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Co-ordinators : Dr. B.V.S. Viswanadham

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Co-ordinators : Dr. Deepankar Choudhury

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[Lecture 57 - RS and GIS application for Rural Development: Monitoring and Evaluation using NDVI and NDWI](#)

[Lecture 58 - RS and GIS application for Rural Development: Water Quality Assessment](#)

[Lecture 59 - RS and GIS application for Rural Development: Indicators and Dashboards](#)

[Lecture 60 - RS and GIS for Rural Development - Summary, Wrap and Ways Forward](#)

Lecture 1 - Doming and Diapirism

Lecture 2 - Isostasy - I

Lecture 3 - Isostasy - II

Lecture 4 - Ghyben-Herzberg law, Hydrostatic and Deviatoric stresses and strains

Lecture 5 - Resolution of stress as vectors

Lecture 6 - Addition and resolution of Stress (& Force) - I

Lecture 7 - Addition and resolution of Stress (& Force) - II

Lecture 8 - Addition and resolution of Stress (& Force) - III

Lecture 9 - Addition and resolution of Stress (& Force) - IV

Lecture 10 - Principle of centrifuge analogue modeling

Lecture 11 - Stress Issue: Mohr circle - I

Lecture 12 - Stress Issue: Mohr circle - II

Lecture 13 - Stress Issue: Mohr circle - III

Lecture 14 - Stress Issue: Mohr circle - IV

Lecture 15 - Strain parameters: Definitions and Calculations - I

Lecture 16 - Finding out areas of irregular geometries

Lecture 17 - Elementary strain analysis - I

Lecture 18 - Elementary strain analysis - II

Lecture 19 - Stress and strain behaviour of rocks - I

Lecture 20 - Stress and strain behaviour of rocks - II

Lecture 21 - Stress and strain behaviour of rocks - III

Lecture 22 - Ductile simple shear zone kinematics - I

Lecture 23 - Ductile simple shear zone kinematics - II

Lecture 24 - Ductile simple shear zone kinematics - III

Lecture 25 - Ductile simple shear zone kinematics - IV

Lecture 26 - Ductile simple shear zone kinematics - V

Lecture 27 - Ductile simple shear zone kinematics - VI

Lecture 28 - Ductile simple shear zone kinematics - VII

Lecture 29 - Ductile simple shear zone kinematics - VIII

Lecture 30 - Ductile pure shear zone kinematics

Lecture 31 - Ductile pure shear zone kinematics and Taylor-Couette flow

[Lecture 32 - Taylor-Couette flow](#)

[Lecture 33 - Introduction to Second-Rank Tensors - I](#)

[Lecture 34 - Introduction to Second-Rank Tensors - II](#)

[Lecture 35 - Second-Rank Tensors and Stress Issues - I](#)

[Lecture 36 - Second-Rank Tensors and Stress Issues - II](#)

[Lecture 37 - Second-Rank Tensors and Stress Issues - III](#)

[Lecture 38 - Cauchy Stress Tetrahedron](#)

[Lecture 39 - Stress Invariants](#)

[Lecture 40 - Stress and strain invariants, Hooke law for isotropic materials](#)

[Lecture 41 - Hooke's law - II](#)

[Lecture 42 - Triaxial stress applied on materials with thermal effects](#)

[Lecture 43 - How stress can alter permeability, double dot product and applications](#)

[Lecture 44 - Deviatoric stress and strain, deformation gradient and Jacobian matrix](#)

[Lecture 45 - General definition of 3D strain, application of Jacobian matrix](#)

[Lecture 46 - Application of Jacobian matrix, nonhomogeneous deformation](#)

[Lecture 47 - Rotation and translation - changes in coordinates](#)

[Lecture 48 - Principles of 1g analogue modeling - I](#)

[Lecture 49 - Principles of 1g analogue modeling - II](#)

[Lecture 50 - Principles of 1g analogue modeling - III](#)

[Lecture 51 - Anderson's theory of faulting](#)

[Lecture 52 - Stereoplot of principal stress axes - I](#)

[Lecture 53 - Stereoplot of principal stress axes - II](#)

[Lecture 54 - Stereoplot of principal stress axes - III](#)

[Lecture 55 - Deduction of principal stress axes orientation from fault data](#)

[Lecture 56 - Elementary stress problems dealing with stereonet - I](#)

[Lecture 57 - Elementary stress problems dealing with stereonet - II](#)

[Lecture 58 - Poroelasticity - I](#)

[Lecture 59 - Poroelasticity - II, stereonet problem](#)

[Lecture 60 - Poroelasticity - III](#)

Lecture 1 - Production and Composition

Lecture 2 - Structure and Hydration

Lecture 3 - Structure and Hydration

Lecture 4 - Properties and Tests

Lecture 5 - Types and Use

Lecture 6 - Aggregates (Size, Shape)

Lecture 7 - Packing, FM, SM

Lecture 8 - Properties

Lecture 9 - Chemical Admixtures

Lecture 10 - Chemical Admixtures

Lecture 11 - Mineral Admixtures

Lecture 12 - Mineral Admixtures

Lecture 13 - Mineral Admixtures

Lecture 14 - Mix Proportioning of Concrete: General Principles

Lecture 15 - Mix design of Concrete: General and IS Method

Lecture 16 - Mix Design of Concrete: Is Example and British (DOE) Method

Lecture 17 - Mix Design of concrete: ACI 211 Method

Lecture 18 - Mix Design of concrete: Packing Density, Rheology

Lecture 19 - Batching and Mixing of concrete: General Principles

Lecture 20 - RMC and Transporting Concrete

Lecture 21 - Workability and Pumping of Concrete

Lecture 22 - Compaction and Curing Concrete

Lecture 23 - Strength of Concrete: Factors Affecting

Lecture 24 - Strength of Concrete: Aggregate Contribution

Lecture 25 - Strength of Concrete: Factors Affecting Test Results

Lecture 26 - Mechanical Properties of Concrete: Elastic Modulus, Poisson's Ratio, Fatigue, Impact

Lecture 27 - Creep of Concrete

Lecture 28 - Creep and Shrinkage of Concrete

Lecture 29 - Shrinkage of Concrete

Lecture 30 - Shrinkage of Concrete

Lecture 31 - Fundamental Concepts, Degradation Process, Attacks

[Lecture 32 - Frost Action and Rebar Corrosion](#)

[Lecture 33 - Carbonation and Chloride Affect](#)

[Lecture 34 - Rebar Corrosion](#)

[Lecture 35 - Rebar Corrosion and General Strategy](#)

[Lecture 36 - High Strength Concrete](#)

[Lecture 37 - High Strength Matrics and SCC](#)

[Lecture 38 - Self Compacting Concrete](#)

[Lecture 39 - Fiber Concrete](#)

[Lecture 40 - Fiber and Roller Compacted Concrete](#)

[Lecture 41 - Special Concrete and Sustainability](#)

NPTEL : Seismic Analysis of Structures (Civil Engineering)

Co-ordinators : Dr. T.K. Datta, Dr. Ashok Gupta

[Lecture 1 - Seismology](#)

[Lecture 2 - Seismology \(Continued...\)](#)

[Lecture 3 - Seismology \(Continued...\)](#)

[Lecture 4 - Seismology \(Continued...\)](#)

[Lecture 5 - Seismic Inputs](#)

[Lecture 6 - Seismic Inputs \(Continued...\)](#)

[Lecture 7 - Seismic Inputs \(Continued...\)](#)

[Lecture 8 - Seismic Inputs \(Continued...\)](#)

[Lecture 9 - Response Analysis for Specified Ground Motion](#)

[Lecture 10 - Response Analysis for Specified Ground Motion \(Continued...\)](#)

[Lecture 11 - Response Analysis for Specified Ground Motion \(Continued...\)](#)

[Lecture 12 - Response Analysis for Specified Ground Motion \(Continued...\)](#)

[Lecture 13 - Response Analysis for Specified Ground Motion \(Continued...\)](#)

[Lecture 14 - Response Analysis for Specified Ground Motion \(Continued...\)](#)

[Lecture 15 - Frequency Domain Spectral Analysis](#)

[Lecture 16 - Frequency Domain Spectral Analysis.](#)

[Lecture 17 - Frequency Domain Spectral Analysis \(Continued...\)](#)

[Lecture 18 - Frequency Domain Spectral Analysis \(Continued...\)](#)

[Lecture 19 - Frequency Domain Spectral Analysis \(Continued...\)](#)

[Lecture 20 - Response Spectrum Method of Analysis](#)

[Lecture 21 - Response Spectrum Method of Analysis.](#)

[Lecture 22 - Response Spectrum Method of Analysis \(Continued...\)](#)

[Lecture 23 - Response Spectrum Method of Analysis \(Continued...\)](#)

[Lecture 24 - Response Spectrum Method of Analysis \(Continued...\)](#)

[Lecture 25 - Inelastic Seismic Response of Structures](#)

[Lecture 26 - Inelastic Seismic Response of Structures \(Continued...\)](#)

[Lecture 27 - Inelastic Seismic Response of Structures \(Continued...\)](#)

[Lecture 28 - Inelastic Seismic Response of Structures \(Continued...\)](#)

[Lecture 29 - Inelastic Seismic Response of Structures \(Continued...\)](#)

[Lecture 30 - Inelastic Seismic Response of Structures \(Continued...\)](#)

NPTEL : Building materials and Construction (Civil Engineering)

Co-ordinators : Dr. B. Bhattacharjee

[Lecture 1 - Functions Of Buildings](#)

[Lecture 2 - Role Of Material In Construction](#)

[Lecture 3 - Concrete:Material](#)

[Lecture 4 - Concrete Production \(Continued...\)](#)

[Lecture 5 - Concrete Production \(Continued...\)](#)

[Lecture 6 - Concrete:Production Pumping, Placing](#)

[Lecture 7 - Concrete:Production Curing](#)

[Lecture 8 - Cement: Hydration](#)

[Lecture 9 - Cement and Cementitious Material](#)

[Lecture 10 - Fresh Concrete](#)

[Lecture 11 - Fresh Concrete : Role of Mix Parameters](#)

[Lecture 12 - Fresh Concrete : Role of Admixtures](#)

[Lecture 13 - Fresh Concrete : Segregation Bleeding](#)

[Lecture 14 - Strength of Concrete - I](#)

[Lecture 15 - Strength of Concrete - II](#)

[Lecture 16 - Strength of Concrete - III](#)

[Lecture 17 - Mechanical Properties of Concrete - I](#)

[Lecture 18 - Mechanical Properties of Concrete - II](#)

[Lecture 19 - Strength of Concrete : Non Destructive](#)

[Lecture 20 - Durability of Concrete - I](#)

[Lecture 21 - Durability of Concrete - II](#)

[Lecture 22 - Durability of Concrete - III](#)

[Lecture 23 - Cement Aggregate and Water Selection](#)

[Lecture 24 - Mix Design of Concrete](#)

[Lecture 25 - Mix Design Of concrete IS Method](#)

[Lecture 26 - Mix Design Of Concrete: British](#)

[Lecture 27 - Masonry : Materials](#)

[Lecture 28 - Masonry : Walls](#)

[Lecture 29 - Masonry : Walls; Resistance - I](#)

[Lecture 30 - Masonry : Walls; Resistance - II](#)

[Lecture 31 - Walls : Functional Performances](#)

[Lecture 32 - Walls : Defects and Durability](#)

[Lecture 33 - Metals Fundamentals](#)

[Lecture 34 - Metals and Iron Systems](#)

[Lecture 35 - Steel : Uses in Construction](#)

[Lecture 36 - Steel : Uses in Rebar](#)

[Lecture 37 - Polymer in Construction](#)

[Lecture 38 - Polymer in Construction : Uses](#)

[Lecture 39 - Glass and Timber : Glass](#)

[Lecture 40 - Glass and Timber : Timber](#)

[Lecture 41 - Roof and Floor Construction](#)

Lecture 1 - Introduction to Irrigation Water Management

Lecture 2 - Soil - Water - Plant Relationships

Lecture 3 - Soil - Water - Plant Relationships (Continued...)

Lecture 4 - Soil - Water - Plant Relationships (Continued...)

Lecture 5 - Soil - Water - Plant Relationships (Continued...)

Lecture 6 - Soil - Water - Plant Relationships (Continued...) and Infiltration

Lecture 7 - Crop Water Requirements

Lecture 8 - Crop Water Requirements (Continued...)

Lecture 9 - Crop Water Requirements (Continued...)

Lecture 10 - Crop Water Requirements (Continued...)

Lecture 11 - Crop Water Requirements (Continued...)

Lecture 12 - Crop Water Requirements (Continued...)

Lecture 13 - Crop Water Requirements (continued...)

Lecture 14 - Irrigation Efficiencies - Part I

Lecture 15 - Irrigation Efficiencies - Part II and Irrigation Methods and their Suitability

Lecture 16 - Irrigation Methods - III

Lecture 17 - Irrigation Methods - IV

Lecture 18 - Irrigation Methods - V

Lecture 19 - Irrigation Methods - VI

Lecture 20 - Irrigation Methods and their Suitability

Lecture 21 - Border Irrigation System - I

Lecture 22 - Border Irrigation System - II

Lecture 23 - Border Irrigation System - III

Lecture 24 - Border Irrigation System - IV

Lecture 25 - Furrow Irrigation System - I

Lecture 26 - Furrow Irrigation System - II

Lecture 27 - Furrow Irrigation System - III

Lecture 28 - Furrow Irrigation System - IV

Lecture 29 - Sprinkler Irrigation System - I

Lecture 30 - Sprinkler Irrigation System - II

Lecture 31 - Sprinkler Irrigation System - III

[Lecture 32 - Sprinkler Irrigation System - IV](#)

[Lecture 33 - Sprinkler Irrigation System - V](#)

[Lecture 34 - Sprinkler Irrigation System - VI](#)

[Lecture 35 - Sprinkler Irrigation System - VII](#)

[Lecture 36 - Sprinkler Irrigation System - VIII](#)

[Lecture 37 - Drip Irrigation System - I](#)

[Lecture 38 - Drip Irrigation System - II](#)

[Lecture 39 - Drip Irrigation System - III](#)

[Lecture 40 - Drip Irrigation System - IV](#)

**NPTEL : NOC:Geoenvironmental Engineering (Environmental Geotechnology) Landfills, Slurry Ponds and Contaminated Sites
(Civil Engineering)**

Co-ordinators : Prof. Manoj Datta

Lecture 1 - Introduction to Geoenvironmental Engineering

Lecture 2 - Sources and Impact of Contamination

Lecture 3 - Waste-Soil Interaction

Lecture 4 - Solid Waste Generation and Disposal

Lecture 5 - Waste Minimization by Integrated Solid Waste Management (ISWM)

Lecture 6 - Integrated Solid Waste Management (ISWM) - Case Studies

Lecture 7 - Principles of Landfilling

Lecture 8 - Planning of Landfills - Part 1

Lecture 9 - Planning of Landfills - Part 2

Lecture 10 - Liners for Landfills - Part 1

Lecture 11 - Liners for Landfills - Part 2

Lecture 12 - Liners for Landfills - Part 3

Lecture 13 - Liners for Landfills - Part 4

Lecture 14 - Covers for Landfills - Part 1

Lecture 15 - Covers for Landfills - Part 2

Lecture 16 - Generation and Control of Leachate

Lecture 17 - Generation and Control of Landfill Gas

Lecture 18 - Stability of Slopes - Part 1

Lecture 19 - Stability of Slopes - Part 2

Lecture 20 - Stability of Slopes - Part 3

Lecture 21 - (Lecture Missing)

Lecture 22 - Some Solved Examples

Lecture 23 - Subsurface Monitoring Around Landfills - Part 1

Lecture 24 - Subsurface Monitoring Around Landfills - Part 2

Lecture 25 - Cost of Geotechnical Components of Landfills

Lecture 26 - Construction and Operation of Landfills

Lecture 27 - Site Selection for Landfills

Lecture 28 - Closure, Rehabilitation and Expansion of MSW Landfills

Lecture 29 - Control and Remedial Measures at Contaminated Sites - Part 1

Lecture 30 - Control and Remedial Measures at Contaminated Sites - Part 2

[Lecture 31 - Slurry Disposal on Land](#)

[Lecture 32 - Disposal of Slurry Waste in Ponds and Impoundments and Dry Waste in Mounds](#)

[Lecture 33 - Geotechnical Properties of Coal Ash and Mine Tailings - Part 1](#)

[Lecture 34 - Geotechnical Properties of Coal Ash and Mine Tailings - Part 2](#)

[Lecture 35 - Planning and Design of Slurry Ponds](#)

[Lecture 36 - Stability of Incrementally Raised Embankments - Part 1](#)

[Lecture 37 - Stability of Incrementally Raised Embankments - Part 2](#)

[Lecture 38 - Remedial Measures for Slope Failures in Embankments / Dykes of Slurry Ponds](#)

[Lecture 39 - Environmental Control at Slurry Ponds](#)

[Lecture 40 - Geotechnical Reuse of Waste Materials - Part 1](#)

[Lecture 41 - Geotechnical Reuse of Waste Materials - Part 2](#)

[Lecture 42 - End-of-the-Course Review](#)

[Lecture 1 - Introduction to Environmental Factors - 1](#)

[Lecture 2 - Introduction to Environmental Factors - 2](#)

[Lecture 3 - Introduction to Environmental Factors - 3](#)

[Lecture 4 - Introduction to Environmental Factors - 4](#)

[Lecture 5 - Introduction to Environmental Factors - 5](#)

[Lecture 6 - Introduction to Environmental Factors - 6](#)

[Lecture 7 - Introduction to Environmental Factors - 7](#)

[Lecture 8 - Comfort and Heat Transfer Concepts](#)

[Lecture 9 - Heat Flow in Buildings - 1](#)

[Lecture 10 - Heat Flow in buildings - 2](#)

[Lecture 11 - Heat Flow in buildings - 3](#)

[Lecture 12 - Admittance Method - 1](#)

[Lecture 13 - Admittance Method - 2](#)

[Lecture 14 - Heat Flow in buildings - 1 \(Frequency Domain\)](#)

[Lecture 15 - Heat Flow in buildings - 2 \(Frequency Domain\)](#)

[Lecture 16 - Heat Flow in buildings - 2 \(Frequency Domain\)](#)

[Lecture 17 - Heat flow in buildings](#)

[Lecture 18 - Admittance Method](#)

[Lecture 19 - Comfort - 1](#)

[Lecture 20 - Comfort - 2](#)

[Lecture 21 - Comfort and Thermal Design of Buildings - 1](#)

[Lecture 22 - Comfort and Thermal Design of Buildings - 2](#)

[Lecture 23 - Comfort and Thermal Design of Buildings - 3](#)

[Lecture 24 - Thermal Design of Unconditioned Building](#)

[Lecture 25 - External Shading Multipliers for external suns shading](#)

[Lecture 26 - Passive Concepts](#)

[Lecture 27 - Design for Thermal Efficiency](#)

[Lecture 28 - Ventilation - 1](#)

[Lecture 29 - Ventilation - 2](#)

[Lecture 30 - Natural ventilation design](#)

[Lecture 31 - Noise and Acoustic Fundamentals - 1](#)

[Lecture 32 - Noise and Acoustic Fundamentals - 2](#)

[Lecture 33 - Noise and Acoustic Fundamentals - 3](#)

[Lecture 34 - Noise and Acoustic Fundamentals, Noise Outdoors](#)

[Lecture 35 - Noise outdoors](#)

[Lecture 36 - Sound within enclosure - 1](#)

[Lecture 37 - Sound within enclosure - 2](#)

[Lecture 38 - Sound within enclosure - 3](#)

[Lecture 39 - Sound within enclosure - 4](#)

[Lecture 40 - Sound within enclosure - 5](#)

[Lecture 41 - Sound within enclosure - 6](#)

[Lecture 42 - Sound within enclosure, isolation](#)

[Lecture 43 - Isolation - 1](#)

[Lecture 44 - Isolation - 2](#)

[Lecture 45 - Auditorium - 1](#)

[Lecture 46 - Auditorium - 2](#)

[Lecture 47 - Daylighting - 1](#)

[Lecture 48 - Daylighting - 2](#)

[Lecture 49 - Daylighting - 3](#)

[Lecture 50 - Daylighting - 4](#)

[Lecture 51 - Daylighting - 5](#)

[Lecture 52 - Daylighting - 6](#)

[Lecture 53 - Artificial Lighting](#)

[Lecture 54 - Design Sky models](#)

[Lecture 55 - Live Session](#)

Lecture 1 - Basic concepts of Fire Protection - I

Lecture 2 - Basic concepts of Fire Protection - II

Lecture 3 - Fire Resistance

Lecture 4 - Introduction Process of Combustion

Lecture 5 - ventilation and fuel Process of Combustion controlled fire

Lecture 6 - Process of Combustion: Flashover condition

Lecture 7 - Effect of Fire on Construction Materials

Lecture 8 - Design for Fire Resistance: Steel

Lecture 9 - Design for Fire Resistance: Steel

Lecture 10 - Design for Fire Resistance: Concrete

Lecture 11 - Fire Safety: Urban Planning

Lecture 12 - Fire Safety: Escape and Refuge

Lecture 13 - Fire safety: Internal planning, Detection and Suppression

Lecture 14 - Fire Safety: Detection and Suppression

Lecture 15 - Introduction to Lift Design

Lecture 16 - Design of Lift systems

Lecture 17 - Design of Lift systems: expected stops and floor of reversal

Lecture 18 - Design of Lift systems: Different cases

Lecture 19 - Design of Lift systems: Simulation and arrangement and Escalators

Lecture 20 - Introduction to System and Flow Systems

Lecture 21 - Water Supply System: Constant Demand

Lecture 22 - Water Supply System: Variable Demand and Diversity Factor

Lecture 23 - Diversity factor (Continued...)

Lecture 24 - Control Systems

Lecture 25 - Introduction to HVAC

Lecture 26 - Governing Equations for HVAC Process

Lecture 27 - Numerical Problem on HVAC System

Lecture 28 - Numerical Problem on HVAC System (Continued...)

Lecture 29 - Psychrometric Chart: Equation based Approach

Lecture 30 - Flow in Pipe Networks and Fixture Units

Lecture 31 - Flow in Pipe Networks (Continued...) and Design of Water Supply Distribution System

[Lecture 32 - Design of Water Supply Distribution System \(Continued...\) and Flow in Waste Water pipes](#)

[Lecture 33 - Electrical Systems \(introduction\)](#)

[Lecture 34 - Design of Electrical Systems](#)

[Lecture 35 - Intelligent Building](#)

[Lecture 36 - Life cycle cost and basics of building maintenance](#)

[Lecture 37 - Stages of maintenance management](#)

[Lecture 38 - Planning for building maintenance](#)

[Lecture 39 - Periodicity of maintenance management](#)

[Lecture 40 - Estimation of repair cycle](#)

[Lecture 41 - Cost profile of maintenance](#)

[Lecture 42 - Lamp replacement](#)

[Lecture 43 - Building inspection, Planned and Ad-hoc maintenance](#)

[Lecture 44 - Condition survey and health evaluation of buildings](#)

[Lecture 45 - Diagnosis of building by visual survey](#)

[Lecture 46 - Case studies of visual survey](#)

[Lecture 47 - Effect of corrosion and Alkali Aggregate Reaction](#)

[Lecture 48 - Sampling and choice of test location](#)

[Lecture 49 - Non Destructive Testing - 1](#)

[Lecture 50 - Non Destructive Testing - 2](#)

[Lecture 51 - Core strength test](#)

[Lecture 52 - Carbonation and Chloride measurement](#)

[Lecture 53 - Electrical methods of progress measurement](#)

[Lecture 54 - Repair, Rehabilitation and Retrofit](#)

[Lecture 55 - Periodicity and economics of condition survey](#)

[Lecture 56 - Interpretation of test results](#)

Lecture 1 - Introduction and Planet Equivalent

Lecture 2 - Basics of Carbon Cycle

Lecture 3 - Factors Affecting carbon Cycle

Lecture 4 - Fundamentals of Sustainability

Lecture 5 - Role of Materials and Embodied Energy

Lecture 6 - Case Study for Energy in Building

Lecture 7 - Calculation of Ecological Footprint

Lecture 8 - Role of Cement in Sustainability and Calculation of Chemical Exergy

Lecture 9 - Fuel for Cement

Lecture 10 - Cementitious/Supplementary Cementitious Materials and Their Characterization

Lecture 11 - Strength of Concrete With Supplementary Cementitious Materials and Composite Cements

Lecture 12 - Types of Composite Cements

Lecture 13 - Alternative Fuel for cement and Embodied Energy

Lecture 14 - Life Cycle Embodied Energy and Concrete Sustainability

Lecture 15 - Strength of Concrete and Use of Admixtures

Lecture 16 - Curing Methods and Use of Waste Water for Mixing and Curing

Lecture 17 - Modern Composite Concrete

Lecture 18 - Recycled Aggregate-ITZ and Processing

Lecture 19 - Classification of Recycled Aggregate: Crushing and Grinding of Aggregates

Lecture 20 - Crushing and Grinding: Bond's Law+Operational Energy: U-Value

Lecture 21 - Operational Energy: Thermal Conductivity Models

Lecture 22 - Operational Energy: Thermal Conductivity Models (Continued...)

Lecture 23 - Operational Energy: Estimation of Thermal Conductivity

Lecture 24 - Thermal Diffusivity and Clay Bricks

Lecture 25 - Types of Bricks Kilns and Carbon Balance

Lecture 26 - Carbon Balance, Comparison of Various Types of Brick Kilns and Sealants, Paints, Adhesive

Lecture 27 - Sealants, Health Hazards of Building Materials and Emission Models

Lecture 28 - Emission Models and Testing

Lecture 29 - Energy Efficient Design of Buildings

Lecture 30 - Design Optimization of Buildings

Lecture 31 - Building Design Optimization Using Genetic Algorithm

[Lecture 32 - Urban Heat Island: Radiation Concepts](#)

[Lecture 33 - Urban Heat Island: Urban Canopy Layer](#)

[Lecture 34 - Evapotranspiration: Theory and Models](#)

[Lecture 35 - Evapotranspiration: Case Study and Surface Water Balance](#)

[Lecture 36 - Energy Conservation Building Code \(ECBC2007\)](#)

[Lecture 37 - Energy Conservation Building Code \(ECBC2007\) \(Continued...\)](#)

[Lecture 38 - ECBC Compliant Methodology](#)

[Lecture 39 - OTTV Methodology](#)

[Lecture 40 - Solar Energy and Solar Cells](#)

[Lecture 41 - Solar Photo Volatic Cells](#)

[Lecture 42 - Solar Water Heating](#)

[Lecture 43 - Design Strategies and the Green Design Process](#)

[Lecture 44 - Green Building Rating Systems](#)

[Lecture 45 - Autoclaved Aerated Concrete, Insulated Precast System and Insulated Precast Forms](#)

[Lecture 46 - Insulated Concrete Form and Tunnel Form](#)

[Lecture 47 - Modular Construction](#)

[Lecture 1 - Introduction to Projects](#)

[Lecture 2 - Inputs to Scheduling](#)

[Lecture 3 - Critical Path Method](#)

[Lecture 4 - Precedence Diagramming Method](#)

[Lecture 5 - Line of Balance Method](#)

[Lecture 6 - Resource-driven Scheduling](#)

[Lecture 7 - Information-driven Scheduling](#)

[Lecture 8 - Dependency Structure Matrix - I](#)

[Lecture 9 - Dependency Structure Matrix - II](#)

[Lecture 10 - Dependency Structure Matrix - III](#)

[Lecture 11 - Beeline Diagramming Method](#)

[Lecture 12 - Other Scheduling Techniques](#)

Lecture 1 - Introduction to Safety in Construction

Lecture 2 - Introduction to Safety Standards; Signs, Signals in Construction

Lecture 3 - Role of Stakeholders in Construction safety

Lecture 4 - Cost of Injury Vs Investment in Safety

Lecture 5 - Safety Program Accident/Incident Investigation

Lecture 6 - PPE in Construction

Lecture 7 - A Case Study on Construction Safety

Lecture 8 - Introduction to Fatal Falls

Lecture 9 - Fall hazard in Concerting

Lecture 10 - Fall hazard in Demolition Works

Lecture 11 - Safety in Demolition Work Practical Examples

Lecture 12 - Trench Cav-ins

Lecture 13 - Tunneling Safety

Lecture 14 - Struck by and Caught-inbetween

Lecture 15 - Crane Safety

Lecture 16 - A case Study on Construction Safety - Jigar-Crane

Lecture 17 - A case Study on Construction Safety - Safety Talk

Lecture 18 - Fire Safety and Steel Construction

Lecture 19 - Electrical Safety

Lecture 20 - A case Study on Construction Safety - Contractual Provision on Construction Zone Safety

Lecture 21 - Health Issues in Construction

Lecture 22 - Ergonomics and Health Issues with Concerting

Lecture 23 - General Safety Precautions

Lecture 24 - Safety in MEP Services

Lecture 25 - Managing Hazards in Construction

Lecture 26 - BIM for Construction

Lecture 27 - BIM for Safety

- Lecture 1 - Introduction - advanced hydraulics & course structure
- Lecture 2 - Various classifications of open channel flows
- Lecture 3 - Flow classifications & velocity distribution
- Lecture 4 - Pressure distribution
- Lecture 5 - Equation of continuity & energy
- Lecture 6 - Specific energy & critical flow
- Lecture 7 - Energy, momentum & specific force
- Lecture 8 - Computation of critical flow - Part 1
- Lecture 9 - Critical flow computations
- Lecture 10 - Introduction to uniform flow
- Lecture 11 - Manning's equation and normal depth
- Lecture 12 - Uniform Flow Computations - Part 1
- Lecture 13 - Uniform flow in compound sections, concept of normal slope
- Lecture 14 - Uniform flow approximation for flood discharge
- Lecture 15 - Design of channels for uniform flow
- Lecture 16 - Design of channels using uniform flow
- Lecture 17 - Design of erodible channels
- Lecture 18 - Introduction to gradually varied flows
- Lecture 19 - Gradually varied flow equations
- Lecture 20 - Classification of gradually varied flow - Part 1
- Lecture 21 - Classification of gradually varied flow - Part 2
- Lecture 22 - Gradually varied flow profiles with change in bed slopes
- Lecture 23 - GVF profile properties and transitional depths
- Lecture 24 - Gradually varied flow computations - Part 1
- Lecture 25 - Gradually varied flow computations RK method - Part 2
- Lecture 26 - Standard step method for gradually varied flow computations
- Lecture 27 - Spatially varied flow
- Lecture 28 - Features on spatially varied flow
- Lecture 29 - Rapidly varied flow - introduction
- Lecture 30 - Theoretical aspects of hydraulic jump
- Lecture 31 - Characteristics of jumps in rectangular channel

[Lecture 32 - Features of hydraulic jumps](#)

[Lecture 33 - Jumps as energy dissipators](#)

[Lecture 34 - Jump controls](#)

[Lecture 35 - Surges - Part 1](#)

[Lecture 36 - Surges - Part 2](#)

[Lecture 37 - Channel transitions - Part 1](#)

[Lecture 38 - Channel transitions - Part 2](#)

[Lecture 39 - Channel transitions - Part 3](#)

[Lecture 40 - Application of momentum principles](#)

[Lecture 41 - Pumps - 1](#)

[Lecture 42 - Turbines - Part 3 \(pumps, turbines\)](#)

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NPTEL : Design of Steel Structures (Civil Engineering)

Co-ordinators : Prof. Damodar Maity

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- Lecture 7 - Bolted Connection
- Lecture 8 - Eccentric Connections: Rivet Joints
- Lecture 9 - Design of Eccentric Connection With Load Lying in Plane of Joint Rivet Bolt
- Lecture 10 - Eccentric Connection With Load Perpendicular to Plane of Riveted Joint
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- Lecture 12 - Eccentric Connection
- Lecture 13 - Load Lying Perpendicular to the Plane of Weld Joint
- Lecture 14 - Tension Member
- Lecture 15 - Design of Tension Member
- Lecture 16 - Design of Tension Member: Gusset Plates, Lug Angles and Tension Splices
- Lecture 17 - Design of Tension Member: Subjected to Axial and Bending
- Lecture 18 - Compression Member
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- Lecture 20 - Design of Eccentrically Loaded tension Member
- Lecture 21 - Built up Compression Member
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Co-ordinators : Prof. Mukesh Sharma

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NPTEL : Geotechnical Measurements and Explorations (Civil Engineering)

Co-ordinators : Dr. Nihar Ranjan Patra

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NPTEL : Application of Soil Mechanics (Civil Engineering)

Co-ordinators : Dr. Nihar Ranjan Patra

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- Lecture 29 - Improving the Quality of Cover Concrete
- Lecture 30 - Compaction of Concrete
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Lecture 4 - Plate Tectonics and Continental Drift - I

Lecture 5 - Plate Tectonics and Continental Drift - II

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Lecture 7 - Plate Tectonics and Continental Drift - IV

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Lecture 13 - Rock-Forming Minerals and their Properties - II

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Lecture 15 - Igneous Rocks and their Properties - I

Lecture 16 - Igneous Rocks and their Properties - II

Lecture 17 - Igneous Rocks and their Properties - III

Lecture 18 - Sedimentary Rocks and their Properties - I

Lecture 19 - Sedimentary Rocks and their Properties - II

Lecture 20 - Sedimentary Rocks and their Properties - III

Lecture 21 - Metamorphic Rocks and their Properties - I

Lecture 22 - Metamorphic Rocks and their Properties - II

Lecture 23 - Seismology and Internal Structure of the earth - Part 1

Lecture 24 - Seismology and Internal Structure of the earth - Part 2

Lecture 25 - Seismology and Internal Structure of the earth - Part 3

Lecture 26 - Seismology and Internal Structure of the earth - Part 4

Lecture 27 - Seismology and Internal Structure of the earth - Part 5

Lecture 28 - Seismic Events and Sediments Amplification - I

Lecture 29 - Seismic Events and Sediments Amplification - II

Lecture 30 - Geological Structures - I

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[Lecture 36 - Active Faults and Associated Hazard - I](#)

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Lecture 4 - Aerial Photogrammetry - Part 1

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Lecture 8 - Exploring the Remote Sensing Data and GIS Software - Part 1

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Lecture 11 - Georeferencing of Toposheets on QGIS

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Lecture 1 - Introduction to Natural Hazards: Understanding the Basics

Lecture 2 - Introduction to Natural Hazards: Processes and Types

Lecture 3 - Human Impacts on Natural Hazards: Vulnerability and Risk

Lecture 4 - Human Impacts on Natural Hazards: Mitigation and Adaptation

Lecture 5 - Introduction to Earthquakes and Landslides: Causes and Impacts

Lecture 6 - Introduction to Cloudbursts and Floods: Mechanisms and Hazards

Lecture 7 - Understanding Tsunamis: Generation and Effects

Lecture 8 - Plate Tectonics: Fundamentals and Historical Development

Lecture 9 - Plate Tectonics: Processes and Features

Lecture 10 - Plate Tectonics: Implications for Natural Hazards

Lecture 11 - Earth as a Dynamo: Understanding Magnetic Polarity Reversals

Lecture 12 - Exploring Earth's Interior: Structure and Dynamics

Lecture 13 - Hot Spot Volcanism

Lecture 14 - Earth's Interior and Seismic Waves

Lecture 15 - Earthquakes: A Hazard

Lecture 16 - Earthquake Forecasting and Predictions

Lecture 17 - Locating Earthquakes Using Seismometers

Lecture 18 - Seismic Amplification Due to Sediment Properties

Lecture 19 - Intraplate Earthquakes

Lecture 20 - Earthquake Intensity and Magnitude Scales

Lecture 21 - Active Faults and Associated Hazards

Lecture 22 - Earthquakes and their Characteristics - Part 1

Lecture 23 - Earthquakes and their Characteristics - Part 2

Lecture 24 - Case Studies of Significant Earthquakes Around the World

Lecture 25 - Active Faults Along the Himalayan Frontal Belt

Lecture 26 - Active Faults of the Kangra Valley and Hajipur in the Himalayas

Lecture 27 - Ground Effects Due to Earthquakes

Lecture 28 - Ground Failure, Liquefaction, and Sand Blows

Lecture 29 - Ground Effects and Microzonation in India

Lecture 30 - Volcanic Hazards and Associated Risks

Lecture 31 - Introduction to Floods and Associated Hazards

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[Lecture 37 - River Monitoring](#)

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[Lecture 54 - Case Study of 2004 Sumatra-Andaman Earthquake Tsunami - Part 1](#)

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[Lecture 59 - Case Study of 2011 Tohoku Earthquake Tsunami - Part 1](#)

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Lecture 1 - Introduction to Environmental Fluid Mechanics

Lecture 2 - Processes in Environmental Fluid Mechanics - 1

Lecture 3 - Processes in Environmental Fluid Mechanics - 2

Lecture 4 - Conservation Laws and Governing Equations in EFM

Lecture 5 - Hydrostatic and Boussinesq's Approximation

Lecture 6 - Buoyant Plumes

Lecture 7 - Plumes in Unstratified Medium - 1

Lecture 8 - Plumes in Unstratified Medium - 2

Lecture 9 - Plumes in Stratified Medium - 1

Lecture 10 - Plumes in Stratified Medium - 2

Lecture 11 - Plumes in Stratified Medium - 3

Lecture 12 - Plumes in Stratified Medium - 4

Lecture 13 - Numerical Solutions to the Continuous Release Plumes

Lecture 14 - Plumes with fixed buoyancy release (in unstratified medium) - 1

Lecture 15 - Plumes with fixed buoyancy release (in unstratified medium) - 2

Lecture 16 - Gravity Currents

Lecture 17 - Continuous Release Gravity Currents - 1

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Lecture 19 - Continuous Release Gravity Currents - 3

Lecture 20 - Fixed Volume Gravity Currents - 1

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Lecture 22 - Waves

Lecture 23 - Surface Gravity Waves and Solutions

Lecture 24 - Surface Gravity Waves in Deep and Shallow Waters

Lecture 25 - Kelvin-Helmholtz Instability in Surface Gravity Waves - 1

Lecture 26 - Kelvin-Helmholtz Instability in Surface Gravity Waves - 2

Lecture 27 - Mixing of Fluids due to shear flow

Lecture 28 - Mixing of Fluids due to shear flow and mixing time

Lecture 29 - Rayleigh-Benard Instability (Thermal Instability)

Lecture 30 - Natural Convection and Formation of Convective Layers

Lecture 31 - Height and Temperature of Convective Layers

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[Lecture 33 - Forced Vortex Flows](#)

[Lecture 34 - Free Vortex Flows](#)

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[Lecture 36 - Mixing Mechanisms in Porous Media](#)

[Lecture 37 - One-Dimensional Diffusion in Porous Media - 1](#)

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[Lecture 6 - Shallow Foundation : Bearing Capacity - I](#)

[Lecture 7 - Shallow Foundation : Bearing Capacity - II](#)

[Lecture 8 - Shallow Foundation : Bearing Capacity - III](#)

[Lecture 9 - Shallow Foundation : Bearing Capacity - IV](#)

[Lecture 10 - Shallow Foundation : Bearing Capacity - V](#)

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[Lecture 13 - Shallow Foundation - Settlement Calculation - III](#)

[Lecture 14 - Design of Shallow Foundation](#)

[Lecture 15 - Design of Raft Foundation](#)

[Lecture 16 - Deep Foundation - Introduction](#)

[Lecture 17 - Pile Foundation - Load Carrying Capacity - I](#)

[Lecture 18 - Pile Foundation - Load Carrying Capacity - II](#)

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[Lecture 20 - Tension and Lateral Loaded Piles](#)

[Lecture 21 - Well Foundation](#)

[Lecture 22 - Well Foundation \(Continued...\)](#)

[Lecture 23 - Design of Retaining Wall](#)

[Lecture 24 - Design of Retaining Wall \(Continued...\)](#)

[Lecture 25 - Design of Sheet Piles](#)

[Lecture 26 - Design of Sheet Piles \(Continued...\)](#)

[Lecture 27 - Design of Sheet Piles \(Continued...\)](#)

[Lecture 28 - Design of Sheet Piles \(Continued...\)](#)

[Lecture 29 - Reinforced Earth](#)

[Lecture 30 - Reinforced Retaining Wall](#)

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[Lecture 33 - Soil - Foundation Interaction](#)

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[Lecture 38 - Soil - Foundation Interaction \(Continued...\)](#)

[Lecture 39 - Soil - Foundation Interaction \(Continued...\)](#)

[Lecture 40 - Soil - Foundation Interaction \(Continued...\)](#)

NPTEL : Ground Water Hydrology (Civil Engineering)

Co-ordinators : Dr. Anirban Dhar, Dr. V.R. Desai

Lecture 1 - Introduction : Ground Water (GW) Utilization and Historical Background, GW in hydrologic Cycle

Lecture 2 - Ground Water in & % Hydrologic Cycle (Continued...), Ground Water Budget, Ground Water Level Fluctuations and Environmental Influence

Lecture 3 - Ground water Level Fluctuations and Environmental Influence (Continued...) Literature/Data/Internet Resources

Lecture 4 - Ground water Level Fluctuations and Environmental Influence (Continued...) Literature/Data/Internet Resources

Lecture 5 - Occurrence and Movement of Ground Water : Origin and Age of Ground Water, Rock Properties Affecting Ground Water, Ground Water Column

Lecture 6 - Zones of Aeration and Saturation; Aquifers and their characteristics/classification

Lecture 7 - Aquifer Classification (Continued...), Ground water Basins and Springs; Darcy's Law; Permeability

Lecture 8 - Determination of Permeability : Heterogeneity and Anisotropy

Lecture 9 - Ground Water (GW) flowrates and flow directions; general flow equations through porous media

Lecture 10 - General Flow Equations Through Porous Media (Continued...), Dupuit's Assumptions

Lecture 11 - 1-D Unconfined Ground water Flows; Steady Flow into Wells

Lecture 12 - Steady Flow into Wells (Continued...); Unsteady Flow into Wells

Lecture 13 - Unsteady Flow into Wells (Continued...)

Lecture 14 - Unsteady Radial Flow in Confined and Unconfined Aquifers

Lecture 15 - Unsteady Radial Flow in Leaky Aquifers (Continued...); Well Flow Near Aquifer Boundaries

Lecture 16 - Well Flow for Special Conditions; Partially Penetrating Wells; Horizontal Wells and Collector Wells; Multiple Well Systems

Lecture 17 - Well Completion; Well Development; Well Protection; Well Rehabilitation; Well testing for Yields

Lecture 18 - Well Protection/Rehabilitation/Testing for yield (Continued...); Artificial Ground Water Recharge : Concept and Methods

Lecture 19 - Concept and methods of Artificial Ground Water Recharge (Continued...); Recharge Mounds and Induced Recharge

Lecture 20 - Induced Recharge (Continued...); Wastewater recharge for reuse; Water spreading

Lecture 21 - Pollution and Quality Analysis of Ground Water : Sources of Pollution of GW-Municipal, Industrial, Agricultural and Miscellaneous

Lecture 22 - Ground Water Pollution from Industrial, Agricultural and Miscellaneous Sources (Continued...)

Lecture 23 - Ground Water Pollution from Miscellaneous Sources (Continued...), Attenuation and Underground Distribution of Pollutants

Lecture 24 - Potential Evaluation of Ground water Pollution; Physical/Chemical/Biological analysis of Ground Water quality; Criteria and measures of Ground water quality

Lecture 25 - Ground water salinity and samples ; Graphical representations of ground water quality

Lecture 26 - Graphical representations of ground water quality (Continued...), Surface/Sub-Surface Investigation Of Ground Water: Geological/geophysical exploration; Remote sensing/electrical resistivity methods

Lecture 27 - Surface Investigation of ground water (Continued...); Electrical resistivity seismic refraction/gravity/magnetic methods

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Lecture 28 - Seismic refraction/gravity/magnetic methods (Continued...); Sub-surface investigation of ground water: Geographical/resistivity methods

Lecture 29 - Sub-surface investigation of ground water (Continued...): Geographical/resistivity/spontaneous potential/radiation of methods of logging

Lecture 30 - Radiation method of logging (Continued...); Temperature/caliper/fluid conductivity/fluid velocity/miscellaneous logging methods

Lecture 31 - Saline Water Intrusion in Aquifers: Occurrence, Features affecting aquifers, Bodon - Ghyben - Hergberg Principle

Lecture 32 - Saline Water Intrusion in Aquifers : Bodon - Ghyben - Hergberg principle (Continued...), Analytical Solution of Saline Water Intrusion in Coastal Aquifer

Lecture 33 - Saline Water Intrusion in Aquifers : Analytical Solution of Saline Water Intrusion in Coastal Aquifer (Continued...), Density dependent salt water intrusion model

Lecture 34 - Saline Water Intrusion in Aquifers : Geochemical Investigations, Control of salt water intrusion, Practical Modeling of salt water intrusion

Lecture 35 - Modeling and Management of Ground Water : Ground Water Simulation Models, Ground Water Management Model : Confined Aquifer

Lecture 36 - Modeling and Management of Ground Water : Ground Water Management Model : Confined and Unconfined Aquifer, Linked Simulation - Optimization, Meta Model Based Approach

Lecture 37 - Modeling and Management of Ground Water : Contaminant Source Identification , Monitoring Network Design

Lecture 38 - Modeling and Management of Ground Water : Aquifer Yield and Ground Water Availability, Effects of Ground Water Development, Regional Scale Development of Ground Water

Lecture 39 - Modeling and Management of Ground Water : Conjunctive Surface - Subsurface Modeling of Overland Flow including flow through Vadose zone

Lecture 40 - Modeling and Management of Ground Water : Ground Water - Surface Water Interaction

Lecture 1 - Introduction to Numerical Methods

Lecture 2 - Error Analysis

Lecture 3 - Introduction to Linear Systems - I

Lecture 4 - Linear Systems - II

Lecture 5 - Linear Systems - III

Lecture 6 - Linear Systems - Error Bounds

Lecture 7 - Error Bounds and Iterative Methods for Solving Linear Systems

Lecture 8 - Iterative Methods for Solving Linear Systems - I

Lecture 9 - Iterative Methods - II

Lecture 10 - Iterative Methods - III

Lecture 11 - Iterative Methods for Eigen Value Extraction

Lecture 12 - Solving Nonlinear Equations - I

Lecture 13 - Solving Nonlinear Equations - II

Lecture 14 - Solving Multi Dimensional Nonlinear Equations - I

Lecture 15 - Solving Multi Dimensional Nonlinear Equations - II

Lecture 16 - ARC Length and Gradient Based Methods

Lecture 17 - Gradient Based Methods

Lecture 18 - Conjugate Gradient Method - I

Lecture 19 - Conjugate Gradient Method - II

Lecture 20 - Nonlinear Conjugate Gradient and Introduction to PDEs

Lecture 21 - Eigenfunction Solutions for the Wave Equation

Lecture 22 - Analytical Methods for Solving the Wave Equation

Lecture 23 - Analytical Methods for Hyperbolic and Parabolic PDEs

Lecture 24 - Analytical Methods for Parabolic and Elliptic PDEs

Lecture 25 - Analytical Methods for Elliptic PDE's

Lecture 26 - Series Solutions for Elliptic PDE's and Introduction to Differential Operators

Lecture 27 - Differential Operators - I

Lecture 28 - Differential Operators - II

Lecture 29 - Differential Operators - III

Lecture 30 - Interpolation

Lecture 31 - Polynomial Fitting

[Lecture 32 - Orthogonal Polynomials - I](#)

[Lecture 33 - Orthogonal Polynomials - II](#)

[Lecture 34 - Orthogonal Polynomials - III](#)

[Lecture 35 - Spline Functions](#)

[Lecture 36 - Orthogonal Basis Functions for Solving PDE's - I](#)

[Lecture 37 - Orthogonal Basis Functions for Solving PDE's - II](#)

[Lecture 38 - Integral Equations - I](#)

[Lecture 39 - Integral Equations - II](#)

[Lecture 40 - Integral Equations - III](#)

NPTEL : Probability Methods in Civil Engineering (Civil Engineering)

Co-ordinators : Dr. Rajib Maity

Lecture 1 - Introduction - Role of Probability in Civil Engineering

Lecture 2 - Random Events and Probability Concept

Lecture 3 - Set Theory and Set Operations

Lecture 4 - Axioms of Probability

Lecture 5 - Probability of Events

Lecture 6 - Concept and Definition of Random Variables

Lecture 7 - Probability Distribution of Random Variables

Lecture 8 - CDF and Descriptors of Random Variables

Lecture 9 - Further Descriptors of Random Variables

Lecture 10 - Discrete Probability Distribution

Lecture 11 - Probability Distribution of Continuous RVs

Lecture 12 - Probability Distribution of Continuous RVs (Continued...1)

Lecture 13 - Probability Distribution of Continuous RVs (Continued...2)

Lecture 14 - Functions of Single Random Variables

Lecture 15 - Functions of Random Variables - Different Methods

Lecture 16 - Functions of Random Variables - Different Methods (Continued...)

Lecture 17 - Expectation and Moments of Functions of RV

Lecture 18 - Expectation and Moments of Functions of RV (Continued...)

Lecture 19 - Joint Probability Distribution

Lecture 20 - Marginal Probability Distribution

Lecture 21 - Conditional Probability Distribution

Lecture 22 - Conditional Probability Distribution (Continued...)

Lecture 23 - Properties of Multiple Random Variables

Lecture 24 - Properties of Multiple Random Variables (Continued...)

Lecture 25 - MGF of Multivariate RVs and Multivariate Probability Distributions

Lecture 26 - Multivariate Distribution and Functions of Multiple Random Variables

Lecture 27 - Functions of Multiple Random Variables (Continued...1)

Lecture 28 - Functions of Multiple Random Variables (Continued...2)

Lecture 29 - Introduction to Copulas

Lecture 30 - Introduction to Copulas (Continued...)

Lecture 31 - Probability Models using Normal Distribution

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[Lecture 33 - Probability Models using Gamma and Extreme Value Distribution](#)

[Lecture 34 - Probability Models using Discrete Probability Distributions](#)

[Lecture 35 - Sampling Distribution and Parameter Estimation](#)

[Lecture 36 - Sampling Distribution and Parameter Estimation \(Continued...\)](#)

[Lecture 37 - Hypothesis Testing](#)

[Lecture 38 - Goodness - of - fit tests](#)

[Lecture 39 - Regression Analyses and Correlation](#)

[Lecture 40 - Regression Analyses and Correlation \(Continued...\)](#)

NPTEL : Design of Reinforced Concrete Structures (Civil Engineering)

Co-ordinators : Prof. N. Dhang

[Lecture 1 - Introduction - I](#)

[Lecture 2 - Materials](#)

[Lecture 3 - Different Methods of Design of Reinforced Concrete Structures](#)

[Lecture 4 - Working Stress Method](#)

[Lecture 5 - Working Stress Method \(Continued...\)](#)

[Lecture 6 - Limit State of Collapse Flexure - I](#)

[Lecture 7 - Limit State of Collapse Flexure - II](#)

[Lecture 8 - Design of Doubly Reinforced Beam Flexure - I](#)

[Lecture 9 - Design of Doubly Reinforced Beam Flexure - II](#)

[Lecture 10 - Design of Doubly Reinforced Beam Flexure](#)

[Lecture 11 - Limit State of Collapse Shear](#)

[Lecture 12 - Design for Shear](#)

[Lecture 13 - Design for Shear \(Continued...\)](#)

[Lecture 14 - Design of Slabs - Part I](#)

[Lecture 15 - Design of Slabs - Part II](#)

[Lecture 16 - Design of Slabs - Part III](#)

[Lecture 17 - Design of Slabs - Part IV](#)

[Lecture 18 - Design of Slabs - Part V](#)

[Lecture 19 - Design of Columns - Part I](#)

[Lecture 20 - Design of Columns - Part II](#)

[Lecture 21 - Design of Columns - Part III](#)

[Lecture 22 - Design of Columns - Part IV](#)

[Lecture 23 - Design of Columns - Part V](#)

[Lecture 24 - Design of Footings - Part I](#)

[Lecture 25 - Design of Footings - Part II](#)

[Lecture 26 - Design of Staircases](#)

[Lecture 27 - Design for Torsion - Part I](#)

[Lecture 28 - Design for Torsion - Part II](#)

[Lecture 29 - Design of RC Slender Columns](#)

[Lecture 30 - Deflection of RC Beams](#)

NPTEL : Engineering Geology (Civil Engineering)

Co-ordinators : Dr. Debasis Roy

Lecture 1 - Introduction to Engineering Geology

Lecture 2 - Geologic Structures

Lecture 3 - Geologic Maps and Stratigraphic Sections

Lecture 4 - Remote Sensing in Engineering Geology

Lecture 5 - Physical Properties of Minerals

Lecture 6 - Crystallography and Optical Properties

Lecture 7 - Chemical Characteristics of Minerals

Lecture 8 - Origin And Types of Rocks

Lecture 9 - Origin And Types of Soils

Lecture 10 - Igneous Rocks

Lecture 11 - Sedimentary Rocks

Lecture 12 - Metamorphic Rocks

Lecture 13 - Weathering

Lecture 14 - Sediment Transport and Deposition

Lecture 15 - Introduction to Subsurface Exploration

Lecture 16 - Introduction to Subsurface Exploration

Lecture 17 - Sampling and Non - Intrusive Methods

Lecture 18 - Index Properties and Classification of Soils

Lecture 19 - Index Properties of Rock and Rock Mass

Lecture 20 - Stress-Strain Behavior of Soil and Rock - I

Lecture 21 - Stress-Strain Behavior of Soil and Rock - II

Lecture 22 - In-situ State of Stress

Lecture 23 - Geologic Considerations in Tunneling

Lecture 24 - Geologic Considerations in Dam Construction

Lecture 25 - Groundwater - Preliminaries

Lecture 26 - Groundwater Flow - I

Lecture 27 - Groundwater Flow - II

Lecture 28 - Groundwater Related Engineering Issues

Lecture 29 - Groundwater Over Utilization

Lecture 30 - Plate Tectonics

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Co-ordinators : Prof. Biswanath Banerjee, Prof. Amit Shaw

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NPTEL : Finite Element Analysis (Civil Engineering)

Co-ordinators : Dr. B.N. Rao

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Co-ordinators : Dr. K. Rajagopal

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NPTEL : Urban transportation planning (Civil Engineering)

Co-ordinators : Dr. V. Thamizh Arasan

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NPTEL : NOC:Admixtures and Special Concretes (Civil Engineering)

Co-ordinators : Prof. Manu Santhanam

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Lecture 20 - Solution for Non-Uniform torsion or Vlasov's torsionv

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Lecture 2 - Introduction to Global Positioning System

Lecture 3 - GPS Positioning Methods

Lecture 4 - GPS Solutions and Errors

Lecture 5 - GPS Application

Lecture 6 - Remote Sensing Introduction

Lecture 7 - Electromagnetic Spectrum

Lecture 8 - Sensors and Platform

Lecture 9 - Sensors and Platform

Lecture 10 - Image Interpretation

Lecture 11 - Statistical Evaluation of RS Data

Lecture 12 - Rectification and Restoration

Lecture 13 - Image Enhancement

Lecture 14 - Image Transformation

Lecture 15 - Orthogonal Transformation

Lecture 16 - Image Classification (Supervised Classification)

Lecture 17 - Image Classification (Unsupervised Classification)

Lecture 18 - Spatial Filtering-Noise Removal

Lecture 19 - Spatial Filtering-Edge Removal

Lecture 20 - Photogramatic-Basic concepts of a single photography

Lecture 21 - Stereoscopy-Basic concepts

Lecture 22 - Stereoscopy-Geometry of overlapping photograph

Lecture 23 - Terrestrial Photogrammetry

Lecture 24 - Digital Elevation Model-Basic Concepts

Lecture 25 - Digital Elevation Model-Data Input and Stamping

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NPTEL : Transportation Engineering II (Civil Engineering)

Co-ordinators : Prof. Rajat Rastogi

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Lecture 2 - Gauges and Permanent Way

Lecture 3 - Wheel and Axles, Coning of Wheels

Lecture 4 - Track Resistances, Hauling Capacity

Lecture 5 - Track Modulus, Stresses in Track

Lecture 6 - Stresses in Components of Track

Lecture 7 - Rails

Lecture 8 - Creep in Rails

Lecture 9 - Wears & Failures in Rails

Lecture 10 - Jointed or Welded rails

Lecture 11 - Sleepers

Lecture 12 - Ballast

Lecture 13 - Fastenings

Lecture 14 - Geometric Design - Alignment of Track

Lecture 15 - Horizontal Curve and Super elevation

Lecture 16 - Speeds on Track

Lecture 17 - Transition Curve & Widening of Track

Lecture 18 - Vertical Curve & Gradients

Lecture 19 - Turnouts - Components

Lecture 20 - Crossing and Design of Turnout

Lecture 21 - Track Junctions and Designs

Lecture 22 - Signals - Part 1

Lecture 23 - Signals - Part 2

Lecture 24 - Train Control Systems

Lecture 25 - Interlocking of Track

Lecture 26 - High Speed Tracks

Lecture 27 - Introduction of Air Transport

Lecture 28 - Aircraft Characteristics

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[Lecture 38 - Terminal Planning and Hangers](#)

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- Lecture 1 - What is Geographic Information Systems ?
- Lecture 2 - Different components of GIS
- Lecture 3 - Different types of vector data and concept of topology
- Lecture 4 - Raster data models and comparisons with vector
- Lecture 5 - TIN data model and comparisons with raster
- Lecture 6 - Non-spatial data (attributes) and their type
- Lecture 7 - Raster data compression techniques
- Lecture 8 - Spatial database systems and their types
- Lecture 9 - Pre-processing of spatial datasets
- Lecture 10 - Geo-referencing
- Lecture 11 - Different map projections
- Lecture 12 - Spatial interpolation techniques
- Lecture 13 - Digital Elevation Models and different types of resolutions
- Lecture 14 - Quality assessment of freely available DEMS
- Lecture 15 - GIS analysis - Part 1
- Lecture 16 - GIS analysis - Part 2 (Overlaying Operations)
- Lecture 17 - GIS analysis - Part 3 (Buffer Analysis)
- Lecture 18 - Classification Methods
- Lecture 19 - Errors in GIS and Key elements of maps
- Lecture 20 - Limitations of GIS

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Lecture 2 - Climate Classification

Lecture 3 - Thermal Comfort in Built Environment - 1

Lecture 4 - Thermal Comfort in Built Environment - 2

Lecture 5 - Thermal Adaptation

Lecture 6 - Bioclimatic Assessment

Lecture 7 - Thermal Performance of Building Envelop

Lecture 8 - Thermal Performance of Building Envelop - Indices and Measures (1/2)

Lecture 9 - Thermal Performance of Building Envelop - Indices and Measures (2/2)

Lecture 10 - Glazing and Shading Systems

Lecture 11 - Shading Analysis

Lecture 12 - Energy Efficiency and Simulation

Lecture 13 - Building Acoustics - Basics

Lecture 14 - Sound Propagation

Lecture 15 - Acoustic Quality Indicators (1/2)

Lecture 16 - Acoustic Quality Indicators (2/2)

Lecture 17 - Acoustic Design Considerations

Lecture 18 - Acoustic Materials

Lecture 19 - Lighting - Basics

Lecture 20 - Lighting – Design Concepts

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Lecture 2 - GPS System

Lecture 3 - GPS Signal (Civilian Perspective)

Lecture 4 - GPS Receiver

Lecture 5 - GPS Software

Lecture 6 - GPS Position

Lecture 7 - GPS Positioning (Principle and Methods)

Lecture 8 - Field demonstration of GPS Positioning Method

Lecture 9 - GPS Observables (Types, Errors and Quality)

Lecture 10 - Errors in GPS Observables (Systematics Errors)

Lecture 11 - GPS Data Pre-Processing - I

Lecture 12 - GPS Data Pre-Processing - II

Lecture 13 - GPS Data Processing - I

Lecture 14 - GPS Data Processing - II

Lecture 15 - Quality Assessment of GPS Surveying

Lecture 16 - Procedure of GPS Surveying - I

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Lecture 20 - GPS Data Processing

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Lecture 2 - Fundamentals and Operations

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Lecture 4 - Introduction of GPS

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Lecture 7 - GPS Positioning of Control Point

Lecture 8 - Demonstration of GPS Receivers, Software and Positioning of Control Point

Lecture 9 - GPS Position

Lecture 10 - Principle of GPS Positioning and GPS Observables

Lecture 11 - Errors in GPS Observables

Lecture 12 - GPS Data Pre-processing: Differencing

Lecture 13 - GPS Data Pre-processing: Point Positioning

Lecture 14 - GPS Data Processing: Baseline Processing

Lecture 15 - GPS Data Processing: Network Adjustment

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Lecture 18 - Parts of Total Station

Lecture 19 - Accessories of Total Station

Lecture 20 - Handling and Setting of Total Station

Lecture 21 - Measurement of Distance

Lecture 22 - Measurement of Distance Using TS

Lecture 23 - Measurement of Horizontal Angle Using TS

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Lecture 27 - Errors and Quality of Surveying Measurements

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Lecture 2 - Different Techniques of Image Acquisition

Lecture 3 - Why is Digital Image processing Important ?

Lecture 4 - Image characteristics and Different Resolutions in Remote Sensing

Lecture 5 - Electromagnetic spectrum, solar reflection, and thermal emission

Lecture 6 - Color Representation and Transformations

Lecture 7 - Image histograms and statistics

Lecture 8 - Geo-referencing Techniques

Lecture 9 - Image Enhancement Techniques part 1

Lecture 10 - Image Enhancement Techniques part 2

Lecture 11 - Multispectral Transform, Scatter Plot, Principal Component Analysis and Decorrelation Stretch

Lecture 12 - Spatial Filtering Techniques

Lecture 13 - Frequency Domain Fourier Transformation

Lecture 14 - Basic Image Compression Techniques and Different Image File Formats

Lecture 15 - Image Classification Techniques

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- Lecture 2 - Equilibrium-Process Feasibility, Gibbs Energy-Standard Condition
- Lecture 3 - Gibbs Free Energy-Non Standard Conditions - I
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- Lecture 5 - Phase Equilibrium
- Lecture 6 - Component Balance
- Lecture 7 - Reaction Kinetics
- Lecture 8 - Rate of Reaction - I
- Lecture 9 - Rate of Reaction - II, Types of Reactors
- Lecture 10 - Mass Balance on different types of Reactors
- Lecture 11 - Material Balance for Complex Reactions
- Lecture 12 - Material Balance for Reversible Reactions
- Lecture 13 - Determination of Kinetic Equations
- Lecture 14 - Acid-Base Reactions
- Lecture 15 - Acid Dissociation Constant, Strength of Acid
- Lecture 16 - Ionization Fractions
- Lecture 17 - Introduction to VMINTEQ
- Lecture 18 - Estimation of pH using VMINTEQ
- Lecture 19 - Mixing Problems
- Lecture 20 - Inverse Dose Problems
- Lecture 21 - logC-pH Diagram
- Lecture 22 - Carbonate System: Closed System
- Lecture 23 - Carbonate System: Open System
- Lecture 24 - VMINTEQ: Application of Gases, Acid-Base Titration
- Lecture 25 - VMINTEQ: Titration and Multisweep, Buffer: Introduction
- Lecture 26 - VMINTEQ: Buffer System, Buffer Intensity: Introduction
- Lecture 27 - Buffer Intensity: Monoprotic and Diprotic Acids
- Lecture 28 - Alkalinity: Introduction
- Lecture 29 - Alkalinity: Theoretical and Practical Definition
- Lecture 30 - Acidity and its Applications
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Lecture 7 - Risk Assessment - Deterministic approach

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Lecture 13 - Remediation of contaminated GW by Pump and Treat - I

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Lecture 17 - Permeable Reactive Barriers - II

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