - VI  
Lecture 14 - Interacting Field Theory - VII  
Lecture 15 - Quantization of Electromagnetic Field - I  
Lecture 16 - Quantization of Electromagnetic Field - II  
Lecture 17 - Fermion Quantization - I  
Lecture 18 - Fermion Quantization - II  
Lecture 19 - Fermion Quantization - III  
Lecture 20 - Fermion Quantization - IV  
Lecture 21 - Fermion Quantization - V  
Lecture 22 - Fermion Quantization - VI  
Lecture 23 - The S-Matrix Expansion in QED - I  
Lecture 24 - The S-Matrix Expansion in QED - II  
Lecture 25 - Feynman Rules in QED - I  
Lecture 26 - Feynman Rules in QED - II  
Lecture 27 - Compton Scattering - I  
Lecture 28 - Compton Scattering - II  
Lecture 29 - Compton Scattering - III

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

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- Lecture 30 - Moller Scattering - I
- Lecture 31 - Moller Scattering - II
- Lecture 32 - Vertex Correction - I
- Lecture 33 - Vertex Correction - II
- Lecture 34 - Vertex Correction - III
- Lecture 35 - Vertex Correction - IV
- Lecture 36 - Electron Selfenergy
- Lecture 37 - Photon Selfenergy - I
- Lecture 38 - Photon Selfenergy - II

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

NPTEL Video Course - Physics - Quantum Mechanics I

Subject Co-ordinator - Prof. S. Lakshmi Bala

Co-ordinating Institute - IIT - Madras

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

Lecture 1 - Quantum Mechanics â An Introduction  
Lecture 2 - Linear Vector Spaces - I  
Lecture 3 - Linear Vector Spaces - II  
Lecture 4 - Linear Vector Spaces - III  
Lecture 5 - Postulates of Quantum Mechanics - I  
Lecture 6 - Postulates of Quantum Mechanics - II  
Lecture 7 - The Uncertainty Principle  
Lecture 8 - The Linear Harmonic Oscillator  
Lecture 9 - Introducing Quantum Optics  
Lecture 10 - An Interesting Quantum Superposition  
Lecture 11 - The Displacement and Squeezing Operators  
Lecture 12 - Exercises in Finite Dimensional Linear Vector Spaces  
Lecture 13 - Exercises on Angular Momentum Operators and their algebra  
Lecture 14 - Exercises on Quantum Expectation Values  
Lecture 15 - Composite Systems  
Lecture 16 - The Quantum Beam Splitter  
Lecture 17 - Addition of Angular Momenta - I  
Lecture 18 - Addition of Angular Momenta - II  
Lecture 19 - Addition of Angular Momenta - III  
Lecture 20 - Infinite Dimensional Linear Vector Spaces  
Lecture 21 - Square-Integrable Functions  
Lecture 22 - Ingredients of Wave Mechanics  
Lecture 23 - The Schrodinger equation  
Lecture 24 - Wave Mechanics of the Simple Harmonic Oscillator  
Lecture 25 - One-Dimensional Square Well Potential  
Lecture 26 - The Square Well and the Square Potential Barrier  
Lecture 27 - The Particle in a one-dimensional Box  
Lecture 28 - A Charged Particle in a Uniform Magnetic Field  
Lecture 29 - The Wavefunction

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

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- Lecture 30 - The Central Potential
- Lecture 31 - The Spherical Harmonics
- Lecture 32 - Central Potential
- Lecture 33 - Illustrative Exercises - I
- Lecture 34 - Illustrative Exercises - II
- Lecture 35 - Ehrenfest's Theorem
- Lecture 36 - Perturbation Theory - I
- Lecture 37 - Perturbation Theory - II
- Lecture 38 - Perturbation Theory - III
- Lecture 39 - Perturbation Theory - IV
- Lecture 40 - Time-dependent Hamiltonians
- Lecture 41 - The Jaynes-Cummings model

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

NPTEL Video Course - Physics - Special Topics in Classical Mechanics

Subject Co-ordinator - Prof. P.C. Deshmukh

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Course Overview
- Lecture 2 - Equations of Motion (i)
- Lecture 3 - Equations of Motion (ii)
- Lecture 4 - Equations of Motion (iii)
- Lecture 5 - Equations of Motion (iv)
- Lecture 6 - Equations of Motion (v)
- Lecture 7 - Oscillators, Resonances, Waves (i)
- Lecture 8 - Oscillators, Resonances, Waves (ii)
- Lecture 9 - Oscillators, Resonances, Waves (iii)
- Lecture 10 - Oscillators, Resonances, Waves (iv)
- Lecture 11 - Polar Coordinates (i)
- Lecture 12 - Polar Coordinates (ii)
- Lecture 13 - Dynamical Symmetry in the Kepler Problem (i)
- Lecture 14 - Dynamical Symmetry in the Kepler Problem (ii)
- Lecture 15 - Real Effects of Pseudo-Forces (i)
- Lecture 16 - Real Effects of Pseudo-Forces (ii)
- Lecture 17 - Real Effects of Pseudo-Forces (iii)
- Lecture 18 - Real Effects of Pseudo-Forces (iv)
- Lecture 19 - Special Theory of Relativity (i)
- Lecture 20 - Special Theory of Relativity (ii)
- Lecture 21 - Special Theory of Relativity (iii)
- Lecture 22 - Special Theory of Relativity (iv)
- Lecture 23 - Potentials Gradients Fields (i)
- Lecture 24 - Potentials Gradients Fields (ii)
- Lecture 25 - Potentials Gradients Fields (iii)
- Lecture 26 - Gauss Law Eq of continuity (i)
- Lecture 27 - Gauss Law Eq of continuity (ii)
- Lecture 28 - Gauss Law Eq of continuity (iii)
- Lecture 29 - Fluid Flow Bernoulli Principle (i)

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

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- Lecture 30 - Fluid Flow Bernoulli Principle (ii)
- Lecture 31 - Classical Electrodynamics (i)
- Lecture 32 - Classical Electrodynamics (ii)
- Lecture 33 - Classical Electrodynamics (iii)
- Lecture 34 - Classical Electrodynamics (iv)
- Lecture 35 - Chaotic Dynamical Systems (i)
- Lecture 36 - Chaotic Dynamical Systems (ii)
- Lecture 37 - Chaotic Dynamical Systems (iii)
- Lecture 38 - Chaotic Dynamical Systems (iv)
- Lecture 39 - Chaotic Dynamical Systems (v)
- Lecture 40 - The Scope and Limitations of Classical Mechanics

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

NPTEL Video Course - Physics - Special, Select Topics in the Theory of Atomic Collisions and Spectroscopy

Subject Co-ordinator - Prof. P.C. Deshmukh

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Introduction to the STiTACS course
- Lecture 2 - Quantum Theory of collisions
- Lecture 3 - Quantum Theory of collisions
- Lecture 4 - Quantum Theory of collisions
- Lecture 5 - Quantum Theory of collisions
- Lecture 6 - Quantum Theory of collisions
- Lecture 7 - Quantum Theory of collisions
- Lecture 8 - Quantum Theory of collisions
- Lecture 9 - Quantum Theory of collisions
- Lecture 10 - Quantum Theory of collisions
- Lecture 11 - Quantum Theory of collisions
- Lecture 12 - Quantum Theory of collisions
- Lecture 13 - Many body theory, electron correlations
- Lecture 14 - Second Quantization Creation, Destruction and Number operators
- Lecture 15 - Many-particle Hamiltonian & Schrodinger Equation in 2nd Quantization
- Lecture 16 - Many-electron problem in quantum mechanics
- Lecture 17 - Hartree-Fock Self-Consistent-Field
- Lecture 18 - Exchange, Statistical, Fermi-Dirac correlations
- Lecture 19 - Limitations of the Hartree-Fock Self-Consistent-Field formalism
- Lecture 20 - Many-Body formalism, II Quantization
- Lecture 21 - Density fluctuations in an electron gas
- Lecture 22 - Bohm-Pines approach to Random Phase Approximation
- Lecture 23 - Bohm-Pines approach to Random Phase Approximation (Continued...)
- Lecture 24 - Bohm-Pines approach to Random Phase Approximation (Continued...)
- Lecture 25 - Schrodinger, Heisenberg and Dirac's pictures of QM
- Lecture 26 - Dyson's chronological operator
- Lecture 27 - Gell-Mann-Low Theorem
- Lecture 28 - Reyleigh-Schrodinger perturbation methods and adiabatic switching
- Lecture 29 - Feynman Diagrams

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

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- Lecture 30 - I Order Feynman Diagrams
- Lecture 31 - II and higher order Feynman Diagrams
- Lecture 32 - Linear response of electron correlations
- Lecture 33 - Lippman Schwinger equation of potential scattering
- Lecture 34 - Born Approximation
- Lecture 35 - Coulomb scattering
- Lecture 36 - Scattering of partial waves
- Lecture 37 - Scattering at high energy
- Lecture 38 - Resonances in Quantum Collisions
- Lecture 39 - Breit-Wigner Resonances
- Lecture 40 - Fano parameterization of Breit-Wigner formula
- Lecture 41 - Discrete state embedded in the continuum
- Lecture 42 - Resonance life times
- Lecture 43 - Wigner-Eisenbud formalism of time-delay in scattering
- Lecture 44 - Photoionization and Photoelectron Angular Distributions
- Lecture 45 - Ionization and Excitation of Atoms by Fast Charged Particles
- Lecture 46 - Photo-absorption by Free and Confined Atoms and Ions

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

NPTEL Video Course - Physics - Selected Topics in Mathematical Physics

Subject Co-ordinator - Prof. V. Balakrishnan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Analytic functions of a complex variable - Part I
- Lecture 2 - Analytic functions of a complex variable - Part II
- Lecture 3 - Calculus of residues - Part I
- Lecture 4 - Calculus of residues - Part II
- Lecture 5 - Calculus of residues - Part III
- Lecture 6 - Calculus of residues - Part IV
- Lecture 7 - Linear response; dispersion relations - Part I
- Lecture 8 - Linear response; dispersion relations - Part II
- Lecture 9 - Analytic continuation and the gamma function - Part I
- Lecture 10 - Analytic continuation and the gamma function - Part II
- Lecture 11 - Möbius transformations - Part I
- Lecture 12 - Möbius transformations - Part II
- Lecture 13 - Möbius transformations - Part III
- Lecture 14 - Multivalued functions; integral representations - Part I
- Lecture 15 - Multivalued functions; integral representations - Part II
- Lecture 16 - Multivalued functions; integral representations - Part III
- Lecture 17 - Multivalued functions; integral representations - Part IV
- Lecture 18 - Laplace transforms - Part I
- Lecture 19 - Laplace transforms - Part II
- Lecture 20 - Fourier transforms - Part I
- Lecture 21 - Fourier transforms - Part II
- Lecture 22 - Fourier transforms - Part III
- Lecture 23 - Fundamental Green function for  $\hat{1}^2$  - Part I
- Lecture 24 - Fundamental Green function for  $\hat{1}^2$  - Part II
- Lecture 25 - The diffusion equation - Part I
- Lecture 26 - The diffusion equation - Part II
- Lecture 27 - The diffusion equation - Part III
- Lecture 28 - The diffusion equation - Part IV
- Lecture 29 - Green function for  $(\hat{1}^2 + k^2)$ ; nonrelativistic scattering - Part I

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

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- Lecture 30 - Green function for  $(\hat{I}^2 + k^2)$ ; nonrelativistic scattering - Part II
- Lecture 31 - Green function for  $(\hat{I}^2 + k^2)$ ; nonrelativistic scattering - Part III
- Lecture 32 - The wave equation - Part I
- Lecture 33 - The wave equation - Part II
- Lecture 34 - The rotation group and all that - Part I
- Lecture 35 - The rotation group and all that - Part II
- Lecture 36 - The rotation group and all that - Part III

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

NPTEL Video Course - Physics - Nuclear Reactors and Safety - An Introduction

Subject Co-ordinator - Dr.G.Vaidyanathan

Co-ordinating Institute - SRM University

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

- Lecture 1 - Energy Sources
- Lecture 2 - Nuclear Power Production Cycle
- Lecture 3 - Basic Physics of Nuclear Fission
- Lecture 4 - Basic Physics of Nuclear Fission (Continued...)
- Lecture 5 - Nuclear Reactors
- Lecture 6 - Reactors Generation
- Lecture 7 - Radiation Sources and Protection
- Lecture 8 - Biological Effects of Radiation
- Lecture 9 - Safety Principles
- Lecture 10 - Safety Principles (Continued...)
- Lecture 11 - Safety Approach
- Lecture 12 - Risk and Probabilistic safety analysis (PSA)
- Lecture 13 - History of Events in Nuclear Power Plants and Radiation facilities
- Lecture 14 - Other Events
- Lecture 15 - Validation and Dynamic Analysis
- Lecture 16 - Validation and Dynamic Analysis (Continued...)
- Lecture 17 - Quality Assurance
- Lecture 18 - Siting of Nuclear Plants
- Lecture 19 - Siting of Nuclear Plants (Continued...)
- Lecture 20 - Engineered Safety Systems
- Lecture 21 - Engineered Safety Systems (Continued...)
- Lecture 22 - Assessment of Radiological Consequences of Incidents
- Lecture 23 - Safety Regulation in India
- Lecture 24 - Safety Regulation in India (Continued...)
- Lecture 25 - Safety Regulation in India (Continued...)
- Lecture 26 - Safety Practices in Indian NPPs
- Lecture 27 - Safety Practices in Indian NPPs (Continued...)
- Lecture 28 - Safety Practices in Indian NPPs (Continued...)
- Lecture 29 - Passive Safety

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Lecture 30 - Passive Safety (Continued...)

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

NPTEL Video Course - Physics - Physical Applications of Stochastic Processes

Subject Co-ordinator - Prof. V. Balakrishnan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Discrete probability distributions - Part 1
- Lecture 2 - Discrete probability distributions - Part 2
- Lecture 3 - Continuous random variables
- Lecture 4 - Central Limit Theorem
- Lecture 5 - Stable distributions
- Lecture 6 - Stochastic processes
- Lecture 7 - Markov processes - Part 1
- Lecture 8 - Markov processes - Part 2
- Lecture 9 - Markov processes - Part 3
- Lecture 10 - Birth-and-death processes
- Lecture 11 - Continuous Markov processes
- Lecture 12 - Langevin dynamics - Part 1
- Lecture 13 - Langevin dynamics - Part 2
- Lecture 14 - Langevin dynamics - Part 3
- Lecture 15 - Langevin dynamics - Part 4
- Lecture 16 - Itô and Fokker-Planck equations for diffusion processes
- Lecture 17 - Level-crossing statistics of a continuous random process
- Lecture 18 - Diffusion of a charged particle in a magnetic field
- Lecture 19 - Power spectrum of noise
- Lecture 20 - Elements of linear response theory
- Lecture 21 - Random pulse sequences
- Lecture 22 - Dichotomous diffusion
- Lecture 23 - First passage time - Part 1
- Lecture 24 - First passage time - Part 2
- Lecture 25 - First passage and recurrence in Markov chains
- Lecture 26 - Recurrent and transient random walks
- Lecture 27 - Non-Markovian random walks
- Lecture 28 - Statistical aspects of deterministic dynamics - Part 1
- Lecture 29 - Statistical aspects of deterministic dynamics - Part 2

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

NPTEL Video Course - Physics - NOC:Mechanics, Heat Oscillations and Waves

Subject Co-ordinator - Prof. V. Balakrishnan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - The Nature of Physical Laws
- Lecture 2 - Fundamental Constants and Dimensional Analysis
- Lecture 3 - Dimensional analysis and scaling
- Lecture 4 - sketching Elementary Functions
- Lecture 5 - The fundamental forces of nature
- Lecture 6 - Scalars, Vectors and All That
- Lecture 7 - Plane Polar Coordinates
- Lecture 8 - Vectors In a Plane, Scalars and Pseudoscalars
- Lecture 9 - Kinematics In a Plane
- Lecture 10 - Vectors in 3-Dimensional Space
- Lecture 11 - Vectors in 3-Dimensional space (Continued...)
- Lecture 12 - The Finite Rotation Formula, Polar Coordinates in 3-dimensions
- Lecture 13 - Cylindrical and Spherical polar coordinates
- Lecture 14 - Motion in a circle - Acceleration
- Lecture 15 - Newtons laws of motion
- Lecture 16 - Conservation Laws and Newtons Equations
- Lecture 17 - Conservation of Angular Momentum
- Lecture 18 - Two-Body Scattering
- Lecture 19 - Two-Body Collision Kinematics
- Lecture 20 - Conservative Forces - The Concept of a Potential
- Lecture 21 - Central Potential and Central Force
- Lecture 22 - The 2-Body Central Force Problem
- Lecture 23 - Keplers Laws of Planetary Motion
- Lecture 24 - Non-Inertial Forces (Pseudo-forces)
- Lecture 25 - More on the Kepler problem; Satellite motion
- Lecture 26 - Linear Elasticity of Solids
- Lecture 27 - Simple Harmonic Motion
- Lecture 28 - Some Physical Examples of Simple Harmonic Motion
- Lecture 29 - More on Simple Harmonic Motion

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

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- Lecture 30 - Damped Simple Harmonic Motion
- Lecture 31 - Wave Motion - Travelling and Standing Waves
- Lecture 32 - Wave Motion - Wave Equation, General Solution
- Lecture 33 - Fluid Dynamics - Hydrostatic Equilibrium
- Lecture 34 - Fluid Dynamics - Equation of Continuity
- Lecture 35 - Fluid Flow - Bernoullis Principle
- Lecture 36 - Circulation and Vorticity
- Lecture 37 - What is Thermodynamics?
- Lecture 38 - The Classical Ideal Gas
- Lecture 39 - The Laws of Thermodynamics
- Lecture 40 - Specific Heat of an Ideal Gas
- Lecture 41 - Van der Waals Equation
- Lecture 42 - Phase Transitions
- Lecture 43 - Summary

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

NPTEL Video Course - Physics - Nonequilibrium Statistical Mechanics

Subject Co-ordinator - Prof. V. Balakrishnan

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Recapitulation of equilibrium statistical mechanics
- Lecture 2 - The Langevin model (Part 1)
- Lecture 3 - The Langevin model (Part 2)
- Lecture 4 - The Langevin model (Part 3)
- Lecture 5 - The Langevin model (Part 4)
- Lecture 6 - Linear response theory (Part 1)
- Lecture 7 - Linear response theory (Part 2)
- Lecture 8 - Linear response (Part 3)
- Lecture 9 - Linear response (Part 4)
- Lecture 10 - Linear response (Part 5)
- Lecture 11 - Linear response (Part 6)
- Lecture 12 - Linear response theory (Part 7)
- Lecture 13 - Quiz 1 - Questions and answers
- Lecture 14 - Linear response theory (Part 8)
- Lecture 15 - Linear response theory (Part 9)
- Lecture 16 - The dynamic mobility
- Lecture 17 - Fokker-Planck equations (Part 1)
- Lecture 18 - Fokker-Planck equations (Part 2)
- Lecture 19 - Fokker-Planck equations (Part 3)
- Lecture 20 - The generalized Langevin equation (Part 1)
- Lecture 21 - The generalized Langevin equation (Part 2)
- Lecture 22 - Diffusion in a magnetic field
- Lecture 23 - The Boltzmann equation for a dilute gas (Part 1)
- Lecture 24 - The Boltzmann equation for a dilute gas (Part 2)
- Lecture 25 - The Boltzmann equation for a dilute gas (Part 3)
- Lecture 26 - The Boltzmann equation for a dilute gas (Part 4)
- Lecture 27 - The Boltzmann equation for a dilute gas (Part 5)
- Lecture 28 - Quiz 2 - Questions and answers
- Lecture 29 - Critical phenomena (Part 1)

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

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- Lecture 30 - Critical phenomena (Part 2)
- Lecture 31 - Critical phenomena (Part 3)
- Lecture 32 - Critical phenomena (Part 4)
- Lecture 33 - Critical phenomena (Part 5)
- Lecture 34 - Critical phenomena (Part 6)
- Lecture 35 - Critical phenomena (Part 7)
- Lecture 36 - The Wiener process (standard Brownian motion)

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

NPTEL Video Course - Physics - NOC:Statistical Mechanics

Subject Co-ordinator - Prof. Ashwin Joy

Co-ordinating Institute - IIT - Madras

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

- Lecture 1 - Discrete Probability
- Lecture 2 - Continous Probability
- Lecture 3 - Characteristic Function
- Lecture 4 - Gausssian Distribution
- Lecture 5 - Binomial Distribution
- Lecture 6 - Poisson Distribution
- Lecture 7 - Central Limit Theorem
- Lecture 8 - Many Random Variables
- Lecture 9 - Entropy and Probability
- Lecture 10 - Entropy Maximization
- Lecture 11 - Transformation of Random Variables
- Lecture 12 - Tutorial
- Lecture 13 - Mathematical Preliminaries - 1
- Lecture 14 - Microcanonical Ensemble
- Lecture 15 - Two Level System (Microcanonical Ensemble)
- Lecture 16 - Classical Ideal Gas (Microcanonical Ensemble)
- Lecture 17 - Entropy of Mixing
- Lecture 18 - Canonical Ensemble
- Lecture 19 - Two Level System (Canonical Ensemble)
- Lecture 20 - Classical Ideal Gas (Canonical Ensemble)
- Lecture 21 - Gibbs Canonical Ensemble
- Lecture 22 - Classical Ideal Gas (Gibbs Canonical Ensemble)
- Lecture 23 - N Spins in a Uniform Magnetic Field
- Lecture 24 - Grand Canonical Ensemble
- Lecture 25 - Ideal Gas (Grand Canonical Ensemble)
- Lecture 26 - N Non - Interacting Spins in Constant Magnetic Field
- Lecture 27 - Qunatum Statistical Mechanics
- Lecture 28 - Statistics of Fermions and Bosons
- Lecture 29 - Quantum to Classical Correspondance

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

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- Lecture 30 - Vibrations of Solid (Low Temperature)
- Lecture 31 - Vibrations of Solid (Continuation)
- Lecture 32 - Free Electrons(Fermi Gas) in a Metal
- Lecture 33 - Free Electrons(Fermi Gas) in a Metal (Continuation)
- Lecture 34 - Problem solving demo - Part 1
- Lecture 35 - Problem solving demo - Part 2



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

NPTEL Video Course - Physics - NOC:Fiber Optics

Subject Co-ordinator - Prof. Vipul Rastogi

Co-ordinating Institute - IIT - Roorkee

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

- Lecture 1 - Introduction
- Lecture 2 - Need for Optical Communication
- Lecture 3 - Salient Features of Optical Fiber - I
- Lecture 4 - Salient Features of Optical Fiber - II
- Lecture 5 - Optical Fiber Fabrication
- Lecture 6 - Transmission Characteristics - I
- Lecture 7 - Transmission Characteristics - II
- Lecture 8 - Transmission Characteristics - III
- Lecture 9 - Propagation in Infinitely Extended Dielectric
- Lecture 10 - EM Waves in Dielectrics
- Lecture 11 - Electromagnetic Analysis of Waveguides - I
- Lecture 12 - Electromagnetic Analysis of Waveguides - II
- Lecture 13 - Electromagnetic Analysis of Waveguides - III
- Lecture 14 - Electromagnetic Analysis of Waveguides - IV
- Lecture 15 - Electromagnetic Analysis of Waveguides - V
- Lecture 16 - Electromagnetic Analysis of Waveguides - VI
- Lecture 17 - Electromagnetic Analysis of Waveguides - VII
- Lecture 18 - Electromagnetic Analysis of Waveguides - VIII
- Lecture 19 - Optical Fiber Waveguide - I
- Lecture 20 - Optical Fiber Waveguide - II
- Lecture 21 - Optical Fiber Waveguide - III
- Lecture 22 - Optical Fiber Waveguide - IV
- Lecture 23 - Optical Fiber Waveguide - V
- Lecture 24 - Splice Loss
- Lecture 25 - Waveguide Dispersion - I
- Lecture 26 - Waveguide Dispersion - II
- Lecture 27 - Recap
- Lecture 28 - Optical Fiber Components and Devices - I
- Lecture 29 - Optical Fiber Components and Devices - II

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

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- Lecture 30 - Optical Fiber Components and Devices - III
- Lecture 31 - Optical Fiber Components and Devices - IV
- Lecture 32 - Optical Fiber Components and Devices - V
- Lecture 33 - Optical Sources and Detectors - I
- Lecture 34 - Optical Sources and Detectors - II
- Lecture 35 - Optical Sources and Detectors - III
- Lecture 36 - Optical Sources and Detectors - IV
- Lecture 37 - Optical Sources and Detectors - V
- Lecture 38 - System Design Aspects
- Lecture 39 - Optical Fiber Measurements
- Lecture 40 - Summary and Recent Advances

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

NPTEL Video Course - Physics - Relativistic Quantum Mechanics

Subject Co-ordinator - Prof. Apoorva D Patel

Co-ordinating Institute - IISc - Bangalore

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

- Lecture 1 - Introduction, The Klein-Gordon equation
- Lecture 2 - Particles and antiparticles, Two component framework
- Lecture 3 - Coupling to electromagnetism, Solution of the Coulomb problem
- Lecture 4 - Bohr-Sommerfeld semiclassical solution of the Coulomb problem, The Dirac equation and the Clifford
- Lecture 5 - Dirac matrices, Covariant form of the Dirac equation, Equations of motion, Spin, Free particle so
- Lecture 6 - Electromagnetic interactions, Gyromagnetic ratio
- Lecture 7 - The Hydrogen atom problem, Symmetries, Parity, Separation of variables
- Lecture 8 - The Frobenius method solution, Energy levels and wavefunctions
- Lecture 9 - Non-relativistic reduction, The Foldy-Wouthuysen transformation
- Lecture 10 - Interpretation of relativistic corrections, Reflection from a potential barrier
- Lecture 11 - The Klein paradox, Pair creation process and examples
- Lecture 12 - Zitterbewegung, Hole theory and antiparticles
- Lecture 13 - Charge conjugation symmetry, Chirality, Projection operators, The Weyl equation
- Lecture 14 - Weyl and Majorana representations of the Dirac equation, Unitary and antiunitary symmetries
- Lecture 15 - Time reversal symmetry, The PCT invariance
- Lecture 16 - Arrow of time and particle-antiparticle asymmetry, Band theory for graphene
- Lecture 17 - Dirac equation structure of low energy graphene states, Relativistic signatures in graphene prop
- Lecture 18 - Groups and symmetries, The Lorentz and Poincare groups
- Lecture 19 - Group representations, generators and algebra, Translations, rotations and boosts
- Lecture 20 - The spinor representation of  $SL(2,C)$ , The spin-statistics theorem
- Lecture 21 - Finite dimensional representations of the Lorentz group, Euclidean and Galilean groups
- Lecture 22 - Classification of one particle states, The little group, Mass, spin and helicity
- Lecture 23 - Massive and massless one particle states
- Lecture 24 - P and T transformations, Lorentz covariance of spinors
- Lecture 25 - Lorentz group classification of Dirac operators, Orthogonality and completeness of Dirac spinors
- Lecture 26 - Propagator theory, Non-relativistic case and causality
- Lecture 27 - Relativistic case, Particle and antiparticle contributions, Feynman prescription and the propaga
- Lecture 28 - Interactions and formal perturbative theory, The S-matrix and Feynman diagrams
- Lecture 29 - Trace theorems for products of Dirac matrices

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

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- Lecture 30 - Photons and the gauge symmetry
- Lecture 31 - Abelian local gauge symmetry, The covariant derivative and invariants
- Lecture 32 - Charge quantisation, Photon propagator, Current conservation and polarisations
- Lecture 33 - Feynman rules for Quantum Electrodynamics, Nature of perturbative expansion
- Lecture 34 - Dyson's analysis of the perturbation series, Singularities of the S-matrix, Elementary QED processes
- Lecture 35 - The T-matrix, Coulomb scattering
- Lecture 36 - Mott cross-section, Compton scattering
- Lecture 37 - Klein-Nishina result for cross-section
- Lecture 38 - Photon polarisation sums, Pair production through annihilation
- Lecture 39 - Unpolarised and polarised cross-sections
- Lecture 40 - Helicity properties, Bound state formation
- Lecture 41 - Bound state decay, Non-relativistic potentials
- Lecture 42 - Lagrangian formulation of QED, Divergences in Green's functions, Superficially divergent 1-loop
- Lecture 43 - Infrared divergences due to massless particles, Renormalisation and finite physical results
- Lecture 44 - Symmetry constraints on Green's functions, Furry's theorem, Ward-Takahashi identity, Spontaneous
- Lecture 45 - Status of QED, Organisation of perturbative expansion, Precision tests

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

NPTEL Video Course - Physics - NOC:Control System Design

Subject Co-ordinator - Prof. G R Jayanth

Co-ordinating Institute - IISc - Bangalore

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

Lecture 1 - Introduction

Lecture 2 - Linear Systems

Lecture 3 - Homogeneous linear time invariant ordinary differential equations

Lecture 4 - In-homogeneous linear time invariant ordinary differential equations

Lecture 5 - Fourier transforms - Part 1

Lecture 6 - Fourier transforms - Part 2

Lecture 7 - Laplace transforms - Part 1

Lecture 8 - Laplace transforms - Part 2

Lecture 9 - Introduction to feedback control - Part 1

Lecture 10 - Introduction to feedback control - Part 2

Lecture 11 - Nyquist stability theory - Part 1

Lecture 12 - Nyquist stability theory - Part 2

Lecture 13 - Nyquist stability theory - Part 3

Lecture 14 - Bode plots

Lecture 15 - Steps for performing control design - Part 1

Lecture 16 - Steps for performing control design - Part 2

Lecture 17 - General controllers - Part 1

Lecture 18 - General controllers - Part 2

Lecture 19 - General controllers - Part 3

Lecture 20 - Bode plot-based control design - Part 1

Lecture 21 - Bode plot-based control design - Part 2

Lecture 22 - Introduction to root-locus

Lecture 23 - Control system design using root-locus

Lecture 24 - Control of systems with some known parameters - Part 1

Lecture 25 - Control of systems with some known parameters - Part 2

Lecture 26 - Limitations of 1-degree of freedom control

Lecture 27 - Introduction to 2-degree of freedom control

Lecture 28 - 2-Degree of freedom robust control design for plants with gain uncertainty - Part 1

Lecture 29 - 2-Degree of freedom robust control design for plants with uncertain gain - Part 2

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

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- Lecture 30 - 2-Degree of freedom robust control design for plants with uncertain pole
- Lecture 31 - 2-Degree of freedom robust control design for plants with multiple uncertainties in their structure
- Lecture 32 - Issues connected with 2-Degree of freedom control design using root-locus
- Lecture 33 - Introduction to Nichols plot
- Lecture 34 - Feedback control design using Nichols plot
- Lecture 35 - Robust control design using Quantitative feedback theory - Part 1
- Lecture 36 - Robust control design using Quantitative feedback theory - Part 2
- Lecture 37 - Tutorial on QFT Toolbox software - Part 1
- Lecture 38 - Tutorial on QFT Toolbox software - Part 2
- Lecture 39 - Tutorial on QFT Toolbox software - Part 3
- Lecture 40 - Fundamental properties of the loop gain - Part 1
- Lecture 41 - Fundamental properties of the loop gain - Part 2
- Lecture 42 - Ideal Bode Characteristic - Part 1
- Lecture 43 - Ideal Bode Characteristic - Part 2
- Lecture 44 - Introduction to nonminimum phase systems
- Lecture 45 - Fundamental properties of nonminimum phase systems - Part 1
- Lecture 46 - Fundamental properties of nonminimum phase systems - Part 2
- Lecture 47 - Fundamental properties of unstable systems
- Lecture 48 - Consequences of actuator bandwidth limitations while controlling unstable systems
- Lecture 49 - Describing functions - Part 1
- Lecture 50 - Describing functions - Part 2