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

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

NPTEL : Quantum Electronics (Physics)

Co-ordinators : Prof. K. Thyagarajan

NPTEL : Quantum Mechanics and Applications (Physics)

Co-ordinators : Prof. Ajoy Ghatak

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

Lecture 32 - Laser Basics

Lecture 33 - Semiconductor Laser-I Device Structure

Lecture 34 - Semiconductor Laser-II Output Characteristics

Lecture 35 - Semiconductor Laser-III Single Frequency Lasers

Lecture 36 - Vertical cavity Surface Emitting Laser (VCSEL)

Lecture 37 - Quantum Well Laser

Lecture 38 - Practical Laser Diodes and Handling

Lecture 39 - General Characteristics of Photodetectors

Lecture 40 - Responsivity and Impulse Response

Lecture 41 - Photoconductors

Lecture 42 - Semiconductor Photo-Diodes-I: PIN Diode

Lecture 43 - Semiconductor Photo-Diodes-II: APD

Lecture 44 - Other Photodetectors

Lecture 45 - Photonic Integrated Circuits

NPTEL : NOC:Introduction to LASER (Physics)

Co-ordinators : Unknown

Lecture 1 - General Introduction, Scope and Contents

Lecture 2 - Interaction of Radiation with Matter

Lecture 3 - The Einstein Coefficients

Lecture 4 - Atomic Lineshape Function, g(Î½)

Lecture 5 - Amplification by Stimulated Emission

Lecture 6 - Line Broadening Mechanisms - 1

Lecture 7 - Line Broadening Mechanisms - 2

Lecture 8 - Laser Rate Equations: 2-Level System

Lecture 9 - Laser Rate Equations: 3-Level System

Lecture 10 - Laser Rate Equations: 4-Level System

Lecture 11 - Laser Amplifiers

Lecture 12 - Er-Doped Fiber Amplifier

Lecture 13 - Resonance Frequencies

Lecture 14 - Spectral Response of an Optical Resonator

Lecture 15 - Resonator Loss and Cavity Lifetime

Lecture 16 - Spherical Mirror Resonators

Lecture 17 - Resonator Stability Condition

Lecture 18 - Ray Paths in Spherical Mirror Resonators

Lecture 19 - Tranverse Modes of a Spherical Mirror Resonator

Lecture 20 - Gaussian Mode of the Spherical Mirror Resonator

Lecture 21 - Longitudinal Modes of a Spherical Mirror Resonator

Lecture 22 - Laser Oscillations and The Threshold Condition

Lecture 23 - Spectral Hole Burning

Lecture 24 - Variation of Laser Power around Threshold

Lecture 25 - Optimum Output Coupling

Lecture 26 - Laser Output Characteristics

Lecture 27 - Laser Beam Properties

Lecture 28 - Ultimate Linewidth of a Laser

Lecture 29 - Pulsed Lasers

Lecture 30 - Q-Switching

Lecture 31 - Mode Locking

Lecture 32 - Methods of Mode Locking

Lecture 33 - Some Common Lasers

Lecture 34 - Fiber Lasers

Lecture 35 - Semiconductor Lasers

Lecture 36 - Lasers and Laser Amplifiers in Optical Fiber Communication

Lecture 37 - Lasers in Nonlinear Optics

Lecture 38 - Laser Safety

NPTEL : NOC:Nuclear and Particle Physics (Physics)

Co-ordinators : Dr. P. Poulose

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

Lecture 1 - Introduction and Basic Quantum Mechanics

Lecture 2 - Problem Solving Session - 1

Lecture 3 - Two-level System - I

Lecture 4 - Bloch Sphere: Supplementary Lectuer - I

Lecture 5 - Two-level Systems - II

Lecture 6 - Two-level Systems - III

Lecture 7 - Dressed States;Introduction to Density Matrix

Lecture 8 - Problem Solving Session - 2

Lecture 9 - Density-matrix formalism

Lecture 10 - Quantum Harmonic Oscillators

Lecture 11 - Quantization of Electromagnetic Radiation

Lecture 12 - Quantization of Standing EM Waves;Quantum States of Radiation Fields - I

Lecture 13 - Problem Solving Session - 3

Lecture 14 - Quantum States of Radiation Fields-II: Squeezed States

Lecture 15 - Problem Solving Session - 4

Lecture 16 - Introduction and Basics of Superconductivity

Lecture 17 - Cooper Pair Box as TLS;Introduction to Transmission Line

Lecture 18 - Quantization of Transmission Line - I

Lecture 19 - Quantization of Transmission Line - II

Lecture 20 - The Jaynes Cummings Model - I

Lecture 21 - Problem Solving Session - 5

Lecture 22 - The Jaynes Cummings Model - II

Lecture 23 - Josephson Junctions - I

Lecture 24 - Josephson Junctions - II

Lecture 25 - Problem Solving Session - 6

Lecture 26 - Transmon;Introduction to Dissipation in Quantum Systems

Lecture 27 - Quantum Master Equation

Lecture 28 - Pure dephasing and Dissipative Bloch Equations

Lecture 29 - Derivation of Fermi-Golden Rule

Lecture 30 - Introduction to Cavity Optomechanics;Fabry-Perot Cavity

Lecture 31 - Cavity Optomechanics: Basic Physics - I

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

Co-ordinators : Prof. Girish S. Setlur

Lecture 32 - Creation and annihilation operators - Photons

Lecture 33 - Creation and annihilation operators - Many-body physics

Lecture 34 - Particle and Hole Green functions

Lecture 35 - Current Algebra

Lecture 36 - Tight Binding Models - I

Lecture 37 - Tight Binding Models - II

Lecture 38 - Order Parameters

Lecture 39 - Schrieffer Wolff Transformation

Lecture 40 - Matsubara Green functions - I

Lecture 41 - Matsubara Green functions - II

Lecture 42 - Self Energy and Spectral Functions

Lecture 43 - S-Matrix Perturbation Theory

Lecture 44 - Keldysh Contour

Lecture 45 - Bosonic Coherent States

Lecture 46 - Fermionic Coherent States

Lecture 47 - Nonlocal particle hole operators - Bosons

Lecture 48 - Nonlocal particle hole operators - Fermions

NPTEL : NOC:Quantum Hall Effects (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

NPTEL : NOC:Engineering Mechanics (Physics)

Co-ordinators : Prof. Manoj K Harbola

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

NPTEL : NOC:Physics of Turbulence (Physics)

Co-ordinators : Prof. Mahendra Verma

NPTEL : NOC:Introduction to Astrophysical Fluids (Physics)

Co-ordinators : Prof. Supratik Banerjee

Lecture 32 - Jeans instability

Lecture 33 - Waves and instabilities in a two-fluid interface - I

Lecture 34 - Waves and instabilities in a two-fluid interface - II

Lecture 35 - Oscillations of stars

Lecture 36 - Oscillation of stars (Continued...)

Lecture 37 - Rotation in astrofluids and Rayleigh criterion

Lecture 38 - Fluid dynamics in a rotating frame of reference

Lecture 39 - Vorticity theorem in rotating frame and Taylor-Proudman theorem

Lecture 40 - Effect of rotation on a self gravitating mass

Lecture 41 - Effect of rotation in stars

Lecture 42 - Introduction to Plasmas

Lecture 43 - Description of Plasma

Lecture 44 - Kinetic to fluid picture of plasmas

Lecture 45 - MHD fluids: magnetic pressure, magnetic tension and plasma beta

Lecture 46 - Inviscid invariants in MHD

Lecture 47 - Inviscid invariants in MHD (Continued...)

Lecture 48 - Elsasser variables in MHD

Lecture 49 - Linear wave modes in MHD

Lecture 50 - MHD in space plasmas

Lecture 51 - Introduction to turbulence in fluids

Lecture 52 - Richardson-Kolmogorov phenomenology of turbulence

Lecture 53 - Turbulent diffusion

Lecture 54 - Turbulent viscosity

Lecture 55 - Turbulence in MHD fluids

Lecture 56 - Introduction to astrophysical dynamos

Lecture 57 - Anti-dynamo theorem and turbulent dynamos

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 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

NPTEL : Astrophysics and Cosmology (Physics)

Co-ordinators : Prof. S. Bharadwaj

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

Co-ordinators : Prof. Samudra Roy

Lecture 1 - Set, Group, Field, Ring

Lecture 2 - Vector Space

Lecture 3 - Span, Linear combination of vectors

Lecture 4 - Linearly dependent and independent vector, Basis

Lecture 5 - Dual Space

Lecture 6 - Inner Product

Lecture 7 - Schwarz Inequality

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

Lecture 9 - Projection operator

Lecture 10 - Transformation of Basis

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

Lecture 12 - Unitary transformation, Similarity Transformation

Lecture 13 - Eigen Value, Eigen Vectors

Lecture 14 - Normal Matrix

Lecture 15 - Diagonalization of a Matrix

Lecture 16 - Hermitian Matrix

Lecture 17 - Rank of a Matrix

Lecture 18 - Cayley - Hamilton Theorem, Function space

Lecture 19 - Metric Space, Linearly dependent - independent functions

Lecture 20 - Linearly dependent â€“independent functions (Continued...), Inner Product of functions

Lecture 21 - Orthogonal functions

Lecture 22 - Delta Function, Completeness

Lecture 23 - Fourier

Lecture 24 - Fourier Series (Continued...)

Lecture 25 - Parseval Theorem, Fourier Transform

Lecture 26 - Parseval Relation, Convolution Theorem

Lecture 27 - Polynomial space, Legendre Polynomial

Lecture 28 - Monomial Basis, Factorial Basis, Legendre Basis

Lecture 29 - Complex Numbers

Lecture 30 - Geometrical interpretation of complex numbers

Lecture 31 - de Moivreâ€™s Theorem

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

Lecture 65 - Magnetic Property of Solid (Continued...)

Lecture 66 - Magnetic Property of Solid (Continued...)

Lecture 67 - Magnetic Property of Solid (Continued...)

Lecture 68 - Magnetic Property of Solid (Continued...)

Lecture 69 - Magnetic Property of Solid (Continued...)

Lecture 70 - Magnetic Property of Solid (Continued...)

Lecture 71 - Magnetic Property of Solids (Continued...)

Lecture 72 - Dielectric Properties of Solid

Lecture 73 - Dielectric Properties of Solid (Continued...)

Lecture 74 - Dielectric Properties of Solid (Continued...)

Lecture 75 - Superconductivity

NPTEL : NOC:Atomic and Molecular Physics (Physics)

Co-ordinators : Prof. Amal Kumar Das

NPTEL : NOC:Modern Optics (Physics)

Co-ordinators : Prof. Partha Roy Choudhuri

Lecture 1 - Maxwells equations and electromagnetic waves

Lecture 2 - Maxwells equations and electromagnetic waves (Continued...)

Lecture 3 - Maxwells equations and electromagnetic waves (Continued...)

Lecture 4 - Maxwells equations and electromagnetic waves (Continued...)

Lecture 5 - Maxwells equations and electromagnetic waves (Continued...)

Lecture 6 - Maxwells equations and electromagnetic waves (Continued...)

Lecture 7 - Maxwells equations and electromagnetic waves (Continued...)

Lecture 8 - Wave propagation in anisotropic media

Lecture 9 - Wave propagation in anisotropic media (Continued...)

Lecture 10 - Wave propagation in anisotropic media (Continued...)

Lecture 11 - Wave propagation in anisotropic media (Continued...)

Lecture 12 - Wave propagation in anisotropic media (Continued...)

Lecture 13 - Wave propagation in layered structures

Lecture 14 - Wave propagation in layered structures (Continued...)

Lecture 15 - Wave propagation in layered structures (Continued...)

Lecture 16 - Wave propagation in layered structures (Continued...)

Lecture 17 - Wave propagation in layered structures (Continued...)

Lecture 18 - Waves in guided structures and modes

Lecture 19 - Waves in guided structures and modes (Continued...)

Lecture 20 - Waves in guided structures and modes (Continued...)

Lecture 21 - Waves in guided structures and modes (Continued...)

Lecture 22 - Waves in guided structures and modes (Continued...)

Lecture 23 - Waves in guided structures and modes (Continued...)

Lecture 24 - Coupling of waves and optical couplers

Lecture 25 - Coupling of waves and optical couplers (Continued...)

Lecture 26 - Coupling of waves and optical couplers (Continued...)

Lecture 27 - Coupling of waves and optical couplers (Continued...)

Lecture 28 - Coupling of waves and optical couplers (Continued...)

Lecture 29 - Electro-optic Effect

Lecture 30 - Electro-optic Effect (Continued...)

Lecture 31 - Electro-optic Effect (Continued...)

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

Co-ordinators : Prof. Samudra Roy

NPTEL : NOC:Upstream LNG Technology (Physics)

Co-ordinators : Prof. Pavitra Sandilya

Lecture 32 - Design of distillation column

Lecture 33 - Equillibrium fluid solid separation

Lecture 34 - Membrane separation in natural gas systems

Lecture 35 - Estimation of water content in natural gas

Lecture 36 - Multistage single component equillibrium separation

Lecture 37 - Tutorial on vapour liquid separation

Lecture 38 - Tutorial on ideal binary distillation

Lecture 39 - Tutorial on equillibrium gas- solid separation

Lecture 40 - Tutorial on membrane gas separation

Lecture 41 - Dehydration of natural gas

Lecture 42 - Natural gas Processing - hydrate removal

Lecture 43 - Acid gas removal in natural gas system - I

Lecture 44 - Acid gas removal in natural gas system - II

Lecture 45 - Nitrogen removal in natural gas system - I

Lecture 46 - Nitrogen removal in natural gas system - II

Lecture 47 - Compression in natural gas systems

Lecture 48 - Compressors used in natural gas systems

Lecture 49 - Tutorial on hydrate removal

Lecture 50 - Multicomponent distillation column design: Approximate method

Lecture 51 - Sulfur recovery in natural gas systems - I

Lecture 52 - Tutorial on compression

Lecture 53 - Pigging

Lecture 54 - Sulfur recovery in natural gas systems - II

Lecture 55 - Trace components in natural gas

Lecture 56 - Helium recovery, upgradation and purification

Lecture 57 - Fundamentals of absorption and stripping for natural gas processing

Lecture 58 - Tutorial on absorption and stripping

Lecture 59 - Gas liquid separation in natural gas systems - I

Lecture 60 - Gas liquid separation in natural gas systems - II

Lecture 61 - Tutorial on equillibrium in multicomponent systems

Lecture 62 - Tutorial on multicomponent distillation - I

Lecture 63 - Tutorial on multicomponent distillation - II

Lecture 64 - Pumps in natural gas systems - I

NPTEL : NOC:Experimental Physics-I (Physics)

Co-ordinators : Prof. Amal Kumar Das

NPTEL : NOC:Experimental Physics-II (Physics)

Co-ordinators : Prof. Amal Kumar Das

Lecture 30 - Determination of the dispersive power, Cauchy constant and resolving power of a given prism.

Lecture 31 - Interference Phenomena

Lecture 32 - Interference Phenomena (Continued...)

Lecture 33 - Interference Phenomena (Continued...)

Lecture 34 - Bi-prism

Lecture 35 - Bi-prism (Continued...)

Lecture 36 - Interference phenomena by Newton ring (Theory)

Lecture 37 - Interference phenomena by Newton ring (Experiment)

Lecture 38 - Michelson interferometer (Theory)

Lecture 39 - Michelson interferometer (Experiment)

Lecture 40 - Theory of diffraction

Lecture 41 - Theory of diffraction (Continued...)

Lecture 42 - Theory of diffraction (Continued...)

Lecture 43 - Single slit diffraction

Lecture 44 - Double slit diffraction

Lecture 45 - Plane transmission grating

Lecture 46 - Plane transmission grating (Continued...)

Lecture 47 - Theory of polarization

Lecture 48 - Theory of polarization (Continued...)

Lecture 49 - Experiment for Verification of Malus law

Lecture 50 - Experiment for brewester

Lecture 51 - Experiment for Brewester angle

Lecture 52 - Experiment on e-ray and o-ray

Lecture 53 - Polarimeter

Lecture 54 - Zone-plate Theory

Lecture 55 - Zone-plate Experiment

Lecture 56 - Theory of Photoelectric Effect

Lecture 57 - Experiment on Photoelectric Effect

Lecture 58 - Thomson experiment to determine the specific charge of an electron (e/m)

Lecture 59 - Frank-Hertz Experiment

Lecture 60 - Experiment on Rydberg constant

Lecture 61 - Experiment on Rydberg constant (Continued...)

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

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

Lecture 32 - Electrostatic dipole

Lecture 33 - Electric dipole (Continued...)

Lecture 34 - Multipole expansion

Lecture 35 - Monopole and Dipole moment

Lecture 36 - Quadrupole moment

Lecture 37 - Dipole and Quadrupole moment (Continued...)

Lecture 38 - Conductor

Lecture 39 - Conductor (Continued...)

Lecture 40 - Boundary condition

Lecture 41 - Electrostatic pressure, Capacitor

Lecture 42 - Energy of the Capacitor, Dielectric

Lecture 43 - Dielectric (Continued...)

Lecture 44 - Displacement Vector

Lecture 45 - Electrostatic boundary value problem

Lecture 46 - Electrostatic boundary value problem (Continued...)

Lecture 47 - Electrostatic boundary value problem (Continued...), Image method

Lecture 48 - Image method (Continued...)

Lecture 49 - Charge particle in magnetic field

Lecture 50 - Biot-Savart Law

Lecture 51 - Application of Biot-Savart Law

Lecture 52 - Ampere's Law

Lecture 53 - Application of Ampere's Law

Lecture 54 - Magnetic vector potential

Lecture 55 - Magnetic vector potential (Continued...)

Lecture 56 - Magnetic dipole moment

Lecture 57 - Magnetic dipole moment (Continued...)

Lecture 58 - Torque and potential energy of magnetic dipole, Magnetization

Lecture 59 - Bound Current

Lecture 60 - Magnetic materials

Lecture 61 - Electromagnetic Induction

Lecture 62 - Self and mutual inductance

Lecture 63 - Wave equation, Maxwellâ€™s Equation

Lecture 64 - Maxwells Equation (Continued...)

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

Co-ordinators : Prof. Amreesh Chandra

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

Lecture 1 - Principles of Condensed Matter Physics

Lecture 2 - Symmetry in Perfect Solids

Lecture 3 - Symmetry in Perfect Solids (Continued...)

Lecture 4 - Symmetry in Perfect Solids - Worked Examples

Lecture 5 - Diffraction Methods For Crystal Structures

Lecture 6 - Diffraction Methods For Crystal Structures (Continued...)

Lecture 7 - Diffraction Methods For Crystal Structures - Worked Examples

Lecture 8 - Physical Properties of Crystals

Lecture 9 - Physical Properties of Crystals (Continued...)

Lecture 10 - Physical Properties of Crystals - Worked Examples

Lecture 11 - Cohesion in Solids

Lecture 12 - Cohesion in Solids - Worked Examples

Lecture 13 - The Free Electron Theory of Metals

Lecture 14 - The Free Electron Theory of Metals - Worked Examples

Lecture 15 - The Free Electron Theory of Metals - Electrical Conductivity

Lecture 16 - The Free Electron Theory of Metals - Electrical Conductivity - Worked Examples

Lecture 17 - Thermal Conductivity of Metals

Lecture 18 - Thermal Conductivity of Metals - Worked Examples

Lecture 19 - The Concept of Phonons

Lecture 20 - Debye Theory of Specific Heat, Lattice Vibrations

Lecture 21 - Debye Theory of Specific Heat, Lattice Vibrations - Worked Examples

Lecture 22 - Lattice Vibrations (Continued) Phonon thermal conductivity

Lecture 23 - Lattice Vibrations (Continued) Phonon Thermal Conductivity - Worked Examples

Lecture 24 - Anharmonicity and Thermal Expansion

Lecture 25 - Dielectric (Insulating) Solids

Lecture 26 - Dispersion and Absorption of Electromagnetic Waves in Dielectric Media, Ferro-and Antiferroelectrics

Lecture 27 - Optical Properties of Metals; Ionic Polarization in Alkali Halides; Piezoelectricity

Lecture 28 - Dielectric Solids - Worked Examples

Lecture 29 - Dia - and Paramagnetism

Lecture 30 - Paramagnetism of Transition Metal and Rare Earth Ions

Lecture 31 - Quenching of Orbital Angular Momentum; Ferromagnetism

Lecture 32 - Exchange Interactions, Magnetic Order, Neutron Diffraction

Lecture 33 - Hysteresis and Magnetic Domains; Spin Waves and Magnons

Lecture 34 - Magnetic Resonance

Lecture 35 - Magnetism and Magnetic Resonance - Worked Examples

Lecture 36 - Magnetism - Worked Examples (Continued...)

Lecture 37 - Pauli Paramagnetism and Landau Diamagnetism

Lecture 38 - Band Magnetism; Itinerant Electrons; Stoner Model

Lecture 39 - Superconductivity - Perfect Electrical Conductivity and Perfect Diamagnetism

Lecture 40 - Type I and Type II Superconductors

Lecture 41 - Ginsburg - Landau Theory, Flux Quantization

Lecture 42 - Cooper Pairs

Lecture 43 - Microscopic (BCS) Theory of Superconductivity

Lecture 44 - BCS Theory (Continued...): Josephson Tunneling: Quantum Interference

Lecture 45 - Josephson Effect (Continued...); High Temperature Superconductors

Lecture 46 - Superconductors - Worked Examples

Lecture 47 - Energy Bands in Solids

Lecture 48 - Electron Dynamics in a Periodic Solid

Lecture 49 - Semiconductors

Lecture 50 - Semiconductors (Continued...)

Lecture 51 - Semiconductors - Worked Examples

Lecture 52 - Defects in Solids - Point Defects

Lecture 53 - Point Defects in Solids - Worked Examples

Lecture 54 - Defects in Solids - Line and Surface Defects

Lecture 55 - Dislocations in Solids - Worked Examples

Lecture 56 - Quantum Fluids and Quantum Solids

Lecture 57 - Quantum Liquids and Quantum Solids - Worked Examples

Lecture 58 - Epilogue

NPTEL : Quantum Field Theory (Physics)

Co-ordinators : Dr. Prasanta Tripathy

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

Lecture 1 - Introduction to the STiTACS course

Lecture 2 - Quantum Theory of collisions

Lecture 3 - Quantum Theory of collisions: optical Theorem

Lecture 4 - Quantum Theory of collisions: Optical Theorem (Continued...)

Lecture 5 - Quantum Theory of collisions: Differential scattering cross section

Lecture 6 - Quantum Theory of collisions: Differential scattering cross section, Partial wave analysis

Lecture 7 - Quantum Theory of collisions: Optical Theorem Â– Unitarity of the Scattering Operator

Lecture 8 - Quantum Theory of collisions: Reciprocity Theorem, Phase shift analysis

Lecture 9 - Quantum Theory of collisions: More on Phase shift analysis

Lecture 10 - Quantum Theory of collisions: resonant condition in the l th partial wave.

Lecture 11 - Quantum Theory of collisions: LevinsonÂ’s theorem

Lecture 12 - Quantum Theory of collisions: LevinsonÂ’s theorem (Continued...)

Lecture 13 - Many body theory, electron correlations

Lecture 14 - Second Quantization Creation, Destruction and Number operators

Lecture 15 - Many-particle Hamiltonian & Schrodinger Equation in 2nd Quantization

Lecture 16 - Many-electron problem in quantum mechanics

Lecture 17 - Hartree-Fock Self-Consistent-Field

Lecture 18 - Exchange, Statistical, Fermi-Dirac correlations

Lecture 19 - Limitations of the Hartree-Fock Self-Consistent-Field formalism

Lecture 20 - Many-Body formalism, II Quantization

Lecture 21 - Density fluctuations in an electron gas

Lecture 22 - Bohm-Pines approach to Random Phase Approximation

Lecture 23 - Bohm-Pines approach to Random Phase Approximation (Continued...)

Lecture 24 - Bohm-Pines approach to Random Phase Approximation (Continued...)

Lecture 25 - Schrodinger, Heisenberg and Dirac Â“picturesÂ” of QM

Lecture 26 - DysonÂ’s chronological operator

Lecture 27 - Gell-Mann-Low Theorem

Lecture 28 - Reyleigh-Schrodinger perturbation methods and adiabatic switching

Lecture 29 - Feynman Diagrams

Lecture 30 - I Order Feynman Diagrams

Lecture 31 - II and higher order Feynman Diagrams

NPTEL : Selected Topics in Mathematical Physics (Physics)

Co-ordinators : Prof. V. Balakrishnan

Lecture 1 - Analytic functions of a complex variable - Part I

Lecture 2 - Analytic functions of a complex variable - Part II

Lecture 3 - Calculus of residues - Part I

Lecture 4 - Calculus of residues - Part II

Lecture 5 - Calculus of residues - Part III

Lecture 6 - Calculus of residues - Part IV

Lecture 7 - Linear response; dispersion relations - Part I

Lecture 8 - Linear response; dispersion relations - Part II

Lecture 9 - Analytic continuation and the gamma function - Part I

Lecture 10 - Analytic continuation and the gamma function - Part II

Lecture 11 - MÃ¶bius transformations - Part I

Lecture 12 - MÃ¶bius transformations - Part II

Lecture 13 - MÃ¶bius transformations - Part III

Lecture 14 - Multivalued functions; integral representations - Part I

Lecture 15 - Multivalued functions; integral representations - Part II

Lecture 16 - Multivalued functions; integral representations - Part III

Lecture 17 - Multivalued functions; integral representations - Part IV

Lecture 18 - Laplace transforms - Part I

Lecture 19 - Laplace transforms - Part II

Lecture 20 - Fourier transforms - Part I

Lecture 21 - Fourier transforms - Part II

Lecture 22 - Fourier transforms - Part III

Lecture 23 - Fundamental Green function forÎ”2 - Part I

Lecture 24 - Fundamental Green function forÎ”2 - Part II

Lecture 25 - The diffusion equation - Part I

Lecture 26 - The diffusion equation - Part II

Lecture 27 - The diffusion equation - Part III

Lecture 28 - The diffusion equation - Part IV

Lecture 29 - Green function for (Î”2 + k2); nonrelativistic scattering - Part I

Lecture 30 - Green function for (Î”2 + k2); nonrelativistic scattering - Part II

Lecture 31 - Green function for (Î”2 + k2); nonrelativistic scattering - Part III

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

Lecture 1 - Recapitulation of equilibrium statistical mechanics

Lecture 2 - The Langevin model (Part 1)

Lecture 3 - The Langevin model (Part 2)

Lecture 4 - The Langevin model (Part 3)

Lecture 5 - The Langevin model (Part 4)

Lecture 6 - Linear response theory (Part 1)

Lecture 7 - Linear response theory (Part 2)

Lecture 8 - Linear response (Part 3)

Lecture 9 - Linear response(Part 4)

Lecture 10 - Linear response (Part 5)

Lecture 11 - Linear response (Part 6)

Lecture 12 - Linear response theory (Part 7)

Lecture 13 - Quiz 1 - Questions and answers

Lecture 14 - Linear response theory (Part 8)

Lecture 15 - Linear response theory (Part 9)

Lecture 16 - The dynamic mobility

Lecture 17 - Fokker-Planck equations (Part 1)

Lecture 18 - Fokker-Planck equations (Part 2)

Lecture 19 - Fokker-Planck equations (Part 3)

Lecture 20 - The generalized Langevin equation (Part 1)

Lecture 21 - The generalized Langevin equation (Part 2)

Lecture 22 - Diffusion in a magnetic field

Lecture 23 - The Boltzmann equation for a dilute gas (Part 1)

Lecture 24 - The Boltzmann equation for a dilute gas (Part 2)

Lecture 25 - The Boltzmann equation for a dilute gas (Part 3)

Lecture 26 - The Boltzmann equation for a dilute gas (Part 4)

Lecture 27 - The Boltzmann equation for a dilute gas (Part 5)

Lecture 28 - Quiz 2 - Questions and answers

Lecture 29 - Critical phenomena (Part 1)

Lecture 30 - Critical phenomena (Part 2)

Lecture 31 - Critical phenomena (Part 3)

NPTEL : NOC:Statistical Mechanics (Physics)

Co-ordinators : Prof. Ashwin Joy

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

NPTEL : NOC:Physics through Computational Thinking (Physics)

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

Lecture 1 - Introduction to Mathematica, Wolfram language and Wolfram Cloud

Lecture 2 - Technical Prelim 1

Lecture 3 - Plotting Simple Functions

Lecture 4 - Function Behaviour near Extrema

Lecture 5 - Radicals and Logarithms

Lecture 6 - Properties of Functions

Lecture 7 - Vector Fields, Vector and Streamline Plots and Contour Plots

Lecture 8 - Introduction to Non-dimesionalisation

Lecture 9 - Non-dimensionalization and visual thinking

Lecture 10 - Non-dimensionalisation and Parametric Plot

Lecture 11 - Technical Prelim 2: Loops

Lecture 12 - Introduction to Simple Harmonic Oscillator

Lecture 13 - Simple Harmonic Oscillator with a spring mass system

Lecture 14 - More Examples of Simple Harmonic Oscillator

Lecture 15 - Anharmonic Oscillator

Lecture 16 - Introduction to Data Analysis - 1

Lecture 17 - Introduction to Data Analysis - 2

Lecture 18 - Curve fitting

Lecture 19 - Linear superposition of oscillations

Lecture 20 - Technical Prelim 3: Introduction to Calculus Tools

Lecture 21 - Damped Harminic Oscillator: LCR Circuit

Lecture 22 - Solving Initial Value Problem with Mathemtica

Lecture 23 - Damped Harmonic Oscillator: Spring-mass System with Friction

Lecture 24 - Technical Prelim 4: Manipulation of Lists using @, @@, /@ operators

Lecture 25 - Introduction to Euler's Method for Solving Differential Equation

Lecture 26 - Technical Prelim 5: Writing Custom Functions

Lecture 27 - Writing Euler's Method as a custom function

Lecture 28 - Mean Global Error in Euler's method and Application of Euler's method to damped oscillator

Lecture 29 - Improved Euler (RK2) and RK4 Methods for solving ODEs

Lecture 30 - Driven oscillations

Lecture 31 - Driven oscillations using the Improved Euler method

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

Lecture 32 - Two-body problem, Conic Sections in Polar Coordinates

Lecture 33 - Two-body problem, Ellipse in polar coordinates

Lecture 34 - Orbits in Kepler Problem

Lecture 35 - Apsidal distances, eccentricity of orbits

Lecture 36 - Kepler's Third law; Laplace-Runge-Lenz vector

Lecture 37 - Rigid Body, degrees of freedom

Lecture 38 - Rigid Body, Transfromation matrix

Lecture 39 - Rigid Body, Euler Angles

Lecture 40 - Parameterization using Euler Angles

Lecture 41 - Rigid Body, Euler's Theorem

Lecture 42 - General motion of a rigid body

Lecture 43 - Moment of Inertia Tensor

Lecture 44 - Principal Moments

Lecture 45 - Langrangian of a rigid body

Lecture 46 - Motion of a free symmetric top

Lecture 47 - Angular velocity using Euler angles

Lecture 48 - Lagrangian of a heavy symmetric top

Lecture 49 - First integrals of a heavy symmetric top

Lecture 50 - Nutation and Precission of a heavy symmetric top

Lecture 51 - Sleeping Top

Lecture 52 - Rotating Frames. Euler Equations

Lecture 53 - Calculus of Variations: Functionals

Lecture 54 - Method of Lagrange Multipliers

Lecture 55 - Calculus of Variations: Condition for extremum

Lecture 56 - Calculus of Variations: Several variables

Lecture 57 - Cartesian Tensors

Lecture 58 - Hamiltonian Mechanics: Hamilton's equations of motion

Lecture 59 - Hamiltonian Mechanics: Liouville's theorem

Lecture 60 - Hamiltonian Mechanics: Poisson Bracket

Lecture 61 - Hamiltonian Mechanics: Canonical Coordinates

Lecture 62 - Hamiltonian Mechanics: Generating Function of Canonical Transformations

Lecture 63 - Hamiltonian Mechanics: Generating functions of the 4 kinds

Lecture 64 - Examples of Generating Functions

NPTEL : NOC:Fluid Dynamics for Astrophysics (Physics)

Co-ordinators : Prof. Prasad Subramanian

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 65 - Ultra Relativistic Bose Gas Stefan Boltzmann Law

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

Co-ordinators : Prof. Nirmal Ganguli

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

Co-ordinators : Prof. Anurag Tripathi

Lecture 1 - Quantum Filed Theory

Lecture 2 - Quantizing Schrodinger Field

Lecture 3 - Quantizing Schrodinger Field (Continued...)

Lecture 4 - Symmetry and normalization of the states

Lecture 5 - A multiparticle system of Bosons

Lecture 6 - Klein-Gordon Equation

Lecture 7 - Quantization of Klein-Gordon Theory

Lecture 8 - Quantization of Klein-Gordon Theory (Continued...)

Lecture 9 - Quantization of Klein-Gordon Theory (Continued...)

Lecture 10 - Quantization of Klein-Gordon Theory (Continued...)

Lecture 11 - Quantization of Klein-Gordon Theory (Continued...)

Lecture 12 - Qunatization of Klein-Gordon Theory (Continued...)

Lecture 13 - Quantization of Klein-Gordon Theory (Continued...)

Lecture 14 - Feynman propagator - 2

Lecture 15 - Feynman propagator - 3

Lecture 16 - Symmetries

Lecture 17 - Lorentz transformations

Lecture 18 - Lorentz transformations (Continued...)

Lecture 19 - Lorentz Group

Lecture 20 - Groups and Generators

Lecture 21 - SU(3) Generators

Lecture 22 - Representation of groups. Poincare group

Lecture 23 - Poincare Algebra

Lecture 24 - Symmetries in Classical Field Theories

Lecture 25 - Symmetries (Continued...)

Lecture 26 - Symmetries (Continued...)

Lecture 27 - Symmetries (Continued...)

Lecture 28 - Noether's theorem: The Proof

Lecture 29 - Noether's theorem (Continued...)

Lecture 30 - Momentum in KG Theory

Lecture 31 - Noether Currents corresponding to Lorentz symmetry

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

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

Lecture 32 - Optical Fiber Components and Devices - V

Lecture 33 - Optical Sources and Detectors - I

Lecture 34 - Optical Sources and Detectors - II

Lecture 35 - Optical Sources and Detectors - III

Lecture 36 - Optical Sources and Detectors - IV

Lecture 37 - Optical Sources and Detectors - V

Lecture 38 - System Design Aspects

Lecture 39 - Optical Fiber Measurements

Lecture 40 - Summary and Recent Advances

NPTEL : 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

Lecture 32 - Applicationss of Perovskite Single Crystal Solar Cells

Lecture 33 - Organic Nano Particles Based Solar Cells

Lecture 34 - Morphology Optimization in Organic Nanoparticle Based Solar Cells

Lecture 35 - Multijunction Tandem Solar Cells

Lecture 36 - Introduction to Characterization Techniques

Lecture 37 - Vacuum Technology in Solar Photovoltaics

Lecture 38 - Introduction of Pressure Gauges

Lecture 39 - Electron Microscopy in Solar Photovoltaics

Lecture 40 - Impedance Spectroscopy

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

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 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

NPTEL : Relativistic Quantum Mechanics (Physics)

Co-ordinators : Prof. Apoorva D Patel

Lecture 32 - Charge quantisation, Photon propagator, Current conservation and polarisations

Lecture 33 - Feynman rules for Quantum Electrodynamics, Nature of perturbative expansion

Lecture 34 - Dyson's analysis of the perturbation series, Singularities of the S-matrix, Elementary QED processes

Lecture 35 - The T-matrix, Coulomb scattering

Lecture 36 - Mott cross-section, Compton scattering

Lecture 37 - Klein-Nishina result for cross-section

Lecture 38 - Photon polarisation sums, Pair production through annihilation

Lecture 39 - Unpolarised and polarised cross-sections

Lecture 40 - Helicity properties, Bound state formation

Lecture 41 - Bound state decay, Non-relativistic potentials

Lecture 42 - Lagrangian formulation of QED, Divergences in Green's functions, Superficially divergent 1-loop diagrams and regularisation

Lecture 43 - Infrared divergences due to massless particles, Renormalisation and finite physical results

Lecture 44 - Symmetry constraints on Green's functions, Furry's theorem, Ward-Takahashi identity, Spontaneous breaking of gauge symmetry and superconductivity

Lecture 45 - Status of QED, Organisation of perturbative expansion, Precision tests

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

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