NPTEL : Electromagnetic Theory (Prof. D.K. Ghosh) (Physics)

Co-ordinators : Prof. D.K. Ghosh

NPTEL : Special Theory of Relativity (Physics)

Co-ordinators : Prof. Shiva Prasad

NPTEL : NOC:Quantum Information and Computing (Physics)

Co-ordinators : Prof.Dipan Ghosh

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 - Ven 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 : NOC:Theory of Groups for Physics Applications (Physics)

Co-ordinators : Prof. Urjit A. Yajnik

NPTEL : NOC:Quantum Mechanics-I (Physics)

Co-ordinators : Prof. Ramadevi

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 Coe cients - I

Lecture 64 - Clebsch-Gordan Coe cients - II

NPTEL : NOC:Path Integral and Functional Methods in Quantum Field Theory (Physics)

Co-ordinators : Prof. Urjit A. Yajnik

Lecture 32 - Topological Vacuum of Yang Mills Theories - II

NPTEL : NOC:Physics of Biological Systems (Physics)

Co-ordinators : Prof. Mithun Mitra

NPTEL : NOC:Group Theory Methods in Physics (Physics)

Co-ordinators : Prof. Ramadevi

NPTEL : NOC:Neutron Scattering for Condensed Matter Studies (Physics)

Co-ordinators : Prof. Saibal Basu

Lecture 32 - Magnetic interaction in solids and magnetic neutron diffarction

Lecture 33 - Magnetic interaction in solids and magnetic neutron diffarction

Lecture 34 - Magnetic neutron diffraction

Lecture 35 - Magnetic neutron diffraction

Lecture 36 - Neutron diffraction from liquid and amorphous systems

Lecture 37 - Neutron diffraction from liquid and amorphous systems

Lecture 38 - Small Angle Neutron Scattering (SANS) for mesoscopic structure

Lecture 39 - Small Angle Neutron Scattering (SANS) for mesoscopic structure

Lecture 40 - Small Angle Neutron Scattering (SANS) for mesoscopic structure

Lecture 41 - Small Angle Neutron Scattering (SANS) for mesoscopic structure

Lecture 42 - SANS for soft condensed matter

Lecture 43 - SANS for soft condensed matter

Lecture 44 - SANS for polymers, biological systems, nanoparticle aggregates, rocks, Superconducting vortex lattice

Lecture 45 - SANS for polymers, biological systems, nanoparticle aggregates, rocks, Superconducting vortex lattice

Lecture 46 - Neutron reflectometry for thin films

Lecture 47 - Neutron reflectometry for thin films

Lecture 48 - Neutron reflectometry for thin films

Lecture 49 - Details formalism to evaluate specular neutron reflectivity and comparison with x-ray reflectometry

Lecture 50 - Details formalism to evaluate specular neutron reflectivity and comparison with x-ray reflectometry

Lecture 51 - Neutron reflectometry data analysis and reflectometers at various sources

Lecture 52 - Neutron reflectometry data analysis and reflectometers at various sources

Lecture 53 - Neutron reflectometry data analysis and reflectometers at various sources

Lecture 54 - Examples of PNR with and without spin analysis and introduction to off-specular reflectometry

Lecture 55 - Examples of PNR with and without spin analysis and introduction to off-specular reflectometry

Lecture 56 - Examples of PNR with and without spin analysis and introduction to off-specular reflectometry

Lecture 57 - Off-specular neutron reflectometry and introduction to inelastic neutron scattering

Lecture 58 - Off-specular neutron reflectometry and introduction to inelastic neutron scattering

Lecture 59 - Off-specular neutron reflectometry and introduction to inelastic neutron scattering

Lecture 60 - Phonon measurements with neutrons

Lecture 61 - Phonon measurements with neutrons

Lecture 62 - Phonon measurements; single crystals

Lecture 63

Lecture 64 - Phonon: Density of States measurements

NPTEL : NOC:Accelerator Physics (Physics)

Co-ordinators : Prof. Rajni Pande, Prof. Amalendu Sharma, Prof. Pitamber Singh

Lecture 32 - Transverse Dynamics - 1

Lecture 33 - Transverse Dynamics - 1

Lecture 34 - Transverse Dynamics - 2

Lecture 35 - Transverse Dynamics - 2

Lecture 36 - Transverse Dynamics - 3

Lecture 37 - Transverse Dynamics - 3

Lecture 38 - Longitudinal Dynamics - 1

Lecture 39 - Longitudinal Dynamics - 1

Lecture 40 - Longitudinal Dynamics - 2

Lecture 41 - Longitudinal Dynamics - 2

Lecture 42 - Radio Frequency Quadrupole

Lecture 43 - Radio Frequency Quadrupole

Lecture 44 - Cyclic accelerators: Some basic principles

Lecture 45 - Cyclic accelerators: Some basic principles

Lecture 46 - About the cyclotron

Lecture 47 - About the cyclotron

Lecture 48 - Microtron

Lecture 49 - Equation of motion, Focusing

Lecture 50 - Equation of motion, Focusing

Lecture 51 - Strong focusing, Edge focusing, AG principle

Lecture 52 - Strong focusing, Edge focusing, AG principle

Lecture 53 - Matrix methods

Lecture 54 - Matrix methods

Lecture 55 - Hill's equation and parameterization - 1

Lecture 56 - Hill's equation and parameterization - 1

Lecture 57 - Hill's equation and parameterization - 2

Lecture 58 - Hill's equation and parameterization - 2

Lecture 59 - Hill's equation and parameterization - 3

Lecture 60 - Hill's equation and parameterization - 3

Lecture 61

Lecture 62

Lecture 63

Lecture 64

NPTEL : Electronics (Physics)

Co-ordinators : Prof. D.C. Dube

NPTEL : Plasma Physics: Fundamentals and Applications (Physics)

Co-ordinators : Prof. Vijayshri, Prof. V.K. Tripathi

Lecture 32 - Electrostatic waves in magnetized plasma

Lecture 33 - Ion acoustic, ion cyclotron and magneto sonic waves in magnetized plasma

Lecture 34 - VIasov 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 : Quantum Electronics (Physics)

Co-ordinators : Prof. K. Thyagarajan

NPTEL : Quantum Mechanics and Applications (Physics)

Co-ordinators : Prof. Ajoy Ghatak

Lecture 1 - Basic Quantum Mechanics I: Wave Particle Duality

Lecture 2 - Basic Quantum Mechanics II: The Schrodinger Equation and The Dirac Delta Function

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: The Hydrogen atom, The Deutron and The Diatomic Molecule

Lecture 22 - Two Body Problem: The Diatomic molecule (Continued...) and the 3 Dimensional Oscillator

Lecture 23 - 3d Oscillator & Dirac's Bra and Ket Algebra

Lecture 24 - Diracâ€™s Bra and Ket Algebra

Lecture 25 - Diracâ€™s Bra and Ket Algebra : The Linear Harmonic Oscillator

Lecture 26 - The Linear Harmonic Oscillator using Bra and Ket Algebra (Continued...)

Lecture 27 - The Linear Harmonic Oscillator: Coherent State and Relationship with the Classical Oscillator

Lecture 28 - Coherent State and Relationship with the Classical Oscillator

Lecture 29 - Angular Momentum Problem using Operator Algebra

Lecture 30 - Angular Momentum Problem (Continued...)

Lecture 31 - Pauli Spin Matrices and The Stern Gerlach Experiment

NPTEL : Semiconductor Optoelectronics (Physics)

Co-ordinators : Prof. M.R. Shenoy

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 od Photons with Electrons and Holes in a Semiconductor

Lecture 18 - Optical Joint Density of States

Lecture 19 - Rates of Emission and Absorption

Lecture 20 - Amplication 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 Chracteristics

Lecture 30 - Light Emitting Diode-III Output Characteristics

Lecture 31 - Light Emitting Diode-IV Modulation Bandwidth

NPTEL : NOC:Semiconductor Optoelectronics (Physics)

Co-ordinators : Prof. M. R. Shenoy

NPTEL : NOC:Introduction to LASER (Physics)

Co-ordinators : Unknown

NPTEL : NOC:Nuclear and Particle Physics (Physics)

Co-ordinators : Dr. P. Poulose

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

Lecture 30 - Interaction between charged scalars

Lecture 31 - Dirac Equation - 1

NPTEL : NOC:Advanced Condensed Matter Physics (Physics)

Co-ordinators : Dr. Saurabh Basu

NPTEL : NOC:Advanced Quantum Mechanics with Applications (Physics)

Co-ordinators : Dr. Saurabh Basu

NPTEL : NOC:A Brief Course on Superconductivity (Physics)

Co-ordinators : Dr. Saurabh Basu

NPTEL : NOC:Introduction to Statistical Mechanics (Physics)

Co-ordinators : Prof.Girish S. Setlur

Lecture 32 - Current algebra

NPTEL : NOC:Numerical Methods and Simulation Techniques for Scientists and Engineers (Physics)

Co-ordinators : Dr. Saurabh Basu

NPTEL : NOC:Theoretical Mechanics (Physics)

Co-ordinators : Dr. Charudatt Y. Kadolkar

NPTEL : NOC:Solar Energy Engineering and Technology (Physics)

Co-ordinators : Prof. Pankaj Kalita

NPTEL : NOC:Quantum Technology and Quantum Phenomena in Macroscopic Systems (Physics)

Co-ordinators : Prof. Amarendra Kumar Sarma

NPTEL : NOC:Dynamics of Classical and Quantum Fields (Physics)

Co-ordinators : Prof. Girish S. Setlur

Lecture 1 - Introduction

Lecture 2 - Lagrangian Formalism

Lecture 3 - Hamiltonian Mechanics

Lecture 4 - Flows and Symmetries

Lecture 5 - Examples of Continuum Systems

Lecture 6 - Symmetries and Noether's Theorem

Lecture 7 - Dynamical Symmetries

Lecture 8 - Symmetries in Field Theories

Lecture 9 - The Relativistic Electromagnetic Field

Lecture 10 - Stress-Energy (Energy-Momentum) Tensor

Lecture 11 - Green's Theorem and Green's Functions

Lecture 12 - Diffraction Theory

Lecture 13 - Introduction to Elasticity Theory

Lecture 14 - Solution of the rubber band problem

Lecture 15 - The Stress Function Method

Lecture 16 - Strain Energy

Lecture 17 - The Euler Equation

Lecture 18 - Bernoulli's Principle

Lecture 19 - Matter, Momentum and Energy Transport

Lecture 20 - Stokes' Drag - I

Lecture 21 - Stokes' Drag - II

Lecture 22 - Towards Quantum Fields

Lecture 23 - Right and Left Movers

Lecture 24 - Functional Integration - I

Lecture 25 - Functional Integration - II

Lecture 26 - Perturbation theory

Lecture 27 - Quantum Mechanics using Lagrangians

Lecture 28 - Path Integrals - Formalism

Lecture 29 - Path Integrals - Free particles

Lecture 30 - Path Integrals - Harmonic oscillator

Lecture 31 - Creation and annihilation operators - Excitations

NPTEL : NOC:Quantum Hall Effects (Physics)

Co-ordinators : Prof. Saurabh Basu

NPTEL : NOC:Quantum Entanglement: Fundamentals, Measures and Applications (Physics)

Co-ordinators : Prof. Amarendra Kumar Sarma

Lecture 1 - Introduction

Lecture 2 - Review of Quantum Mechanics

Lecture 3 - Mathematical Tools: Density Matrix - Part 1

Lecture 4 - Mathematical Tools: Density Matrix - Part 2

Lecture 5 - Problem solving session - 1

Lecture 6 - Basic Technical Introduction to Quantum Entanglement

Lecture 7 - Schmidt Decomposition Method

Lecture 8 - The EPR Paradox and Bell Inequalities

Lecture 9 - Problem solving session - 2

Lecture 10 - Quantum Measurements

Lecture 11 - Properties of Quantum Entanglement

Lecture 12 - Quantum Entanglement Measures - I

Lecture 13 - Problem solving session - 3

Lecture 14 - Quantum Entanglement Measures - II

Lecture 15 - Applications of Quantum Entanglement - I

Lecture 16 - Applications of Quantum Entanglement - II

Lecture 17 - Problem solving session - 4

NPTEL : NOC:Topology and Condensed Matter Physics (Physics)

Co-ordinators : Prof. Saurabh Basu

Lecture 1 - Introduction to Topology

Lecture 2 - Topological invariant, Berry phase

Lecture 3 - Second quantization

Lecture 4 - Ten Fold Classification

Lecture 5 - Symmetries and SSH - model

Lecture 6 - SSH - model, Introduction to superconductivity

Lecture 7 - Kitaev model

Lecture 8 - Introduction to Classical and Quantum Hall effect

Lecture 9 - Quantum Hall Effect

Lecture 10 - Landau Levels

Lecture 11 - Properties of Landau Levels

Lecture 12 - Edge modes of Landau levels, Incompressibility of Quantum Hall States

Lecture 13 - Kubo formula

Lecture 14 - Hall quantization and Topological invariant

Lecture 15 - Electronic structure of Graphene

Lecture 16 - Symmetries and QHE in Graphene

Lecture 17 - Haldane model

Lecture 18 - Anomalous quantum Hall effect in Haldane model

Lecture 19 - Introduction of spin Hall effect

Lecture 20 - Spin current, quantum spin Hall effect

Lecture 21 - Quantum spin Hall insulator, Kane Mele model

Lecture 22 - Kane Mele model with Rashba spin-orbit coupling, spin Hall conductivity

Lecture 23 - Symmetric gauge in FQHE

Lecture 24 - Laughlin States

Lecture 25 - Plasma analogy

Lecture 26 - Composite Fermions, Hierarchy picture

Lecture 27 - Topological Consideration of FQHE

Lecture 28 - 3D Topological Insulators

NPTEL : NOC:Statistical Physics of Non-Interacting and Interacting Systems (Physics)

Co-ordinators : Prof. Saurabh Basu

NPTEL : Nuclear Physics: Fundamentals and Applications (Physics)

Co-ordinators : Prof. H.C. Verma

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

Lecture 30 - Nuclear Reactions

Lecture 31 - Nuclear reaction (Continued...)

NPTEL : NOC:Introduction to Electromagnetism (Physics)

Co-ordinators : Prof. Manoj K Harbola

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

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 : NOC:Engineering Mechanics (Physics)

Co-ordinators : Prof. Manoj K Harbola

Lecture 32 - Properties of plane surfaces III - Centroid of a distributed force and its relation with centre of gravity

Lecture 33 - Properties of plane surfaces IV - solved examples of calculation of first moment and centroid of distributed forces

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 an area

Lecture 36 - Properties of plane surfaces VII - transformation of second moment and product of an area under rotation of coordinate axes

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 terms of virtual work

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: solved examples

Lecture 43 - Description of motion in cylindrical and spherical coordinate systems

Lecture 44 - Using planar polar, cylindrical and spherical coordinate systems: solved examples

Lecture 45 - Motion with constraints, constraint forces and free body diagram

Lecture 46 - Motion with constraints Â– solved examples

Lecture 47 - Motion with dry friction Â– solved examples

Lecture 48 - Motion with drag Â– solved examples

Lecture 49 - Equation of motion in terms of linear momentum and the principle of conservation of linear momentum

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 Â– 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 energy and the principle of conservation of energy

Lecture 56 - Work and energy III - Two solved examples using conservation principles

Lecture 57 - Work and energy IV Â– Further discussion on potential energy

Lecture 58 - Work and energy V - Solved examples

Lecture 59 - Work and energy VI Â– 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 a rigid body

Lecture 62 - Rigid body motion II - Equation of motion for a single particle in terms of angular momentum and torque; motion of a conical pendulum

Lecture 63 - Rigid body motion III - Conservation of angular momentum; angular momentum for a collection of particles

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 momentum about fixed axis

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 axis rotation and some solved examples

Lecture 68 - Rigid body motion VIII (fixed axis rotation) - solved examples for calculating moment of inertia and conservation of angular momentum

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 by an infinitesimal angle

Lecture 74 - Rigid-body dynamics XIV - Angular velocity and the rate of change of a rotating vector; relating change in angular velocity to an applied torque

Lecture 75 - Rigid-body dynamics XV - Relationship between angular momentum and angular velocity Â– the moment of inertia tensor and the principal axes

Lecture 76 - Rigid-body dynamics XVI - Solved examples

Lecture 77 - Rigid body motion XVII Â– A review of the relation between angular momentum and angular velocity, moment of inertia tensor and the principal axes Edit Lesson

Lecture 78 - Rigid body motion XVIII- Solved examples for calculating rate of change of angular momentum and torque when angular velocity and angular momentum are not parallel

Lecture 79 - Rigid body dynamics XIX - understanding demonstrations shown earlier using equation of motion

Lecture 80 - Rigid body dynamics XX - understanding demonstrations shown earlier using equation of motion (Euler 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 force

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 an 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 oscillatory 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 : NOC:Computational Science and Engineering Using Python (Physics)

Co-ordinators : Prof. Mahendra Verma

NPTEL : NOC:Introductory Quantum Mechanics (Physics)

Co-ordinators : Prof. Manoj K Harbola

NPTEL : NOC:Introduction to Solid State Physics (Physics)

Co-ordinators : Prof. Satyajit Banerjee

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

Lecture 30 - Bravais Lattice Types - Part 2

Lecture 31 - Introduction to different crystal types - Part 1

NPTEL : NOC:Physics of Turbulence (Physics)

Co-ordinators : Prof. Mahendra Verma

Lecture 32 - Kolmogorov's four-fifth law: Derivation (Final steps)

Lecture 33 - Enstrophy Spectrum and Flux

Lecture 34 - Two-dimensional Turbulence

Lecture 35 - Helical turbulence

Lecture 36 - Flow with a scalar

Lecture 37 - Passive scalar turbulence

Lecture 38 - Stably stratified turbulence

Lecture 39 - Turbulent thermal convection

Lecture 40 - Flow with a vector

Lecture 41 - MHD Turbulence: Formalism

Lecture 42 - MHD Turbulence: Energy Transfers

Lecture 43 - MHD Turbulence: Turbulence Models

Lecture 44 - MHD Turbulence: Dynamo

NPTEL : NOC:Introduction to Astrophysical Fluids (Physics)

Co-ordinators : Prof. Supratik Banerjee

Lecture 1 - General introduction

Lecture 2 - Phase space and Liouville's theorem

Lecture 3 - Collisionless Boltzmann equation

Lecture 4 - Boltzmann equation for collisional system - I

Lecture 5 - Boltzmann equation for collisional system - II

Lecture 6 - Equilibrium distribution function - I

Lecture 7 - Equilibrium distribution function - II

Lecture 8 - Derivation of moment equations - I

Lecture 9 - Derivation of moment equations - II

Lecture 10 - Application of moment equations in collisionless systems

Lecture 11 - Derivation of ideal fluid equations

Lecture 12 - Macroscopic forces on an ideal fluid

Lecture 13 - Properties of ideal fluid

Lecture 14 - Kevin's vorticity theorem

Lecture 15 - Conservative form and invariants in ideal fluids

Lecture 16 - Steady flow, streamlines and stream function

Lecture 17 - Departure from Maxwellian distribution

Lecture 18 - Derivation of real fluid equations

Lecture 19 - Hydrostatics: Model of solar corona

Lecture 20 - Stellar/solar wind

Lecture 21 - Accretion disks - I

Lecture 22 - A small digression: Newtonian fluids

Lecture 23 - Accretion disk - II

Lecture 24 - Weak perturbation in a compressible fluid: sound wave

Lecture 25 - Effect of nonlinearity: shocks

Lecture 26 - Supernova explosion and spherical blast waves - I

Lecture 27 - Supernova explosion and spherical blast waves - II

Lecture 28 - de Laval nozzle and extragalactic jets

Lecture 29 - Convective instability and Swarzschild stability criterian

Lecture 30 - Rayleigh Benard convection - I

Lecture 31 - Rayleigh Benard convection - II

NPTEL : NOC:Introduction to Electromagnetic Theory (Hindi) (Physics)

Co-ordinators : Prof. Manoj Harbola

Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

Lecture 41

Lecture 42

Lecture 43

Lecture 44

Lecture 45

Lecture 46

Lecture 47

Lecture 48

Lecture 49

Lecture 50

Lecture 51

Lecture 52

Lecture 53

NPTEL : NOC:Scientific Computing Using Python (Physics)

Co-ordinators : Prof. Mahendra K. Verma

Lecture 32

Lecture 33

Lecture 34

Lecture 35

Lecture 36

Lecture 37

Lecture 38

Lecture 39

Lecture 40

Lecture 41

Lecture 42

Lecture 43

Lecture 44

Lecture 45

Lecture 46

Lecture 47

Lecture 48

Lecture 49

Lecture 50

Lecture 51

Lecture 52

Lecture 53

Lecture 54

Lecture 55

Lecture 56

Lecture 57

Lecture 58

Lecture 59

Lecture 60

Lecture 61

Lecture 62

Lecture 63

Lecture 64

NPTEL : NOC:Tapestry of Field theory: Classical and Quantum, Equilibrium and Nonequilibrium Perspectives (Physics)

Co-ordinators : Prof. Mahendra K. Verma

NPTEL : NOC:Coherence and Quantum Entanglement (Physics)

Co-ordinators : Prof. Anand Kumar Jha

NPTEL : NOC:Classical Motion of a Single Particle (Physics)

Co-ordinators : Prof. Supratik Banerjee

Lecture 1 - Introduction and Newton's laws of motion

Lecture 2 - From dynamics to Kinematics

Lecture 3 - Equations of dynamics and constants of motion

Lecture 4 - Constants of motion (Continued...), Wrok-energy theorem and conservative forces

Lecture 5 - Dynamics under constants and central forces

Lecture 6 - Derivation of gradient form from zero curl condition

Lecture 7 - Concept of equilibrium

Lecture 8 - Terminal velocity, stable and unstable equilibria

Lecture 9 - Stable and unstable equilibria in more than one dimensions

Lecture 10 - Motion in one-dimensional potential

Lecture 11 - Solving equations of motion in one dimension

Lecture 12 - Calculation of Work Done in a Force Field

Lecture 13 - Central forces, Velocity and Acceleration in Plane Polar Coordinates

Lecture 14 - Dynamics and Trajectories Under a Central Force

Lecture 15 - Equation For Trajectories Under a Central Force (Continued...) : Binet Equation

Lecture 16 - Trajectory of a Particle Under Attractive Inverse-Square Force Law

Lecture 17 - Energy Diagram in an Effective One-Dimensional Motion

Lecture 18 - Two Interesting Problems On the motion Under Central Forces

Lecture 19 - Motion Under an Attractive Inverse-Square Force

Lecture 20 - Motion Under an Attractive Inverse-Square Force (Continued...)

Lecture 21 - Trajectories Under Attractive Inverse-Square Force, Laws of Kepler

Lecture 22 - Laplace Runge-Lenz Vector

Lecture 23 - Simple harmonic oscillators

Lecture 24 - Two examples of simple harmonic oscillation

Lecture 25 - Forced harmonic oscillator

Lecture 26 - Forced harmonic oscillator at resonance

Lecture 27 - Damped harmonic oscillator

Lecture 28 - Nature of motion under a harmonic potential

Lecture 29 - Comparison among three types of damped oscillation

Lecture 30 - Forced harmonic oscillator with damping

Lecture 31 - A problem on damped harmonic oscillator

Lecture 32 - Beats

Lecture 33 - Motion of a particle in electric and magnetic fields

Lecture 34 - E X B drift

Lecture 35 - Inertial frames of reference, Galilean transformation

Lecture 36 - Non-inertial frames of reference, pseudo forces

Lecture 37 - Motion of a particle in a rotating frame of reference

Lecture 38 - Motion of a particle relative to an observer on earth

Lecture 39 - Motion of a particle under various constraints

Lecture 40 - Principle of Virtual work, D'Alembert's principle

Lecture 41 - Lagrange's equation of first kind

Lecture 42 - Solving problems using Lagrange's equation of first kind

Lecture 43 - Generalized Coordinates and Generalized Velocities

Lecture 44 - Knetic Energy and Acceleration in Terms of Generalized Coordinates

Lecture 45 - Generalized Momentum and Generalized Force; Derivation of Euler-Lagrange Equation

Lecture 46 - Euler Lagrange Equation, Cyclic Coordinates and Other Properties

Lecture 47 - Properties of Euler-Lagrange equations (Continued...)

Lecture 48 - Lagrangian of various oscillating systems

Lecture 49 - Problem solving using Euler-Lagrange equations

Lecture 50 - Concept of Phase Space

Lecture 51 - Phase space trajectories and fixed points

Lecture 52 - Stability of fixed points

Lecture 53 - Different types of fixed points

Lecture 54 - Fixed points and their stability for mechanical systems

Lecture 55 - Linear two-dimensional phase space dynamics

Lecture 56 - Linear two-dimensional phase space dynamics (Continued...)

Lecture 57 - Concept of limit cycles

Lecture 58 - Lorenz equations and introduction to chaos

NPTEL : Astrophysics and Cosmology (Physics)

Co-ordinators : Prof. S. Bharadwaj

NPTEL : NOC:Mathematics Methods in Physics - I (Physics)

Co-ordinators : Prof. Samudra Roy

NPTEL : NOC:Classical Mechanics - from Newtonian to Lagrangian Formulation (Physics)

Co-ordinators : Prof. Debamalya Banerjee

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

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 : NOC:Solid State Physics (Physics)

Co-ordinators : Prof. Amal Kumar Das

NPTEL : NOC:Atomic and Molecular Physics (Physics)

Co-ordinators : Prof. Amal Kumar Das

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 (Continued...)

Lecture 3 - Experimental observations and theoretical development in discovery of constituents of an atom (Continued...)

Lecture 4 - Experimental observations and theoretical development in discovery of constituents of an atom (Continued...:

Lecture 5 - Experimental observations and theoretical development in discovery of constituents of an atom (Continued...)

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

Lecture 30 - Quantum mechanical treatment of H-like atom (Continued...)

Lecture 31 - Quantum mechanical treatment of Hydrogen like atom

NPTEL : NOC:Modern Optics (Physics)

Co-ordinators : Prof. Partha Roy Choudhuri

NPTEL : NOC:Introduction to Non-linear Optics and its Applications (Physics)

Co-ordinators : Prof. Samudra Roy

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 : NOC:Upstream LNG Technology (Physics)

Co-ordinators : Prof. Pavitra Sandilya

NPTEL : NOC:Experimental Physics-I (Physics)

Co-ordinators : Prof. Amal Kumar Das

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 determine the linear mass density of the string.

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 chromelÃ¢â‚¬â€œalumel) thermocouple and hence determination of Seebeck coefficient

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 : NOC:Experimental Physics-II (Physics)

Co-ordinators : Prof. Amal Kumar Das

NPTEL : NOC:Experimental Physics-III (Physics)

Co-ordinators : Prof. Amal Kumar Das

NPTEL : NOC:Electronic Theory of Solids (Physics)

Co-ordinators : Prof. Arghya Taraphder

NPTEL : NOC:Physics of Linear and Nonlinear Optical Waveguides (Physics)

Co-ordinators : Prof. Samudra Roy

NPTEL : NOC:Physics of Renewable Energy Systems (Physics)

Co-ordinators : Prof. Amreesh Chandra

NPTEL : NOC:Thermal Physics (Physics)

Co-ordinators : Prof. Debamalya Banerjee

Lecture 1 - Foundation of kinetic theory of gasses

Lecture 2 - Maxwell's law for speed distribution of gas molecules

Lecture 3 - Average speeds in an ideal gas assembly

Lecture 4 - Principle of equipartition of energy

Lecture 5 - Maxwell's law for energy distribution of gas molecules

Lecture 6 - The mean free path of a gas assembly

Lecture 7 - Expression for mean free path

Lecture 8 - Experimental determination of mean free path

Lecture 9 - Pressure an molecular flux from mean free path

Lecture 10 - Problems on mean free path

Lecture 11 - Transport in fluids: introduction

Lecture 12 - Viscosity: transport of momentum

Lecture 13 - Thermal conductivity: trasnport of thermal energy

Lecture 14 - Diffusion coefficient: transport of mass

Lecture 15 - Molecular effusion: theory and applications

Lecture 16 - Brownian motion: concept, features, theory of fluctuation

Lecture 17 - Brownian motion: mean square displacement and vertical distribution of particles

Lecture 18 - Perrin's experiment on Brownian motion - Part 1

Lecture 19 - Perrin's experiment on Brownian motion - Part 2

Lecture 20 - Problems on Brownian motion, Rotational brownian motion

Lecture 21 - Specific heat of solids: Dulong-Petit law and Einstein theory

Lecture 22 - Limitaion of Einstein theory of specific heat

Lecture 23 - Debye theory of specific heat

Lecture 24 - Behavior of real gasses

Lecture 25 - Van der Waals equation of state

Lecture 26 - Critical parameters from Van der Waal's equation

Lecture 27 - Determination of Van der Waals' constants and Boyle temperature

Lecture 28 - Other equations of state

Lecture 29 - Measurement of temperature: Celcius scale, ideal gas scale, absolute zero

Lecture 30 - The platinum resistance thermometer

Lecture 31 - Basic concepts of classical thermodynamics

NPTEL : NOC:Concepts in Magnetism and Superconductivity (Physics)

Co-ordinators : Prof. A Taraphder

Lecture 1 - Introduction: Magnetism and superconductivity as macroscopic quantum phenomena

Lecture 2 - Bohr magneton, BvL theorem

Lecture 3 - An electron in a magnetic field, magnetism of isolated atoms

Lecture 4 - Magnetism of isolated atoms (Continued...), Diamagnetism

Lecture 5 - Magnetism of atoms-dia and paramagnetic susceptibilities. Hund's rules,Van Vleck paramagnetism

Lecture 6 - Van Vleck paramagnetism (Continued...), Paramagnetism

Lecture 7 - Curie's law for arbitrary J, adiabatic demagnetization

Lecture 8 - Paramagnetism of conduction electrons - Pauli paramagnetism

Lecture 9 - Ions in a solid: crystal field, orbital quenching, Jahn-Teller effect

Lecture 10 - Jahn-Teller effect (Continued...), Magnetic resonance techniques NMR, ESR

Lecture 11 - Resonance techniques (Continued...), Recapitulation and overview

Lecture 12 - Recapitulation, interacting moments and long range order, dipolar exchange

Lecture 13 - Interacting moments, 2-electron system, origin of exchange and spin Hamiltonian

Lecture 14 - Spin Hamiltonian, Heisenberg model, Exchange interactions: direct

Lecture 15 - GMR, spin model and mean-field theory, Ising model

Lecture 16 - Ising model and its properties

Lecture 17 - Ising model and its properties (Continued...), absence of LRO in d=1, mean-field theory

Lecture 18 - Ising model recap, applications, exact solutions

Lecture 19 - Exact solution of Ising model in d=1, exact results in d=2. Mermin-Wagner theorem

Lecture 20 - Recap - Exact solution of Ising model. Mermin-Wagner theorem on the absence

Lecture 21 - Ferromagnetic Heisenberg model ground state

Lecture 22 - Ferromagnetic Heisenberg model, spin-waves and magnons

Lecture 23 - Antiferromagnetic Heisenberg model, AF magnetic structures

Lecture 24 - AF magnetic structures, susceptibility and excitations

Lecture 25 - Antiferromagnets and frustration, spin glass

Lecture 26 - Superconductivity: discovery, properties

Lecture 27 - Superconductivity: Meissner effect, London Equation

Lecture 28 - Electron-phonon interaction, Cooper problem

Lecture 29 - Cooper problem, setting up the BCS theory

Lecture 30 - BCS wave function, the Superconducting state and calculations of various properties

Lecture 31 - BCS theory (Continued...), energy gap, transition temperature

NPTEL : NOC:Foundations of Classical Electrodynamics (Physics)

Co-ordinators : Prof. Samudra Roy

Lecture 1 - Vector analysis, Scalar and vector fields, vector identities

Lecture 2 - Vector Analysis (Continued...)

Lecture 3 - Use of Levi-Civita Symbol, Coordinate system

Lecture 4 - Coordinate system, Orthogonal Transformation

Lecture 5 - Spherical Coordinate system, Line, surface and volume element

Lecture 6 - Line, surface and volume element (Continued...)

Lecture 7 - Line, surface and volume integral

Lecture 8 - Differential calculus, Gradient

Lecture 9 - Gradient operator, Concept of divergence

Lecture 10 - Divergence operator, Divergence Theorem

Lecture 11 - Curl operator, Stokes Theorem

Lecture 12 - Gradient, Divergence and Curl (A recap), Vector identities

Lecture 13 - Curvilinear coordinate system

Lecture 14 - Curvilinear coordinate system (Continued...)

Lecture 15 - Curvilinear coordinate system (Continued...)

Lecture 16 - Delta Function

Lecture 17 - Delta Function (Continued...)

Lecture 18 - Helmholtz's Theorem

Lecture 19 - Helmholtz's Theorem(Recap), Tutorial

Lecture 20 - Tutorial (Continued...)

Lecture 21 - Concept of charge, Charge density

Lecture 22 - Coulomb's Law

Lecture 23 - Coulomb's Law (Continued...), Charge distribution

Lecture 24 - Charge distribution problem, Gauss's Law

Lecture 25 - Topics More on Gauss's Law

Lecture 26 - Application of Gauss's Law

Lecture 27 - Electrostatic potential

Lecture 28 - Electrostatic potential (Continued...)

Lecture 29 - Electrostatic energy

Lecture 30 - Electrostatic energy (Continued...)

Lecture 31 - Electrostatic energy calculation

NPTEL : NOC:Physics of Functional Materials and Devices (Physics)

Co-ordinators : Prof. Amreesh Chandra

Lecture 32 - Ferrofluids

Lecture 33 - Spintronics and devices

Lecture 34 - Introduction to the basic properties of liquids and melts

Lecture 35 - Heat capacity and diffusion of liquids and melts

Lecture 36 - Viscosity, electric and thermal conduction of liquids and melts

Lecture 37 - Sensors

Lecture 38 - Electrochemical Sensors

Lecture 39 - Introduction to energy storage devices and basics of supercapacitors

Lecture 40 - Supercapacitors - II

Lecture 41 - Magnetic supercapacitors

Lecture 42 - Battery - I

Lecture 43 - Battery - II

Lecture 44 - Solar Cells - I

Lecture 45 - Solar Cells - II

Lecture 46 - X-ray Diffraction (XRD)

Lecture 47 - Fourier Transform Infrared Spectroscopy

Lecture 48 - UV- Vis Spectroscopy

Lecture 49 - Scanning and Transmission Electron Microscopy

Lecture 50 - Summary

NPTEL : NOC:Fundamentals of Attosecond Science and Technology (FAST) (Physics)

Co-ordinators : Prof. Sivarama Krishnan

Lecture 1 - Introduction to waves, 1D wave equation and its solutions

Lecture 2 - 1D Light waves

Lecture 3 - Characteristics of light waves - amplitude, absolute phase, wavelenght and frequency

Lecture 4 - Phase, Phase velocity and Phase delay

Lecture 5 - Complex notation for the description light waves and superposition

Lecture 6 - Maxwell's equations to the 3D wave equation and its solutions

Lecture 7 - Recap of Week 1

Lecture 8 - 3D wave equation and plane waves

Lecture 9 - Complex notation for Electric fields, Superposition and interference

Lecture 10 - Fabry-Perot inteferometer and it transmittance

Lecture 11 - Physical interpretation of FP transmittance

Lecture 12 - Recap of Fabry-Perot modes

Lecture 13 - Free spectral range of a Fabry-Perot etalon

Lecture 14 - Resonator modes and optical pulses - insight

Lecture 15 - Table - Top Coherent and Incoherent Imaging

Lecture 16 - Recap of Etalon free spectral range

Lecture 17 - Line width and finesse of an etalon

Lecture 18 - Actual resonator modes

Lecture 19 - Resonator configurations and stability

Lecture 20 - Recap of optical resonators

Lecture 21 - Introduction of light pulses

Lecture 22 - Complex amplitude, Gaussian pulse

Lecture 23 - Recap of light pulses

Lecture 24 - Introduction of Fourier Transforms

Lecture 25 - Tutorial 1

Lecture 26 - Motivating Fourier Transforms

Lecture 27 - Fourier Transform Properties

Lecture 28 - Frequency domain electric field

Lecture 29 - Recap of Fourier transform properties

Lecture 30 - Frequency domain description of pulses

Lecture 31 - Spectral Phase

Lecture 65 - Origin of nonlinear optical effects

Lecture 66 - Wave equation in an inert gas

Lecture 67 - Perturbation theory and second harmonics

Lecture 68 - Numerical simulation strategy

Lecture 69 - Atoms in the presence of fields

Lecture 70 - Ionization models

Lecture 71 - Attosecond pulse generation and metrology

Lecture 72 - Nonlinear optics review

Lecture 73 - Nonlinear response of matter to light

Lecture 74 - Sum and difference frequency generation

Lecture 75 - Recap of sum and difference frequency generation, second harmonic generation

Lecture 76 - Generalized nonlinear effects, conservation laws in SHG

Lecture 77 - Phase matching in SHG, polarization dependent refractive index

NPTEL : NOC:Wave Optics (Physics)

Co-ordinators : Prof. Samudra Roy

Lecture 1 - Introduction

Lecture 2 - Introduction (Continued...)

Lecture 3 - Concept of wave, Wave Equation

Lecture 4 - Plane wave, Spherical wave

Lecture 5 - Maxwell's wave equation, Poynting Vector

Lecture 6 - Superposition of waves

Lecture 7 - Superposition of wave (Complex method)

Lecture 8 - Random and coherent sourse, standing wave formation

Lecture 9 - Group and Phase velocity

Lecture 10 - Material Dispersion

Lecture 11 - Material Dispersion (Continued...)

Lecture 12 - Concept of Coherence

Lecture 13 - Concept of Coherence (Continued...)

Lecture 14 - Concept of Coherence (Continued...)

Lecture 15 - Concept of Coherence (Continued...)

Lecture 16 - Two beam interference

Lecture 17 - Young's double slit experiment

Lecture 18 - Youngâ€™s double slit experiment (Continued...)

Lecture 19 - Interference by division of amplitude

Lecture 20 - Interference by division of amplitude (Continued...)

Lecture 21 - Newton's Ring

Lecture 22 - Newtonâ€™s Ring (Continued...)

Lecture 23 - Newtonâ€™s Ring (Continued...)

Lecture 24 - Optical Interferometers

Lecture 25 - Michelson Interferometer

Lecture 26 - Multiple beam interference

Lecture 27 - Febry-Perot Interferometer

Lecture 28 - Febry-Perot Interferometer (Continued...)

Lecture 29 - Resolving power of Fabry-Perot interferometer

Lecture 30 - Diffraction of Light

Lecture 31 - Huygenâ€™s Theory

NPTEL : Special Topics in Atomic Physics (Physics)

Co-ordinators : Prof. P.C. Deshmukh

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 Formula

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 Cooling, BEC, Atomic Clock / Attosecond metrology

NPTEL : Classical Field Theory (Physics)

Co-ordinators : Prof. Suresh Govindarajan

NPTEL : Topics in Nonlinear Dynamics (Physics)

Co-ordinators : Prof. V. Balakrishnan

NPTEL : Condensed Matter Physics (Physics)

Co-ordinators : Prof. G. Rangarajan

NPTEL : Quantum Field Theory (Physics)

Co-ordinators : Dr. Prasanta Tripathy

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 - Quantuzation of Electromagnetic Field - I

Lecture 16 - Quantuzation 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

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 : Quantum Mechanics I (Physics)

Co-ordinators : Prof. S. Lakshmi Bala

NPTEL : Special Topics in Classical Mechanics (Physics)

Co-ordinators : Prof. P.C. Deshmukh

NPTEL : Special, Select Topics in the Theory of Atomic Collisions and Spectroscopy (Physics)

Co-ordinators : Prof. P.C. Deshmukh

NPTEL : Selected Topics in Mathematical Physics (Physics)

Co-ordinators : Prof. V. Balakrishnan

NPTEL : Nuclear Reactors and Safety - An Introduction (Physics)

Co-ordinators : Dr.G.Vaidyanathan

NPTEL : Physical Applications of Stochastic Processes (Physics)

Co-ordinators : Prof. V. Balakrishnan

NPTEL : NOC:Mechanics, Heat Oscillations and Waves (Physics)

Co-ordinators : Prof. V. Balakrishnan

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, Victors 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

Lecture 30 - Damped Simple Harmonic Motion

Lecture 31 - Wave Motion - Travelling and Standing Waves

NPTEL : Nonequilibrium Statistical Mechanics (Physics)

Co-ordinators : Prof. V. Balakrishnan

NPTEL : NOC:Statistical Mechanics (Physics)

Co-ordinators : Prof. Ashwin Joy

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

Lecture 30 - Vibrations of Solid (Low Temperature)

Lecture 31 - Vibrations of Solid (Continuation)

NPTEL : NOC:Computational Physics (Physics)

Co-ordinators : Prof. Prasenjit Ghosh

Lecture 32 - Differential Equations With Specified Boundary Conditions - Part 2

Lecture 33 - Partial Differential equations - 1

Lecture 34 - Partial Differential equations - 2

Lecture 35 - Partial Differential equations - 3

Lecture 36 - Differential Equation for Quantum Mechanical Problems: Numerov Algorithm - 1

Lecture 37 - Differential Equation for Quantum Mechanical Problems: Numerov Algorithm - 2

Lecture 38 - Differential Equation for Quantum Mechanical Problems: Numerov Algorithm - 3

Lecture 39 - Differential Equation for Quantum Mechanical Problems: Numerov Algorithm - 4

Lecture 40 - Differential Equation for Quantum Mechanical Problems: Numerov Algorithm - 5

Lecture 41 - Differential Equation for Quantum Mechanical Problems: Variational principle - 1

Lecture 42 - Differential Equation for Quantum Mechanical Problems: Variational principle - 2

Lecture 43 - Differential Equation for Quantum Mechanical Problems: Variational principle - 3

Lecture 44 - Differential Equation for Quantum Mechanical Problems: Variational principle - 4

Lecture 45 - Differential Equation for Quantum Mechanical Problems: Variational principle - 5

Lecture 46 - Molecular Dynamics Introduction - Part 1

Lecture 47 - Molecular Dynamics Introduction - Part 2

Lecture 48 - Molecular Dynamics Details and Algorithm - Part 1

Lecture 49 - Molecular Dynamics Details and Algorithm - Part 2

Lecture 50 - Molecular Dynamics Details and Algorithm - Part 3

Lecture 51 - Molecular Dynamics Analysis - Part 1

Lecture 52 - Molecular Dynamics Analysis - Part 2

Lecture 53 - Molecular Dynamics Neighbours Lists - Part 1

Lecture 54 - Molecular Dynamics Neighbours Lists - Part 2

Lecture 55 - Molecular Dynamics: Calculation Of Themodynamics Quantities

Lecture 56 - Molecular Dynamics Diffusion Constant Calculation - Part 1

Lecture 57 - Molecular Dynamics Diffusion Constant Calculation - Part 2

Lecture 58 - Molecular Dynamics Diffusion Constant Calculation - Part 3

NPTEL : NOC:Waves and Oscillations (Physics)

Co-ordinators : Prof. M. S. Santhanam

Lecture 1 - Simple Harmonic Motion

Lecture 2 - Superposition of Oscillations : Beats

Lecture 3 - Superposition of Oscillations : Beats

Lecture 4 - Superposition of Oscillations : Lissajous Figures

Lecture 5 - Simple Harmonic Motion : Problems

Lecture 6 - Damped oscillator - Part 1

Lecture 7 - Damped oscillator - Part 2

Lecture 8 - Damped oscillator and Q-factor

Lecture 9 - Damped oscillator : Problems

Lecture 10 - Forced oscillator - Part 1

Lecture 11 - Forced oscillator - Part 2

Lecture 12 - Resonances

Lecture 13 - Q-factor of forced oscillator

Lecture 14 - Applications of forced oscillator

Lecture 15 - Forced Oscillator : Problems

Lecture 16 - Coupled Oscillations - Part 1

Lecture 17 - Coupled Oscillations - Part 2

Lecture 18 - Solving for normal modes

Lecture 19 - Coupled oscillations - More examples

Lecture 20 - Coupled oscillator : Problems

Lecture 21 - Coupled Oscillations of Loaded String

Lecture 22 - Solutions for Loaded String

Lecture 23 - Oscillations of Loaded String

Lecture 24 - Continuum Limit of Loaded String

Lecture 25 - Wave equation and its solutions

Lecture 26 - Wave equation - impedance and velocities

Lecture 27 - Standing waves

Lecture 28 - Transverse waves in periodic structures

Lecture 29 - Wave equation : Problems

Lecture 30 - Reflection and transmission of waves

Lecture 31 - Impedance matching

Lecture 32 - Energy of vibrating string

Lecture 33 - Dispersion of waves

Lecture 34 - Bandwidth theorem and problems

Lecture 35 - Longitudnal Waves and Speed of Sound

Lecture 36 - Longitudnal Standing Waves

Lecture 37 - Sound Intensity

Lecture 38 - Longitudnal Waves: Problems

Lecture 39 - Fourier Series - Part 1

Lecture 40 - Fourier Series - Part 2

Lecture 41 - Fourier Series and Energy of Vibrating String

Lecture 42 - Frequency Spectrum and Fourier Transforms

Lecture 43 - Fourier Series : Problems

Lecture 44 - Waves in Optical Systems

Lecture 45 - Waves in Optical Systems: Applying Fermat's Principle

Lecture 46 - Waves in Optical Systems: Thin Lens

Lecture 47 - Waves in Optical Systems: Matrix Method

Lecture 48 - Waves in Optical Systems: Problems

Lecture 49 - Interference: Part 1

Lecture 50 - Interference: Newton's rings

Lecture 51 - Michelson and Fabry-Perot Interferometers

Lecture 52 - Young's Double Slit Experiment

Lecture 53 - Diffraction

Lecture 54 - Beyond Linear Oscillators: Non-linear Pendulum

Lecture 55 - Beyond Linear Oscillators: Forced Oscillator

Lecture 56 - Beyond Linear Oscillators: Chaotic Oscillator

Lecture 57 - Beyond Linear Waves: Solitary Waves

Lecture 58 - Waves in Quantum Mechanics and Summary

NPTEL : NOC:Physics through Computational Thinking (Physics)

Co-ordinators : Prof. Auditya Sharma, Prof. Ambar Jain

NPTEL : NOC:Electromagnetism (Physics)

Co-ordinators : Prof. Nirmal Ganguli

Lecture 1 - Vector algebra

Lecture 2 - Vector algebra in component form

Lecture 3 - Vector triple products

Lecture 4 - Vector differential calculus: Gradient

Lecture 5 - Divergence

Lecture 6 - Curl

Lecture 7 - Tutorial on differential vector calculus

Lecture 8 - More problems on vector differential calculus

Lecture 9 - Vector integral calculus: Line integral

Lecture 10 - Surface integral

Lecture 11 - Volume integral

Lecture 12 - Fundamental theorems of vector calculus: The gradient theorem

Lecture 13 - The divergence theorem (Gauss's theorem)

Lecture 14 - The curl theorem (Stokes' theorem)

Lecture 15 - Curvilinear coordinates: Cartesian vs. Polar

Lecture 16 - Generic curvilinear coordinate systems: Unit vectors and components

Lecture 17 - Differential vector calculus in curvilinear coordinate systems

Lecture 18 - Special curvilinear coordinate systems: Cylindrical and spherical

Lecture 19 - Vector calculus in spherical coordinate system

Lecture 20 - Vector calculus in cylindrical coordinate system

Lecture 21 - Introduction to Dirac delta function

Lecture 22 - Tutorial on vector calculus and curvilinear coordinates

Lecture 23 - Introduction to electrostatics

Lecture 24 - Continuous charge distribution: Line charge

Lecture 25 - Electric field due to a line charge distribution

Lecture 26 - Electric field lines, Flux, Gauss law

Lecture 27 - Application of Gauss law with cylindrical symmetry

Lecture 28 - Application of Gauss law on a flat 2D surface

Lecture 29 - Tutorial on Dirac delta function and electrostatics

Lecture 30 - Tutorial on electrostatics

Lecture 31 - The curl of an electric field

Lecture 65 - Magnetic field in a long solenoid

Lecture 66 - A comparison between electrostatics nad magnetostatics

Lecture 67 - Magnetic vector potential

Lecture 68 - Tutorial on magnetic fields

Lecture 69 - Calculation of vector potential

Lecture 70 - Boundary conditions on magnetic field

Lecture 71 - Magnetic dipole

Lecture 72 - Multipole expansion of the vector potential

Lecture 73 - Magnetism, force and torque on magnetic dipole

Lecture 74 - Fringing magnetic field

Lecture 75 - Magnetization

Lecture 76 - A tutorial on the magnetic dipole moment

Lecture 77 - Ampere's law in magnetized materials

Lecture 78 - Electrodynamics

Lecture 79 - Electromagnetic induction

Lecture 80 - Laws of electromagnetism so far

Lecture 81 - Maxwell's correction to electromagnetism

Lecture 82 - Fictitious discussion about symmetry

Lecture 83 - Maxwell's equations in matter and the boundary conditions

NPTEL : NOC:Introduction to Classical Mechanics (Physics)

Co-ordinators : Prof. Anurag Tripathi

NPTEL : NOC:Fluid Dynamics for Astrophysics (Physics)

Co-ordinators : Prof. Prasad Subramanian

Lecture 1 - Introduction to the course

Lecture 2 - Continuum hypothesis, distribution function and stress-viscosity relation

Lecture 3 - Continuum hypothesis, distribution function and stress-viscosity relation - Recap

Lecture 4 - Fluid Kinematics

Lecture 5 - Fluid Kinematics - Recap

Lecture 6 - Conservation laws: Mass conservation and incomprehensibility

Lecture 7 - Conservation laws: Momentum conservation and Euler equation

Lecture 8 - Conservation laws - Recap

Lecture 9 - Potential flows

Lecture 10 - Bernoulli constant, its applications and voracity equation

Lecture 11 - Recap - Potential flows, Bernoulli constant and its applications

Lecture 12 - Voracity dynamics -- Kelvin's voracity theorem and Magus effect

Lecture 13 - Navier-Stokes equation

Lecture 14 - Navier-Stokes equation (Continued....) and energy equation

Lecture 15 - Energy equation in a conservative form

Lecture 16 - Boundary conditions in Navier-Stokes equation, d'Alembert's paradox

Lecture 17 - Poiseuille flow, deriving viscosity from microscopics

Lecture 18 - Dimensionless numbers -- Mach number, Reynolds number

Lecture 19 - DimDimensionless numbers (Continued...) -- plasma beta, magnetic Reynolds number, Alfven Mach number, Prandl numberensionless numbers -- Mach number, Reynolds number

Lecture 20 - Reynolds number and dynamic similarity

Lecture 21 - Reynolds number recap, Low Re flows, and drag on a sphere (Stokes law)

Lecture 22 - High Re flows -- turbulent drag law, vortex shedding and drag crisis

Lecture 23 - Lift on a body, introduction to compressible flows

Lecture 24 - Compressible flows -- derivation of sound speed and dispersion relation

Lecture 25 - Subsonic and supersonic flows

Lecture 26 - Propagation of sonic information, shock tube problem and piston problem

Lecture 27 - Criterion for neglect of compressibility, method of characteristics

Lecture 28 - Shock thickness

Lecture 29 - Shock thickness recap, shock jump conditions

Lecture 30 - Shock jump conditions (Continued...), transonic 1D flows, converging/diverging channels

Lecture 64 - Solar eruptions : Coronal Mass Ejections (CMEs) and solar flares

NPTEL : NOC:Quantum Transport (Physics)

Co-ordinators : Prof. Madhu Thalakulam

NPTEL : NOC:Statistical Mechanics (2021) (Physics)

Co-ordinators : Prof. Dipanjan Chakraborty

Lecture 1 - Introduction to Thermodynamics

Lecture 2 - Laws of Thermodynamics

Lecture 3 - Second Law of Thermodynamics and Heat Engines

Lecture 4 - Entropy, Clausius Inequality, Thermodynamic Processes and Systems

Lecture 5 - Extensivity of Entropy and Internal Energy, Gibbs Duhem relation

Lecture 6 - Exact and Inexact differentials, Legendre Transformation

Lecture 7 - Free Energy in Thermodynamics

Lecture 8 - Maxwell's relations - Part I

Lecture 9 - Maxwell's relations - Part II

Lecture 10 - Maxwell's relations - Part III

Lecture 11 - Response Functions and manipulating Partial Derivatives

Lecture 12 - Working With Thermodynamics

Lecture 13 - Joule Expansion and Joule Thomson Effect

Lecture 14 - Stability of Thermodynamic Potentials

Lecture 15 - Consequences of Stability of Thermodynamic Potentials

Lecture 16 - Conditions of Equilibrium and Gibbs Phase Rule

Lecture 17 - Introduction to Probability

Lecture 18 - Discrete and Continuous Distributions

Lecture 19 - Central Limit Theorem and Statistical Entropy

Lecture 20 - Classical Probability Density and Liouville Equation

Lecture 21 - Classical Probability Density, Ergodicity and Microcanonical Ensemble

Lecture 22 - Microcanonical Ensemble

Lecture 23 - Examples of Microcanonical Ensemble - Two Level System

Lecture 24 - Examples of Microcanonical Ensemble - Magnetic System and Ideal Gas - Part I

Lecture 25 - Examples of Microcanonical Ensemble - Magnetic System and Ideal Gas - Part II

Lecture 26 - Examples of Microcanonical Ensemble - Ultra-Relativistic Gas

Lecture 27 - Microcanonical Ultrarelativistic Gas and Quantum Solid

Lecture 28 - Microcanonical Excluded Volume

Lecture 29 - Canonical Ensemble

Lecture 30 - Canonical Ensemble Paramagnet

Lecture 31 - Canonical Ensemble Ideal Gas

Lecture 32 - Canonical Ensemble Einstein Solid

Lecture 33 - Grand Canonical Ensemble

Lecture 34 - Grand Canonical Ensemble Ideal Gas - Part I

Lecture 35 - Grand Canonical Ensemble Ideal Gas - Part II

Lecture 36 - MicroCanonical to Canonical - Part I

Lecture 37 - MicroCanonical to Canonical - Part II

Lecture 38 - Interacting System - Part I

Lecture 39 - Interacting System - Part II

Lecture 40 - Van-Der Waals Equation of State

Lecture 41 - Quantum Statistical Mechanics Density Matrix

Lecture 42 - Density Matrix in different Ensembles

Lecture 43 - Free Particle Quantum Canonical Partition Function Free

Lecture 44 - Single Particle Quantum Partition Function Harmonic Oscillator - Part I

Lecture 45 - Single Particle Quantum Partition Function Harmonic Oscillator - Part II

Lecture 46 - Wigner Transformation

Lecture 47 - N-Particle partition function

Lecture 48 - Canonical Formulation of Ideal Gas

Lecture 49 - Grand Canonical Formulation of Ideal Gas

Lecture 50 - High Temperature Expansion

Lecture 51 - Degenerate Fermi Gas

Lecture 52 - Ideal Fermi Gas close to T=0, Chemical Potential and Specific Heat

Lecture 53 - Relativistic Fermi Gas at T=0

Lecture 54 - Ideal Bose Gas

Lecture 55 - Bose-Einstein Condensation

Lecture 56 - Pressure of an Ideal Bose Gas

Lecture 57 - Specific Heat of an Ideal Bose Gas - Part 1

Lecture 58 - Specific Heat of an Ideal Bose Gas - Part 2

Lecture 59 - Bose-Einstein Condensation in a Harmonically Trapped Bose Gas

Lecture 60 - Specific Heat of a Harmonically Trapped Bose Gas

Lecture 61 - General Treatment of a Bose gas - Part 1

Lecture 62 - General Treatment of a Bose gas - Part 2

Lecture 63 - Discontinuity in the Specific Heat of a Bose Gas - Part 1

Lecture 64 - Discontinuity in the Specific Heat of a Bose Gas - Part 2

Lecture 65 - Ultra Relativistic Bose Gas Stefan Boltzmann Law

NPTEL : NOC:Solid State Physics (2021) (Physics)

Co-ordinators : Prof. Nirmal Ganguli

Lecture 32 - One dimensional chain of atoms

Lecture 33 - One dimensional chain of atoms

Lecture 34 - Periodic boundary condition

Lecture 35 - Energy levels in periodic array of quantum wells

Lecture 36 - Tunneling of electrons

Lecture 37 - Reflection and transmission amplitudes and coefficients

Lecture 38 - Transfer matrix for a rectangular barrier

Lecture 39 - Electron tunneling through a periodic potential

Lecture 40 - The tight-binding approximation

Lecture 41 - Tridiagonal matrices and continued fraction

Lecture 42 - Plane-wave basis for nearly free electrons

Lecture 43 - Nearly free electron approximation

Lecture 44 - Dynamical aspects of electrons in band theory

Lecture 45 - Semiconductor crystals

Lecture 46 - Effective mass

Lecture 47 - Carrier concentration

Lecture 48 - Mobility, impurity conductivity, and Fermi surface

Lecture 49 - Vibration of crystals with monatomic basis

Lecture 50 - Analyzing the dispersion relation

Lecture 51 - Phonons with diatomic basis

Lecture 52 - Quantization of elastic waves

Lecture 53 - Phonon heat capacity

Lecture 54 - Phonon density of states

Lecture 55 - Introduction to diamagnetism

Lecture 56 - Issues with the classical theory of diamagnetism

Lecture 57 - Quantum theory of diamagnetism

Lecture 58 - The quantum theory of paramagnetism

Lecture 59 - Rare earth atoms, Hund's rule

Lecture 60 - Crystal field splitting

Lecture 61 - Quenching of orbital angular momentum

Lecture 62 - Paramagnetic susceptibility of conduction electrons

Lecture 63 - Ferromagnetism

Lecture 64 - Antiferromagnetism and ferrimagnetism

NPTEL : NOC:Introduction to Quantum Field Theory (Theory of Scalar Fields) (Physics)

Co-ordinators : Prof. Anurag Tripathi

NPTEL : NOC:Introduction to Quantum Field Theory (Theory of Scalar Fields) - Part 2 (Physics)

Co-ordinators : Prof. Anurag Tripathi

NPTEL : NOC:Radio Astronomy (Physics)

Co-ordinators : Prof. Abhirup Datta

Lecture 1 - Introduction to Radio Astronomy

Lecture 2 - Review of Electromagnetism - Part 1

Lecture 3 - Review of Electromagnetism - Part 2

Lecture 4 - Radio Astronomy - Tutorial 1

Lecture 5 - Milestones in Radio Astronomy

Lecture 6 - Radio Astronomy Fundamentals - Part 1

Lecture 7 - Radio Astronomy Fundamentals - Part 2

Lecture 8 - Radiative Transfer - Tutorial 1

Lecture 9 - Fundamentals of Antenna

Lecture 10 - Fundamental of Antenna Theory - Part 1

Lecture 11 - Fundamental of Antenna Theory - Part 2

Lecture 12 - Fundamental of Antenna Theory - Part 3

Lecture 13 - Signal Processing and Receivers

Lecture 14 - Signal Proceeding and Receivers - Part 2

Lecture 15 - Radio Telescopes

Lecture 16 - Single Dish Observations

Lecture 17 - Demonstration of Antenna Design and Simulation - Part 1

Lecture 18 - Demonstration Of Antenna Design and Simulation - Part 2

Lecture 19 - What Have we Learnt so Far? - A Review

Lecture 20 - Demonstration of Antenna Design and Simulation - Part 3

Lecture 21 - Co-ordinate System

Lecture 22 - Radio Interferometers

Lecture 23 - Example Questions

Lecture 24 - Python Crash Course

Lecture 25 - Few Concepts with the help of python as a computational tool

Lecture 26 - Live session

Lecture 27 - Example Questions

Lecture 28 - Radio Interferometry and Aperture Synthesis

Lecture 29 - Introduction to CASA

Lecture 30 - Examples

Lecture 31

NPTEL : NOC:Foundations of Quantum Theory: Non-Relativistic Approach (Physics)

Co-ordinators : Prof. Sandeep Kumar Goyal, Prof. Kinjalk Lochan

NPTEL : NOC:Fiber Optics (Physics)

Co-ordinators : Prof. Vipul Rastogi

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: Propagation Characteristics

Lecture 28 - Optical Fiber Components and Devices - I

Lecture 29 - Optical Fiber Components and Devices - II

Lecture 30 - Optical Fiber Components and Devices - III

Lecture 31 - Optical Fiber Components and Devices - IV

NPTEL : NOC:Solar Photovoltaics Fundamentals, Technology and Applications (Physics)

Co-ordinators : Prof. Soumitra SataPathi

Lecture 1 - Energy and its Sources

Lecture 2 - Introduction to Solar Energy

Lecture 3 - Introduction of Quantum Mechanics in Solar Photovoltaics - I

Lecture 4 - Introduction of Quantum Mechanics in Solar Photovoltaics - II

Lecture 5 - Introduction of Quantum Mechanics in Solar Photovoltaics - III

Lecture 6 - Band Theory

Lecture 7 - Energy Band Diagram

Lecture 8 - Charge Carrier Dynamics in Semiconductor

Lecture 9 - P-N junction model and Diode working principle

Lecture 10 - Current-Voltage Characteristics of Solar Cell

Lecture 11 - Equivalent Circuits of Solar Cells, Fill Factor

Lecture 12 - Fabrication Process of Semiconductor Grade Silicon

Lecture 13 - Fabrication Process of Single crystalline Silicon

Lecture 14 - Thin Film deposition Techniques

Lecture 15 - Thin Film Solar Cells: Amorphous Silicon

Lecture 16 - Photo Physics of Dye Sensitized Solar Cells

Lecture 17 - Fabrication of Dye Sensitized Solar Cells

Lecture 18 - Design of Novel dyes

Lecture 19 - Design of Electrolytes

Lecture 20 - Quantum Dot Solar Cells

Lecture 21 - Fabrication of Organic Solar Cells

Lecture 22 - Physics of Bulk Hetero Junction (BHJ) Solar Cells

Lecture 23 - Photo Physics of Organic Solar Cells

Lecture 24 - Morphology Optimization of Organic Solar Cells

Lecture 25 - Perovskite Solar Cells

Lecture 26 - Fabrication of Perovskite Solar Cells

Lecture 27 - Photo Physics of Perovskite Solar Cells

Lecture 28 - Stability in Perovskite Solar Cells

Lecture 29 - Morphology Optimization of Perovskite Solar Cells

Lecture 30 - Perovskite Single Crystal Solar Cells

Lecture 31 - Photophysics in Perovskite Single Crystal Solar Cells

NPTEL : NOC:Introduction to Atmospheric and Space Sciences (Physics)

Co-ordinators : Prof. M V Sunil Krishna

Lecture 32 - Atmospheric Stability

Lecture 33 - Atmospheric Stability Conditions

Lecture 34 - Stable Unstable and Neutral Atmosphere

Lecture 35 - Cloud Seeding and Precipitation

Lecture 36 - Measuring Precipitation

Lecture 37 - Droplet Growth and Curvature Effect

Lecture 38 - Droplet Growth and Solute Effect

Lecture 39 - Radial Growth of Droplets by Diffusion

Lecture 40 - Radial Growth of Droplets by Diffusion (Continued...)

Lecture 41 - Ionospheric Layers and Photochemistry

Lecture 42 - Ionization Processes

Lecture 43 - Ionospheric Chemical Reactions and Layers

Lecture 44 - Chapman's Theory of Layer Production

Lecture 45 - Chapman's Theory of Layer Production (Continued...)

Lecture 46 - Chapman's Alpha Layer

Lecture 47 - Hydrogen in Ionosphere

Lecture 48 - Debye's Shielding

Lecture 49 - Debye's Shielding and Debye's Potential

Lecture 50 - Debye's Potential (Continued...)

Lecture 51 - Particle Motion in Uniform Electric Field

Lecture 52 - Particle Motion in Uniform Magnetic Field

Lecture 53 - Particle Motion in Uniform Magnetic Field and Guiding Center

Lecture 54 - Particle Motion in Uniform Electric and Magnetic Fields

Lecture 55 - Gradient Magnetic Field

Lecture 56 - Gradient Drift and Curvature Drift

Lecture 57 - Vacuum Drift and Planetary Ring Current

Lecture 58 - Magnetic Mirroring

Lecture 59 - Magnetic Mirroring and Loss Cone

Lecture 60 - Airglow and Aurora

NPTEL : NOC:Optical Sensors (Physics)

Co-ordinators : Prof. Sachin Kumar Srivastava

Lecture 1 - Introduction

Lecture 2 - Sensor Fabrication and Characterization

Lecture 3 - Basic Optics for Optical Sensing - I

Lecture 4 - Basic Optics for Optical Sensing - II

Lecture 5 - Basic Optics for Optical Sensing - III

Lecture 6 - Basic Optics for Optical Sensing - IV

Lecture 7 - Basic Optics for Optical Sensing - V

Lecture 8 - Basic Optics for Optical Sensing - VI

Lecture 9 - Basic Optics for Optical Sensing - VII

Lecture 10 - Plasmons - I

Lecture 11 - Plasmons - II

Lecture 12 - Plasmons - III

Lecture 13 - Plasmons - IV

Lecture 14 - Plasmons - V

Lecture 15 - Plasmons - VI

Lecture 16 - Multiple Optical Sensors of Different Mechanisms

Lecture 17 - Interference based Sensors

Lecture 18 - Interference, Diffraction and Optical Fiber Sensors

Lecture 19 - Review of Biomaterial Optics

Lecture 20 - Terahertz Based Detection and Circular Dichroism

NPTEL : NOC:Advanced Atmospheric Physics (Physics)

Co-ordinators : Prof. M V Sunil Krishna

Lecture 1 - Atmospheric Forces and Dynamics - Part 1

Lecture 2 - Atmospheric Forces and Dynamics - Part 2

Lecture 3 - Total Derivative (Introduction)

Lecture 4 - Total Derivative of a Vector in a Rotating Frame of Reference

Lecture 5 - Momentum Equations and its Vectorial Form in Spherical Polar Coordinates - Part 1

Lecture 6 - Momentum Equations and its Vectorial Form in Spherical Polar Coordinates - Part 2

Lecture 7 - Momentum Equations and its Vectorial Form in Spherical Polar Coordinates - Part 3

Lecture 8 - Total Derivative and Lagrangian

Lecture 9 - Continuity Equation: Eulerian

Lecture 10 - Energy Equations - Part 1

Lecture 11 - Energy Equations - Part 2

Lecture 12 - Scaling analysis - Part 1

Lecture 13 - Scaling analysis - Part 2

Lecture 14 - Scaling Analysis of Governing Equations - Part 1

Lecture 15 - Scaling Analysis of Governing Equations - Part 2

Lecture 16 - Scaling Analysis - Part 3, A Tutorial

Lecture 17 - Scaling Analysis - Part 4, A Tutorial

Lecture 18 - Introduction of Atmospheric Waves - Part 1

Lecture 19 - Introduction of Atmospheric Waves - Part 2

Lecture 20 - Problems based on Total Derivative - Part 1

Lecture 21 - Problems based on Total Derivative - Part 2

Lecture 22 - Shallow Water Gravity Waves - Part 1

Lecture 23 - Shallow Water Gravity Waves - Part 2

Lecture 24 - Acoustic Waves

Lecture 25 - Internal Gravity Waves - Part 1

Lecture 26 - Internal Gravity Waves - Part 2

Lecture 27 - Internal Gravity Waves - Part 3

Lecture 28 - Pressure as a vertical coordinate - Part 1

Lecture 29 - Pressure as a vertical coordinate - Part 2

Lecture 30 - Pressure as a vertical coordinate - Part 3

Lecture 31 - General circulation and global winds

Lecture 32 - Introduction to different types of Fronts

Lecture 33 - Geostrophic winds

Lecture 34 - Natural coordinate and Inertial flows

Lecture 35 - Cyclostrophic winds and Rossby number

Lecture 36 - Gradient winds

Lecture 37 - Thermal winds

Lecture 38 - Problems on thermal winds

Lecture 39 - Ionosphere introduction (Basics)- Part 1

Lecture 40 - Ionosphere introduction (Different layers) - Part 2

Lecture 41 - Ionosphere introduction (Photochemistry) - Part 3

Lecture 42 - Ionosphere introduction (Recombination) - Part 4

Lecture 43 - Composite F layer - Part 1

Lecture 44 - Composite F layer - Part 2

Lecture 45 - Composite F layer H/He ions - Part 3

Lecture 46 - The Sun - Earth Energetics and Aurora

Lecture 47 - Airglows and Aurora

Lecture 48 - Sun's magnetic field, Formation of Aurora, and Solar cycle

Lecture 49 - Sun's internal structure, Prominences

Lecture 50 - Solar wind - Magnetosphere interactions

Lecture 51 - Solar wind interactions with different planets

Lecture 52 - Solar wind properties and its interaction with different planets

Lecture 53 - Static Model of Corona

Lecture 54 - Parker's Theory of Solar Wind Acceleration - Part 1

Lecture 55 - Parker's Theory of Solar Wind Acceleration - Part 2

Lecture 56 - Parker's Theory of Solar Wind Acceleration - Part 3

Lecture 57 - Parker's Theory of Solar Wind Acceleration - Part 4

Lecture 58 - Introduction to Space Weather - Part 1

Lecture 59 - Introduction to Space Weather - Part 2

Lecture 60 - Introduction to Space Weather - Part 3

NPTEL : NOC:Nuclear Astrophysics (Physics)

Co-ordinators : Prof. Anil Kumar Gourishetty

NPTEL : NOC:Applied Optics (Physics)

Co-ordinators : Prof. Akhilesh Kumar Mishra

Lecture 1 - Course Overview

Lecture 2 - Introduction to Geometrical Optics

Lecture 3 - Ray Theory, Fermat's Principle

Lecture 4 - Refraction from Single Interface

Lecture 5 - Refraction from double interface

Lecture 6 - Matrix method in paraxial optics - I

Lecture 7 - Matrix Method in Paraxial Optics - II

Lecture 8 - Thick and Thin Lenses, Unit Planes

Lecture 9 - Nodal Planes, System of Thin Lenses

Lecture 10 - Problems on Geometrical Optics

Lecture 11 - Concept of Wavefront, Huygens Principle - I

Lecture 12 - Concept of Wavefront, Huygens Principle - II

Lecture 13 - Superposition of Waves

Lecture 14 - Introduction to Polarization, Linear and Circular Polarization

Lecture 15 - Elliptical Polarization

Lecture 16 - Interference of Light Waves, Interference of Polarized Light - I

Lecture 17 - Interference of Light Waves, Interference of Polarized Light - II

Lecture 18 - Young's Double Slit Experiment - I

Lecture 19 - Young's Double Slit Experiment - II

Lecture 20 - Interference with White Light, Displacement of Fringes, Fresnel's Biprism

Lecture 21 - Interference by Division of Amplitude

Lecture 22 - Thin Parallel Films, Wedge Shaped Films

Lecture 23 - Newton's Rings

Lecture 24 - Michelson Interferometer and Its Applications - I

Lecture 25 - Michelson Interferometer and Its Applications - II

Lecture 26 - Multiple Beam Interference

Lecture 27 - Fabry-Perot Interferometer and Etalon - I

Lecture 28 - Fabry-Perot Interferometer and Etalon - II

Lecture 29 - Concept of Coherence - I

Lecture 30 - Concept of Coherence - II

Lecture 31 - Introduction to Diffraction

Lecture 32 - Fraunhofer Diffraction

Lecture 33 - Single Slit Diffraction

Lecture 34 - Double Slit Diffraction

Lecture 35 - Multiple Slit Diffraction

Lecture 36 - Diffraction at a Rectangular Aperture

Lecture 37 - Diffraction at a Circular Aperture

Lecture 38 - Diffraction Grating

Lecture 39 - Grating Spectrum and Resolving Power

Lecture 40 - Fresnel Diffraction

Lecture 41 - Fresnel Half Period Zones

Lecture 42 - Vibration Curve

Lecture 43 - Circular Obstacle, Zone Plates

Lecture 44 - Rectangular Aperture

Lecture 45 - Diffraction of a Plane Wave by a Long Narrow Slit

Lecture 46 - Brewster's Law, Malus' Law

Lecture 47 - Phenomenon of Double Refraction

Lecture 48 - Normal and Oblique Incidence

Lecture 49 - Production of Polarized Light

Lecture 50 - Quarter and Half Wave Plates

Lecture 51 - Analysis of Polarized Light and Optical Activity

Lecture 52 - Plane Wave Propagation in Anisotropic Media - I

Lecture 53 - Plane Wave Propagation in Anisotropic Media - II

Lecture 54 - Antireflecting Coating

Lecture 55 - Basic Concepts of Holography - I

Lecture 56 - Basic Concepts of Holography - II

Lecture 57 - Basic Concepts and Ray Optics Consideration of Optical Fiber

Lecture 58 - Introduction to Lasers - I

Lecture 59 - Introduction to Lasers - II

Lecture 60 - Trifle

NPTEL : NOC:Newtonian Mechanics With Examples (Physics)

Co-ordinators : Prof. Shiladitya Sengupta

Lecture 1 - Scalars vectors, and tensors - basic definitions

Lecture 2 - Scalars, vectors and tensors - most general definition

Lecture 3 - Elementary vector algebra - I (unit vector, dot product)

Lecture 4 - Elementary vector algebra - II (cross product, triple product)

Lecture 5 - Review of Newtonâ€™s laws of motion - tools for analysis

Lecture 6 - Newtonâ€™s laws of motion - third and second law

Lecture 7 - Newtonâ€™s laws of motion - first law

Lecture 8 - Solving mechanics problems - how to draw free body diagram correctly

Lecture 9 - Mechanical equilibrium (statics) using force and torque balance

Lecture 10 - Mechanical equilibrium (statics) using force and torque balance - more examples

Lecture 11 - Mechanical equilibrium of rope like structures, nature of tension force

Lecture 12 - Massless, flexible suspension cable in mechanical equilibrium

Lecture 13 - Massive flexible suspension cable in mechanical equilibrium

Lecture 14 - Mechanical equilibrium of truss (framework) - nature of internal forces

Lecture 15 - Mechanical equilibrium of truss (framework) - examples

Lecture 16 - Mechanical equilibrium of truss - uniqueness of solution, beam with distributed load

Lecture 17 - Mechanical equilibrium of truss - more on beam with distributed load

Lecture 18 - Mechanical equilibrium - more examples, principle of virtual work, constrained motion

Lecture 19 - Mechanical equilibrium: constraints, degrees of freedom, work done by constrained force

Lecture 20 - d'Alembert - Lagrange principle of virtual work - statement and examples

Lecture 21 - Equivalence of principles of force, torque balance and virtual work, stability analysis

Lecture 22 - Mechanical equilibrium: stability analysis, energy diagram technique

Lecture 23 - Friction between solids - Amonton-Coulomb laws, common misconceptions

Lecture 24 - Friction between solids - worked out examples

Lecture 25 - Friction between solid and fluid - drag force

Lecture 26 - Friction examples - projectile motion with drag force, tying a rope

Lecture 27 - Work-energy theorem in one dimension, importance of conservation laws

Lecture 28 - Work-energy theorem in higher dimensions, conservative forces

Lecture 29 - Momentum balance principle, critical review: projectile motion in real-life

Lecture 30 - Projectile motion - effect of lift and thrust force by examples

Lecture 31 - More on rocket motion - comparing effect of thrust in deep space and at lift off

Lecture 32 - Collisions in daily life - application of energy and momentum balance principles

Lecture 33 - Collision at micro-meter, atomic and sub-atomic scales - Brownian motion, Compton effect

Lecture 34 - Concepts necessary for translation and rotation of rigid bodies - centre of mass

Lecture 35 - Centre of mass of composite objects

Lecture 36 - Concepts necessary for translation and rotation of rigid bodies - moment of inertia

Lecture 37 - More on moment of inertia - 3D objects, composite objects, engineering applications

Lecture 38 - Symmetry of mass distribution - product of inertia

Lecture 39 - Determining the principal axes of rotation and moment of inertia about them

Lecture 40 - Example of finding principal axes, introduction to rotation, the angular velocity vector

Lecture 41 - Rotation of rigid bodies - the angular momentum vector

Lecture 42 - Rotation of rigid bodies - torque

Lecture 43 - Translation and rotation of rigid bodies - computing rules

Lecture 44 - Translation and rotation of rigid bodies - examples (rolling, collision with rotation)

NPTEL : NOC:Plasma Physics and Applications (Physics)

Co-ordinators : Prof. M.V. Sunil Krishna

Lecture 1 - Introduction to Plasma - I

Lecture 2 - Introduction to Plasma - II

Lecture 3 - Plasma Oscillations

Lecture 4 - Debye Shielding

Lecture 5 - Debye Potential - I

Lecture 6 - Debye Potential - II

Lecture 7 - Debye Length and Plasma Criteria

Lecture 8 - More Aspects of Debye Shielding

Lecture 9 - Numerical Problems on Debye Shielding - I

Lecture 10 - Plasma as a Gas and Distribution of Velocities

Lecture 11 - Numerical Problems on Debye Shielding - II

Lecture 12 - Single-Particle Motion in Uniform Electric Field

Lecture 13 - Single-Particle Motion in Uniform Magnetic Field - I

Lecture 14 - Single-Particle Motion in Uniform Magnetic Field - II

Lecture 15 - Single-Particle Motion in Uniform Magnetic Field - III

Lecture 16 - Single-Particle Motion Under Uniform Magnetic field - IV

Lecture 17 - Motion in Perpendicular Electric and Magnetic fields - I

Lecture 18 - Motion in Perpendicular Electric and Magnetic fields - II

Lecture 19 - Gradient Drift

Lecture 20 - Gradient and Curvature Drifts

Lecture 21 - Vacuum Drift

Lecture 22 - Numerical Problems on Drifts

Lecture 23 - Magnetic Mirroring - I

Lecture 24 - Magnetic Mirroring - II

Lecture 25 - Magnetic Mirroring - III

Lecture 26 - Magnetic Mirroring - IV

Lecture 27 - Motion in Time Varying Magnetic Field - I

Lecture 28 - Motion in Time Varying Magnetic Field - II

Lecture 29 - Motion in Time Varying Electric field - I

Lecture 30 - Motion in Time Varying Electric field - II

Lecture 31 - Plasma as a Fluid: Equation of Continuity

Lecture 32 - Plasma as a Fluid: Fluid Equation - I

Lecture 33 - Plasma as a Fluid: Fluid Equation - II

Lecture 34 - Plasma as a fluid: Governing Equations

Lecture 35 - MHD Approximation - I

Lecture 36 - MHD Approximation - II

Lecture 37 - Plasma as a fluid: Electric and Magnetic Properties - I

Lecture 38 - Plasma as a fluid: Electric and Magnetic Properties - II

Lecture 39 - Plasma as a fluid: Fluid Drift - I

Lecture 40 - Plasma as a fluid: Fluid Drift - II

Lecture 41 - Magnetic Pressure

Lecture 42 - Wave in Plasma: Perturbation Theory

Lecture 43 - Wave in Plasma: Plasma Oscillation

Lecture 44 - Wave in Plasma: Dispersion Relation

Lecture 45 - Ion Acoustic Wave - I

Lecture 46 - Ion Acoustic Wave - II

Lecture 47 - Ion Acoustic Wave - III

Lecture 48 - Invalidity of Plasma Approximation - I

Lecture 49 - Invalidity of Plasma Approximation - II

Lecture 50 - Electromagnetic Waves in Plasma

Lecture 51 - Collisions and Diffusion in Plasma - I

Lecture 52 - Collisions and Diffusion in Plasma - II

Lecture 53 - Ambipolar Diffusion - I

Lecture 54 - Ambipolar Diffusion - II

Lecture 55 - Diffusion Equation

Lecture 56 - Diffusion in Presence of B - I

Lecture 57 - Diffusion in Presence of B - II

Lecture 58 - Instabilities in Plasma

Lecture 59 - Laser Produced Plasma and Pulsed Laser Deposited (PLD) Thin Film - I

Lecture 60 - Laser Produced Plasma and Pulsed Laser Deposited (PLD) Thin Film - II

Lecture 61 - Surface Modification of Metallic Components by Plasma Nitriding - I

Lecture 62 - Surface Modification of Metallic Components by Plasma Nitriding - II

NPTEL : Relativistic Quantum Mechanics (Physics)

Co-ordinators : Prof. Apoorva D Patel

NPTEL : NOC:Control System Design (Physics)

Co-ordinators : Prof. G R Jayanth

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

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

NPTEL : NOC:Bonds and Bands in Solids (Physics)

Co-ordinators : S. Ramashesha

NPTEL : NOC:Advanced NMR Techniques in Solution and Solid-State (Physics)

Co-ordinators : Prof. N. Suryaprakash

Lecture 32 - Spectral density function and relaxation mechanisms

Lecture 33 - T1 Relaxation mechanisms

Lecture 34 - T1 Relaxation mechanisms and T2 relaxation

Lecture 35 - Measurement of T1 and T2

Lecture 36 - Decoupling and NOE concepts

Lecture 37 - DQ and ZQ relaxation pathways

Lecture 38 - Positive and Negative NOE and spectral density functions

Lecture 39 - NOE and correlation time

Lecture 40 - Product operators

Lecture 41 - Product operator analysis

Lecture 42 - Productor operator analysis of pulse sequences

Lecture 43 - Product operators for two J coupled spins

Lecture 44 - Spin echo sequences

Lecture 45 - Introduction to 2D NMR

Lecture 46 - 2D NMR concepts, 2D experiments

Lecture 47 - 2D COSY experiment

Lecture 48 - 2D COSY and its variants

Lecture 49 - TOCSY Heteronuclear 2D experiments

Lecture 50 - coupled and decoupled HSQC, HMBC, INADEQUATE, 2D Jresolved

Lecture 51 - Introduction to multiple quantum NMR

Lecture 52 - DQ and ZQ of coupled spins

Lecture 53 - MQ and relative signs of couplings

Lecture 54 - MQ and spin system filtering

Lecture 55 - Introduction to solid state NMR

Lecture 56 - CSA and dipolar couplings

Lecture 57 - Magic Angle Spinning

Lecture 58 - WAHUHA and Cross Polarization

Lecture 59 - Cross Polarization

Lecture 60 - CP at high speeds, Side band suppression, TOSS