

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 - 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 - 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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- 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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- 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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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

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 \hat{A} 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 \hat{A} I

Lecture 17 - Solved examples; equilibrium of bodies \hat{A} 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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- 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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- 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 frequency
- 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 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 - 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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- 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 - 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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- 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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- 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 Antiferroelectrics
- Lecture 27 - Optical Properties of Metals; Ionic Polarization in Alkali Halides; Piezoelectricity
- Lecture 28 - Dielectric Solids - Worked Examples
- Lecture 29 - Diamagnetism and Paramagnetism

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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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- 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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- 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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- 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 - Quantum Theory of collisions
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 - Many body theory, electron correlations
Lecture 13 - Second Quantization Creation, Destruction and Number operators
Lecture 14 - Many-particle Hamiltonian & Schrodinger Equation in 2nd Quantization
Lecture 15 - Many-electron problem in quantum mechanics
Lecture 16 - Hartree-Fock Self-Consistent-Field
Lecture 17 - Exchange, Statistical, Fermi-Dirac correlations
Lecture 18 - Limitations of the Hartree-Fock Self-Consistent-Field formalism
Lecture 19 - Many-Body formalism, II Quantization
Lecture 20 - Density fluctuations in an electron gas
Lecture 21 - Bohm-Pines approach to Random Phase Approximation
Lecture 22 - Bohm-Pines approach to Random Phase Approximation
Lecture 23 - Bohm-Pines approach to Random Phase Approximation
Lecture 24 - (Lecture Missing)
Lecture 25 - Schrodinger, Heisenberg and Dirac \"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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- Lecture 30 - I Order Feynman Diagrams
- Lecture 31 - Some more I Order Feynman Diagrams
- Lecture 32 - II and higher order Feynman Diagrams

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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

- 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...)

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

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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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- 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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- 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 - 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

- 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