NPTEL : Elementary Numerical Analysis (Mathematics)

Co-ordinators : Prof. Rekha P. Kulkarni

NPTEL : Measure and Integration (Mathematics)

Co-ordinators : Prof. Inder K Rana

Lecture 1 - Introduction, Extended Real numbers

Lecture 2 - Algebra and Sigma Algebra of a subset of a set

Lecture 3 - Sigma Algebra generated by a class

Lecture 4 - Monotone Class

Lecture 5 - Set function

Lecture 6 - The Length function and its properties

Lecture 7 - Countably additive set functions on intervals

Lecture 8 - Uniqueness Problem for Measure

Lecture 9 - Extension of measure

Lecture 10 - Outer measure and its properties

Lecture 11 - Measurable sets

Lecture 12 - Lebesgue measure and its properties

Lecture 13 - Characterization of Lebesque measurable sets

Lecture 14 - Measurable functions

Lecture 15 - Properties of measurable functions

Lecture 16 - Measurable functions on measure spaces

Lecture 17 - Integral of non negative simple measurable functions

Lecture 18 - Properties of non negative simple measurable functions

Lecture 19 - Monotone convergence theorem & Fatou's Lemma

Lecture 20 - Properties of Integral functions & Dominated Convergence Theorem

Lecture 21 - Dominated Convergence Theorem and applications

Lecture 22 - Lebesgue Integral and its properties

Lecture 23 - Denseness of continuous function

Lecture 24 - Product measures, an Introduction

Lecture 25 - Construction of Product Measure

Lecture 26 - Computation of Product Measure - I

Lecture 27 - Computation of Product Measure - II

Lecture 28 - Integration on Product spaces

Lecture 29 - Fubini's Theorems

Lecture 30 - Lebesgue Measure and integral on R2

Lecture 31 - Properties of Lebesgue Measure and integral on Rn

NPTEL : Mathematics in India - From Vedic Period to Modern Times (Mathematics)

Co-ordinators : Prof. M.D. Srinivas, Prof. K. Ramasubramanian, Prof. M.S. Sriram

NPTEL : NOC:Measure Theory (Mathematics)

Co-ordinators : Prof. Inder K Rana

Lecture 1 - (1A) Introduction, Extended Real Numbers

Lecture 2 - (1B) Introduction, Extended Real Numbers

Lecture 3 - (2A) Algebra and Sigma Algebra of Subsets of a Set

Lecture 4 - (2B) Algebra and Sigma Algebra of Subsets of a Set

Lecture 5 - (3A) Sigma Algebra generated by a Class

Lecture 6 - (3B) Sigma Algebra generated by a Class

Lecture 7 - (4A) Monotone Class

Lecture 8 - (4B) Monotone Class

Lecture 9 - (5A) Set Functions

Lecture 10 - (5B) Set Functions

Lecture 11 - (6A) The Length Function and its Properties

Lecture 12 - (6B) The Length Function and its Properties

Lecture 13 - (7A) Countably Additive Set Functions on Intervals

Lecture 14 - (7B) Countably Additive Set Functions on Intervals

Lecture 15 - (8A) Uniqueness Problem for Measure

Lecture 16 - (8B) Uniqueness Problem for Measure

Lecture 17 - (9A) Extension of Measure

Lecture 18 - (9B) Extension of Measure

Lecture 19 - (10A) Outer Measure and its Properties

Lecture 20 - (10B) Outer Measure and its Properties

Lecture 21 - (11A) Measurable Sets

Lecture 22 - (11B) Measurable Sets

Lecture 23 - (12A) Lebesgue Measure and its Properties

Lecture 24 - (12B) Lebesgue Measure and its Properties

Lecture 25 - (13A) Characterization of Lebesgue Measurable Sets

Lecture 26 - (13B) Characterization of Lebesgue Measurable Sets

Lecture 27 - (14A) Measurable Functions

Lecture 28 - (14B) Measurable Functions

Lecture 29 - (15A) Properties of Measurable Functions

Lecture 30 - (15B) Properties of Measurable Functions

Lecture 31 - (16A) Measurable Functions on Measure Spaces

NPTEL : NOC:Calculus for Economics, Commerce and Management (Mathematics)

Co-ordinators : Prof.Inder Kumar Rana

NPTEL : NOC:Basic Linear Algebra (Mathematics)

Co-ordinators : Prof.Inder Kumar Rana

NPTEL : NOC:Commutative Algebra (Mathematics)

Co-ordinators : Prof. Dilip P. Patil

NPTEL : NOC:Galois Theory (Mathematics)

Co-ordinators : Prof. Dilip P. Patil

Lecture 1 - Historical Perspectives

Lecture 2 - Examples of Fields

Lecture 3 - Polynomials and Basic properties

Lecture 4 - Polynomial Rings

Lecture 5 - Unit and Unit Groups

Lecture 6 - Division with remainder and prime factorization

Lecture 7 - Zeroes of Polynomials

Lecture 8 - Polynomial functions

Lecture 9 - Algebraically closed Fields and statement of FTA

Lecture 10 - GaussÃ¢â‚¬â„¢s Theorem(Uniqueness of factorization)

Lecture 11 - Digression on Rings homomorphism, Algebras

Lecture 12 - Kernel of homomorphisms and ideals in K[X],Z

Lecture 13 - Algebraic elements

Lecture 14 - Examples

Lecture 15 - Minimal Polynomials

Lecture 16 - Characterization of Algebraic elements

Lecture 17 - Theorem of Kronecker

Lecture 18 - Examples

Lecture 19 - Digression on Groups

Lecture 20 - Some examples and Characteristic of a Ring

Lecture 21 - Finite subGroups of the Unit Group of a Field

Lecture 22 - Construction of Finite Fields

Lecture 23 - Digression on Group action - I

Lecture 24 - Automorphism Groups of a Field Extension

Lecture 25 - Dedekind-Artin Theorem

Lecture 26 - Galois Extension

Lecture 27 - Examples of Galois extension

Lecture 28 - Examples of Automorphism Groups

Lecture 29 - Digression on Linear Algebra

Lecture 30 - Minimal and Characteristic Polynomials, Norms, Trace of elements

Lecture 31 - Primitive Element Theorem for Galois Extension

NPTEL : NOC:Basic Real Analysis (Mathematics)

Co-ordinators : Prof. I. K. Rana

Lecture 32 - Differentiability - Part II

Lecture 33 - Differentiability - Part III

Lecture 34 - Differentiability - Part IV

Lecture 35 - Differentiability - Part V

Lecture 36 - Differentiability - Part VI

Lecture 37 - Riemann Integration - Part I

Lecture 38 - Riemann Integration - Part II

Lecture 39 - Riemann Integration - Part III

Lecture 40 - Riemann Integration - Part IV

Lecture 41 - Riemann Integration - Part V

Lecture 42 - Riemann Integration - Part VI

Lecture 43 - Riemann Sum and Riemann Integrals - Part I

Lecture 44 - Riemann Sum and Riemann Integrals - Part II

Lecture 45 - Riemann Sum and Riemann Integrals - Part III

Lecture 46 - Optimization in several variables - Part I

Lecture 47 - Optimization in several variables - Part II

Lecture 48 - Optimization in several variables - Part III

Lecture 49 - Integration in several variables - Part I

Lecture 50 - Integration in several variables - Part II

Lecture 51 - Integration in several variables - Part III

Lecture 52 - Change of variables - Part I

Lecture 53 - Change of variables - Part II

Lecture 54 - Change of variables - Part III

Lecture 55 - Change of variables - Part IV

Lecture 56 - Metric Spaces - Part I

Lecture 57 - Metric Spaces - Part II

Lecture 58 - Metric Spaces - Part III

Lecture 59 - L^p Metrics - Part I

Lecture 60 - L^p Metrics - Part II

Lecture 61 - L^p Metrics - Part III

Lecture 62 - Pointwise and Uniform convergence - Part I

Lecture 63 - Pointwise and Uniform convergence - Part II

Lecture 64 - Pointwise and Uniform convergence - Part III

NPTEL : NOC:A Basic Course in Number Theory (Mathematics)

Co-ordinators : Prof. Shripad Garge

NPTEL : NOC:Introduction to Algebraic Topology - Part I (Mathematics)

Co-ordinators : Prof. Anant R. Shastri

NPTEL : NOC:Introduction to Algebraic Topology - Part II (Mathematics)

Co-ordinators : Prof. Anant R. Shastri

NPTEL : NOC:Partial Differential Equations (Mathematics)

Co-ordinators : Prof. Sivaji Ganesh

Lecture 1 - Partial Differential Equations - Basic concepts and Nomenclature

Lecture 2 - First Order Partial Differential Equations- How they arise? Cauchy Problems, IVPs, IBVPs

Lecture 3 - First order Partial Differential Equations - Geometry of Quasilinear equations

Lecture 4 - FOPDE's - General Solutions to Linear and Semilinear equations

Lecture 5 - First order Partial Differential Equations- Lagrange's method for Quasilinear equations

Lecture 6 - Relation between Characteristic curves and Integral surfaces for Quasilinear equations

Lecture 7 - Relation between Characteristic curves and Integral surfaces for Quasilinear equations

Lecture 8 - FOPDE's - Method of characteristics for Quasilinear equations - 1

Lecture 9 - First order Partial Differential Equations - Failure of transversality condition

Lecture 10 - First order Partial Differential Equations - Tutorial of Quasilinear equations

Lecture 11 - FOPDE's - General nonlinear equations 1 - Search for a characteristic direction

Lecture 12 - FOPDE's - General nonlinear equations 2 - Characteristic direction and characteristic strip

Lecture 13 - FOPDE's - General nonlinear equations 3 - Finding an initial strip

Lecture 14 - FOPDE's - General nonlinear equations 4 - Local existence and uniqueness theorem

Lecture 15 - First order Partial Differential Equations - Tutorial on General nonlinear equations

Lecture 16 - First order Partial Differential Equations - Initial value problems for Burgers equation

Lecture 17 - FOPDE's - Conservation laws with a view towards global solutions to Burgers equation

Lecture 18 - Second Order Partial Differential Equations - Special Curves associated to a PDE

Lecture 19 - Second Order Partial Differential Equations - Curves of discontinuity

Lecture 20 - Second Order Partial Differential Equations - Classification

Lecture 21 - SOPDE's - Canonical form for an equation of Hyperbolic type

Lecture 22 - SOPDE's - Canonical form for an equation of Parabolic type

Lecture 23 - SOPDE's - Canonical form for an equation of Elliptic type

Lecture 24 - Second Order Partial Differential Equations - Characteristic Surfaces

Lecture 25 - SOPDE's - Canonical forms for constant coefficient PDEs

Lecture 26 - Wave Equation - A mathematical model for vibrating strings

Lecture 27 - Wave Equation in one space dimension - d'Alembert formula

Lecture 28 - Tutorial on One dimensional wave equation

Lecture 29 - Wave Equation in d space dimensions - Equivalent Cauchy problems via Spherical means

Lecture 30 - Cauchy problem for Wave Equation in 3 space dimensions - Poisson-Kirchhoff formulae

Lecture 31 - Cauchy problem for Wave Equation in 2 space dimensions - Hadamard's method of descent

NPTEL : NOC:An Introduction to Point-Set-Topology - Part I (Mathematics)

Co-ordinators : Prof. Anant R Shastri

NPTEL : NOC:An Introduction to Point-Set-Topology - Part II (Mathematics)

Co-ordinators : Prof. Anant R Shastri

NPTEL : NOC:Fourier Analysis and its Applications (Mathematics)

Co-ordinators : Prof. G. K Srinivasan

NPTEL : NOC:Numerical Analysis (2023) (Mathematics)

Co-ordinators : Prof. S. Baskar

Lecture 32 - Nonlinear Equations: Newton-Raphson's method

Lecture 33 - Nonlinear Equations: Newton-Raphson's method (Convergence Theorem)

Lecture 34 - Nonlinear Equations: Fixed-point Iteration Methods

Lecture 35 - Nonlinear Equations: Fixed-point Iteration Methods (Convergence) and Modified Newton's Method

Lecture 36 - Nonlinear Equations: System of Nonlinear Equations

Lecture 37 - Nonlinear Equations: Implementation of Newton-Raphson's Method as Python Code

Lecture 38 - Polynomial Interpolation: Existence and Uniqueness

Lecture 39 - Polynomial Interpolation: Lagrange and Newton Forms

Lecture 40 - Polynomial Interpolation: Newtonâ€™s Divided Difference Formula

Lecture 41 - Polynomial Interpolation: Mathematical Error in Interpolating Polynomial

Lecture 42 - Polynomial Interpolation: Arithmetic Error in Interpolating Polynomials

Lecture 43 - Polynomial Interpolation: Implementation of Lagrange Form as Python Code

Lecture 44 - Polynomial Interpolation: Runge Phenomenon and Piecewise Polynomial Interpolation

Lecture 45 - Polynomial Interpolation: Hermite Interpolation

Lecture 46 - Polynomial Interpolation: Cubic Spline Interpolation

Lecture 47 - Polynomial Interpolation: Tutorial Session

Lecture 48 - Numerical Integration: Rectangle Rule

Lecture 49 - Numerical Integration: Trapezoidal Rule

Lecture 50 - Numerical Integration: Simpson's Rule

Lecture 51 - Numerical Integration: Gaussian Quadrature Rule

Lecture 52 - Numerical Integration: Tutorial Session

Lecture 53 - Numerical Differentiation: Primitive Finite Difference Formulae

Lecture 54 - Numerical Differentiation: Method of Undetermined Coefficients and Arithmetic Error

Lecture 55 - Numerical ODEs: Euler Methods

Lecture 56 - Numerical ODEs: Euler Methods (Error Analysis)

Lecture 57 - Numerical ODEs: Runge-Kutta Methods

Lecture 58 - Numerical ODEs: Modified Euler's Methods

Lecture 59 - Numerical ODEs: Multistep Methods

Lecture 60 - Numerical ODEs: Stability Analysis

Lecture 61 - Numerical ODEs: Two-point Boundary Value Problems

NPTEL : NOC:Point Set Topology (Mathematics)

Co-ordinators : Prof. Ronnie Sebastian

Lecture 1 - Definition and examples of topological spaces

Lecture 2 - Examples of topological spaces

Lecture 3 - Basis for topology

Lecture 4 - Subspace Topology

Lecture 5 - Product Topology

Lecture 6 - Product Topology (Continued...)

Lecture 7 - Continuous maps

Lecture 8 - Continuity of addition and multiplication maps

Lecture 9 - Continuous maps to a product

Lecture 10 - Projection from a point

Lecture 11 - Closed subsets

Lecture 12 - Closure

Lecture 13 - Joining continuous maps

Lecture 14 - Metric spaces

Lecture 15 - Connectedness

Lecture 16 - Connectedness (Continued...)

Lecture 17 - Connectedness (Continued...)

Lecture 18 - Connected components

Lecture 19 - Path connectedness

Lecture 20 - Path connectedness (Continued...)

Lecture 21 - Connectedness of GL(n,R)^+ (math symbol)

Lecture 22 - Connectedness of GL(n,C), SL(n,C), SL(n,R)

Lecture 23 - Compactness

Lecture 24 - Compactness (Continued...)

Lecture 25 - Compactness (Continued...)

Lecture 26 - Compactness (Continued...)

Lecture 27 - SO(n) is connected

Lecture 28 - Compact metric spaces

Lecture 29 - Lebesgue Number Lemma

Lecture 30 - Locally compact spaces

Lecture 31 - One point compactification

NPTEL : Stochastic Processes (Mathematics)

Co-ordinators : Dr. S. Dharmaraja

Lecture 32 - Renewal Function and Renewal Equation

Lecture 33 - Generalized Renewal Processes and Renewal Limit Theorems

Lecture 34 - Markov Renewal and Markov Regenerative Processes

Lecture 35 - Non Markovian Queues

Lecture 36 - Non Markovian Queues Cont,,

Lecture 37 - Application of Markov Regenerative Processes

Lecture 38 - Galton-Watson Process

Lecture 39 - Markovian Branching Process

NPTEL : NOC:Stochastic Processes - 1 (Mathematics)

Co-ordinators : Dr. S. Dharmaraja

NPTEL : NOC:Stochastic Processes (Mathematics)

Co-ordinators : Dr. S. Dharmaraja

Lecture 97 - Ito Integrals (Continued...)

Lecture 98 - Ito Integrals (Continued...)

Lecture 99 - Renewal Function and Renewal Equation

Lecture 100 - Renewal Function and Renewal Equation (Continued...)

Lecture 101 - Renewal Function and Renewal Equation (Continued...)

Lecture 102 - Generalized Renewal Processes and Renewal Limit Theorems

Lecture 103 - Generalized Renewal Processes and Renewal Limit Theorems (Continued...)

Lecture 104 - Generalized Renewal Processes and Renewal Limit Theorems (Continued...)

Lecture 105 - Markov Renewal and Markov Regenerative Processes

Lecture 106 - Markov Renewal and Markov Regenerative Processes (Continued...)

Lecture 107 - Markov Renewal and Markov Regenerative Processes (Continued...)

Lecture 108 - Markov Renewal and Markov Regenerative Processes (Continued...)

Lecture 109 - Non Markovian Queues

Lecture 110 - Non Markovian Queues (Continued...)

Lecture 111 - Non Markovian Queues (Continued...)

Lecture 112 - Stationary Processes

Lecture 113 - Stationary Processes (Continued...)

Lecture 114 - Stationary Processes (Continued...)

Lecture 115 - Stationary Processes (Continued...) and Ergodicity

Lecture 116 - G1/M/1 queue

Lecture 117 - G1/M/1 queue (Continued...)

Lecture 118 - G1/M/1/N queue and examples

Lecture 119 - Galton-Watson Process

Lecture 120 - Examples and Theorems

Lecture 121 - Theorems and Examples (Continued...)

Lecture 122 - Markov Branching Process

Lecture 123 - Markov Branching Process Theorems and Properties

Lecture 124 - Markov Branching Process Theorems and Properties (Continued...)

NPTEL : NOC:Chaotic Dynamical Systems (Mathematics)

Co-ordinators : Dr. Anima Nagar

NPTEL : NOC:Introduction to Probability Theory and Stochastic Processes (Mathematics)

Co-ordinators : Dr. S. Dharmaraja

NPTEL : NOC:Statistical Inference (Mathematics)

Co-ordinators : Prof. Nilladri Chaterjee

Lecture 1 - Statistical Inference - 1

Lecture 2 - Statistical Inference - 2

Lecture 3 - Statistical Inference - 3

Lecture 4 - Statistical Inference - 4

Lecture 5 - Statistical Inference - 5

Lecture 6 - Statistical Inference - 6

Lecture 7 - Statistical Inference - 7

Lecture 8 - Statistical Inference - 8

Lecture 9 - Statistical Inference - 9

Lecture 10 - Statistical Inference - 10

Lecture 11 - Statistical Inference - 11

Lecture 12 - Statistical Inference - 12

Lecture 13 - Statistical Inference - 13

Lecture 14 - Statistical Inference - 14

Lecture 15 - Statistical Inference - 15

Lecture 16 - Stasistical Inference - 16

Lecture 17 - Stasistical Inference - 17

Lecture 18 - Statistical Inference - 18

Lecture 19 - Stasistical Inference - 19

Lecture 20 - Stasistical Inference - 20

Lecture 21 - Stasistical Inference - 21

NPTEL : NOC:Integral Transforms and their Applications (Mathematics)

Co-ordinators : Prof. Sarthok Sircar

Lecture 32 - Introduction to Hilbert Transforms - Part 2

Lecture 33 - Introduction to Hilbert Transforms - Part 3

Lecture 34 - Applications of Hilbert Transfroms, Introduction to Stieltjes Transform - Part 1

Lecture 35 - Applications of Hilbert Transfroms, Introduction to Stieltjes Transform - Part 2

Lecture 36 - Applications of Hilbert Transfroms, Introduction to Stieltjes Transform - Part 3

Lecture 37 - Applications of Stieltjes Transform, Generalized Stieltjes Transform - Part 1

Lecture 38 - Applications of Stieltjes Transform, Generalized Stieltjes Transform - Part 2

Lecture 39 - Applications of Stieltjes Transform, Generalized Stieltjes Transform - Part 3

Lecture 40 - Introduction to Legendre Transform - Part 1

Lecture 41 - Introduction to Legendre Transform - Part 2

Lecture 42 - Introduction to Legendre Transform - Part 3

Lecture 43 - Introduction to Z-transform - Part 1

Lecture 44 - Introduction to Z-transform - Part 2

Lecture 45 - Introduction to Z-transform - Part 3

Lecture 46 - Inverse Z-transfrom, Applciations of Z-Transform - Part 1

Lecture 47 - Inverse Z-transfrom, Applciations of Z-Transform - Part 2

Lecture 48 - Inverse Z-transfrom, Applciations of Z-Transform - Part 3

Lecture 49 - Introduction to Radon Transform - Part 1

Lecture 50 - Introduction to Radon Transform - Part 2

Lecture 51 - Introduction to Radon Transform - Part 3

Lecture 52 - Inverse Radon Transform, Applications to Radon Transform - Part 1

Lecture 53 - Inverse Radon Transform, Applications to Radon Transform - Part 2

Lecture 54 - Inverse Radon Transform, Applications to Radon Transform - Part 3

Lecture 55 - Introduction to Fractional Calculus - Part 1

Lecture 56 - Introduction to Fractional Calculus - Part 2

Lecture 57 - Introduction to Fractional Calculus - Part 3

Lecture 58 - Fractional ODEs, Abel's Integral Equations - Part 1

Lecture 59 - Fractional ODEs, Abel's Integral Equations - Part 2

Lecture 60 - Fractional ODEs, Abel's Integral Equations - Part 3

Lecture 61 - Fractional PDEs - Part 1

Lecture 62 - Fractional PDEs - Part 2

Lecture 63 - Fractional PDEs - Part 3

Lecture 64 - Fractional ODEs and PDEs (Continued) - Part 1

NPTEL : NOC:Introduction to Fuzzy Set Theory, Arithmetic and Logic (Mathematics)

Co-ordinators : Prof. Nilladri Chaterjee

NPTEL : NOC:Introduction to Methods of Applied Mathematics (Mathematics)

Co-ordinators : Prof. Vivek Kumar Aggarwal

Lecture 32 - Wavelet Transform and Shannon Wavelet

NPTEL : NOC:Advanced Probability Theory (Mathematics)

Co-ordinators : Prof. Niladri Chatterjee

NPTEL : NOC:Scientific Computing using Matlab (Mathematics)

Co-ordinators : Prof. Vivek Kumar Aggarwal, Prof. Mani Mehra

Lecture 65 - Advantage of Implicit and Explicit Methods Over Each other via Matlab/Octave Codes for Initial value Problem

NPTEL : NOC:Non-parametric Statistical Inference (Mathematics)

Co-ordinators : Prof. Niladri Chatterjee

NPTEL : NOC:Matrix Computation and its applications (Mathematics)

Co-ordinators : Prof. Vivek K. Aggarwal

NPTEL : NOC:Introduction to Probability Theory and Statistics (Mathematics)

Co-ordinators : Prof. S Dharmaraja

NPTEL : Formal Languages and Automata Theory (Mathematics)

Co-ordinators : Dr. K.V. Krishna, Dr. Diganta Goswami

Lecture 1 - Introduction

Lecture 2 - Alphabet, Strings, Languages

Lecture 3 - Finite Representation

Lecture 4 - Grammars (CFG)

Lecture 5 - Derivation Trees

Lecture 6 - Regular Grammars

Lecture 7 - Finite Automata

Lecture 8 - Nondeterministic Finite Automata

Lecture 9 - NFA <=> DFA

Lecture 10 - Myhill-Nerode Theorem

Lecture 11 - Minimization

Lecture 12 - RE => FA

Lecture 13 - FA => RE

Lecture 14 - FA <=> RG

Lecture 15 - Variants of FA

Lecture 16 - Closure Properties of RL

Lecture 17 - Homomorphism

Lecture 18 - Pumping Lemma

Lecture 19 - Simplification of CFG

Lecture 20 - Normal Forms of CFG

Lecture 21 - Properties of CFLs

Lecture 22 - Pushdown Automata

Lecture 23 - PDA <=> CFG

Lecture 24 - Turing Machines

Lecture 25 - Turing Computable Functions

Lecture 26 - Combining Turing Machines

Lecture 27 - Multi Input

Lecture 28 - Turing Decidable Languages

Lecture 29 - Varients of Turing Machines

Lecture 30 - Structured Grammars

Lecture 31 - Decidability

NPTEL : Complex Analysis (Mathematics)

Co-ordinators : Prof. P.A.S. Sree Krishna

NPTEL : NOC:Mathematical Finance (Mathematics)

Co-ordinators : Prof. Siddhartha Pratim Chakrabarty

NPTEL : NOC:Mathematical Portfolio Theory (Mathematics)

Co-ordinators : Prof. Siddhartha Pratim Chakrabarty

NPTEL : NOC:Discrete-time Markov Chains and Poission Processes (Mathematics)

Co-ordinators : Prof. Ayon Ganguly, Prof. Subhamay Saha

NPTEL : NOC:Introduction to Queueing Theory (Mathematics)

Co-ordinators : Prof. N. Selvaraju

NPTEL : Applied Multivariate Analysis (Mathematics)

Co-ordinators : Dr. Sharmishtha Mitra

Lecture 32 - Discriminant Analysis and Classification

Lecture 33 - Discriminant Analysis and Classification

Lecture 34 - Discriminant Analysis and Classification

Lecture 35 - Discriminant Analysis and Classification

Lecture 36 - Discriminant Analysis and Classification

Lecture 37 - Discriminant Analysis and Classification

Lecture 38 - Factor_Analysis

Lecture 39 - Factor_Analysis

Lecture 40 - Factor_Analysis

Lecture 41 - Cannonical Correlation Analysis

Lecture 42 - Cannonical Correlation Analysis

Lecture 43 - Cannonical Correlation Analysis

Lecture 44 - Cannonical Correlation Analysis

NPTEL : Calculus of Variations and Integral Equations (Mathematics)

Co-ordinators : Dr. Malay Banerjee, Prof. D. Bahuguna

Lecture 32 - Calculus of Variations and Integral Equations

Lecture 33 - Calculus of Variations and Integral Equations

Lecture 34 - Calculus of Variations and Integral Equations

Lecture 35 - Calculus of Variations and Integral Equations

Lecture 36 - Calculus of Variations and Integral Equations

Lecture 37 - Calculus of Variations and Integral Equations

Lecture 38 - Calculus of Variations and Integral Equations

Lecture 39 - Calculus of Variations and Integral Equations

Lecture 40 - Calculus of Variations and Integral Equations

NPTEL : Linear programming and Extensions (Mathematics)

Co-ordinators : Prof. Prabha Sharma

NPTEL : Convex Optimization (Mathematics)

Co-ordinators : Dr. Joydeep Dutta

Lecture 1 - Convex Optimization

Lecture 2 - Convex Optimization

Lecture 3 - Convex Optimization

Lecture 4 - Convex Optimization

Lecture 5 - Convex Optimization

Lecture 6 - Convex Optimization

Lecture 7 - Convex Optimization

Lecture 8 - Convex Optimization

Lecture 9 - Convex Optimization

Lecture 10 - Convex Optimization

Lecture 11 - Convex Optimization

Lecture 12 - Convex Optimization

Lecture 13 - Convex Optimization

Lecture 14 - Convex Optimization

Lecture 15 - Convex Optimization

Lecture 16 - Convex Optimization

Lecture 17 - Convex Optimization

Lecture 18 - Convex Optimization

Lecture 19 - Convex Optimization

Lecture 20 - Convex Optimization

Lecture 21 - Convex Optimization

Lecture 22 - Convex Optimization

Lecture 23 - Convex Optimization

Lecture 24 - Convex Optimization

Lecture 25 - Convex Optimization

Lecture 26 - Convex Optimization

Lecture 27 - Convex Optimization

Lecture 28 - Convex Optimization

Lecture 29 - Convex Optimization

Lecture 30 - Convex Optimization

Lecture 31 - Convex Optimization

NPTEL : Foundations of Optimization (Mathematics)

Co-ordinators : Dr. Joydeep Dutta

Lecture 32 - Optimization

Lecture 33 - Optimization

Lecture 34 - Optimization

Lecture 35 - Optimization

Lecture 36 - Optimization

Lecture 37 - Optimization

Lecture 38 - Optimization

NPTEL : Probability Theory and Applications (Mathematics)

Co-ordinators : Prof. Prabha Sharma

Lecture 1 - Basic principles of counting

Lecture 2 - Sample space, events, axioms of probability

Lecture 3 - Conditional probability, Independence of events

Lecture 4 - Random variables, cumulative density function, expected value

Lecture 5 - Discrete random variables and their distributions

Lecture 6 - Discrete random variables and their distributions

Lecture 7 - Discrete random variables and their distributions

Lecture 8 - Continuous random variables and their distributions

Lecture 9 - Continuous random variables and their distributions

Lecture 10 - Continuous random variables and their distributions

Lecture 11 - Function of random variables, Momement generating function

Lecture 12 - Jointly distributed random variables, Independent r. v. and their sums

Lecture 13 - Independent r. v. and their sums

Lecture 14 - Chi â€“ square r. v., sums of independent normal r. v., Conditional distr

Lecture 15 - Conditional disti, Joint distr. of functions of r. v., Order statistics

Lecture 16 - Order statistics, Covariance and correlation

Lecture 17 - Covariance, Correlation, Cauchy- Schwarz inequalities, Conditional expectation

Lecture 18 - Conditional expectation, Best linear predictor

Lecture 19 - Inequalities and bounds

Lecture 20 - Convergence and limit theorems

Lecture 21 - Central limit theorem

Lecture 22 - Applications of central limit theorem

Lecture 23 - Strong law of large numbers, Joint mgf

Lecture 24 - Convolutions

Lecture 25 - Stochastic processes: Markov process

Lecture 26 - Transition and state probabilities

Lecture 27 - State prob., First passage and First return prob

Lecture 28 - First passage and First return prob. Classification of states

Lecture 29 - Random walk, periodic and null states

Lecture 30 - Reducible Markov chains

Lecture 31 - Time reversible Markov chains

Lecture 32 - Poisson Processes

Lecture 33 - Inter-arrival times, Properties of Poisson processes

Lecture 34 - Queuing Models: M/M/I, Birth and death process, Littleâ€™s formulae

Lecture 35 - Analysis of L, Lq ,W and Wq , M/M/S model

Lecture 36 - M/M/S , M/M/I/K models

Lecture 37 - M/M/I/K and M/M/S/K models

Lecture 38 - Application to reliability theory failure law

Lecture 39 - Exponential failure law, Weibull law

Lecture 40 - Reliability of systems

NPTEL : NOC:Basic Calculus for Engineers, Scientists and Economists (Mathematics)

Co-ordinators : Dr. Joydeep Dutta

NPTEL : NOC:Probability and Stochastics for finance (Mathematics)

Co-ordinators : Dr. Joydeep Dutta

NPTEL : NOC:Differential Calculus in Several Variables (Mathematics)

Co-ordinators : Prof. Sudipta Dutta

NPTEL : NOC:Curves and Surfaces (Mathematics)

Co-ordinators : Prof. Sudipta Dutta

NPTEL : NOC:Linear Regression Analysis and Forecasting (Mathematics)

Co-ordinators : Prof. Shalabh

NPTEL : NOC:Introduction to R Software (Mathematics)

Co-ordinators : Prof. Shalabh

NPTEL : NOC:Descriptive Statistics with R Software (Mathematics)

Co-ordinators : Prof. Shalabh

NPTEL : NOC:Calculus of Several Real Variables (Mathematics)

Co-ordinators : Dr. Joydeep Dutta

NPTEL : NOC:Linear Algebra (Prof. A.K. Lal) (Mathematics)

Co-ordinators : Prof. A.K. Lal

NPTEL : NOC:Computational Number Theory and Algebra (Mathematics)

Co-ordinators : Prof. Nitin Saxena

Lecture 1 - Introduction: Computation and Algebra

Lecture 2 - Background

Lecture 3 - GCD algorithm and Chinese Remainder Theorem

Lecture 4 - Fast polynomial multiplication

Lecture 5 - Fast polynomial multiplication (Continued...)

Lecture 6 - Fast integer multiplication and division

Lecture 7 - Fast integer arithmetic and matrix multiplication

Lecture 8 - Matrix Multiplication Tensor

Lecture 9 - Polynomial factoring over finite fields: Irreducibility testing

Lecture 10 - Equi-degree factorization and idea of Berlekamp's algorithm

Lecture 11 - Berlekamp's algorithm as a reduction method

Lecture 12 - Factoring over finite fields: Cantor-Zassenhaus algorithm

Lecture 13 - Reed Solomon Error Correcting Codes

Lecture 14 - List Decoding

Lecture 15 - Bivariate Factorization - Hensel Lifting

Lecture 16 - Bivariate polynomial factoring (Continued...)

Lecture 17 - Multivariate Polynomial Factorization

Lecture 18 - Multivariate Factoring - Hilbert's Irreducibility Theorem

Lecture 19 - Multivariate factoring (Continued...)

Lecture 20 - Analysis of LLL algorithm

Lecture 21 - Analysis of LLL algorithm (Continued...)

Lecture 22 - Analysis of LLL-reduced basis algorithm and Introduction to NTRU cryptosystem

Lecture 23 - NTRU cryptosystem (Continued...) and Introduction to Primality testing

Lecture 24 - Randomized Primality testing: Solovay-Strassen and Miller-Rabin tests

Lecture 25 - Deterministic primality test (AKS) and RSA cryptosystem

Lecture 26 - Integer factoring: Smooth numbers and Pollard's rho method

Lecture 27 - Pollard's p-1, Fermat, Morrison-Brillhart, Quadratic and Number field sieve methods

NPTEL : NOC:Basic Calculus 1 and 2 (Mathematics)

Co-ordinators : Prof. Parasar Mohanty

NPTEL : NOC:Advanced Partial Differential Equations (Mathematics)

Co-ordinators : Prof. Kaushik Bal

NPTEL : NOC:Essentials of Data Science With R Software 1: Probability and Statistical Inference (Mathematics)

Co-ordinators : Prof. Shalabh

Lecture 32 - Bernoulli and Binomial Distribution

Lecture 33 - Binomial Distribution in R

Lecture 34 - Poisson Distribution

Lecture 35 - Poisson Distribution in R

Lecture 36 - Geometric Distribution

Lecture 37 - Geometric Distribution in R

Lecture 38 - Continuous Random Variables and Uniform Distribution

Lecture 39 - Normal Distribution

Lecture 40 - Normal Distribution in R

Lecture 41 - Normal Distribution - More Results

Lecture 42 - Exponential Distribution

Lecture 43 - Bivariate Probability Distribution for Discrete Random Variables

Lecture 44 - Bivariate Probability Distribution in R Software

Lecture 45 - Bivariate Probability Distribution for Continuous Random Variables

Lecture 46 - Examples in Bivariate Probability Distribution Functions

Lecture 47 - Covariance and Correlation

Lecture 48 - Covariance and Correlation â€ Examples and R Software

Lecture 49 - Bivariate Normal Distribution

Lecture 50 - Chi square Distribution

Lecture 51 - t-Distribution

Lecture 52 - F-Distribution

Lecture 53 - Distribution of Sample Mean, Convergence in Probability and Weak Law of Large Numbers

Lecture 54 - Central Limit Theorem

Lecture 55 - Needs for Drawing Statistical Inferences

Lecture 56 - Unbiased Estimators

Lecture 57 - Efficiency of Estimators

Lecture 58 - CramÃ©râ€“Rao Lower Bound and Efficiency of Estimators

Lecture 59 - Consistency and Sufficiency of Estimators

Lecture 60 - Method of Moments

Lecture 61 - Method of Maximum Likelihood and Rao Blackwell Theorem

Lecture 62 - Basic Concepts of Confidence Interval Estimation

Lecture 63 - Confidence Interval for Mean in One Sample with Known Variance

Lecture 64 - Confidence Interval for Mean and Variance

Lecture 65 - Basics of Tests of Hypothesis and Decision Rules

Lecture 66 - Test Procedures for One Sample Test for Mean with Known Variance

Lecture 67 - One Sample Test for Mean with Unknown Variance

Lecture 68 - Two Sample Test for Mean with Known and Unknown Variances

Lecture 69 - Test of Hypothesis for Variance in One and Two Samples

NPTEL : NOC:Essentials of Data Science With R Software 2: Sampling Theory and Linear Regression Analysis (Mathematics)

Co-ordinators : Prof. Shalabh

Lecture 32 - Stratified Random Sampling : Drawing of Sample Using survey Package in R

Lecture 33 - Bootstrap Methodology : What is Bootstrap and Methodology

Lecture 34 - Bootstrap Methodology : EDF, Bootstrap Bias and Bootstrap Standard Errors

Lecture 35 - Bootstrap Methodology : Bootstrap Analysis Using boot Package in R

Lecture 36 - Bootstrap Methodology : Bootstrap Confidence Interval

Lecture 37 - Bootstrap Methodology : Bootstrap Confidence Interval Using boot and bootstrap Packages in R

Lecture 38 - Bootstrap Methodology : Example of Bootstrap Analysis Using boot Package

Lecture 39 - Introduction to Linear Models and Regression : Introduction and Basic Concepts

Lecture 40 - Simple Linear Regression Analysis : Basic Concepts and Least Squares Estimation

Lecture 41 - Simple Linear Regression Analysis : Fitting Linear Model With R Software

Lecture 42 - Simple Linear Regression Analysis : Properties of Least Squares Estimators

Lecture 43 - Simple Linear Regression Analysis : Maximum Likelihood and Confidence Interval Estimation

Lecture 44 - Simple Linear Regression Analysis : Test of Hypothesis and Confidence Interval Estimation With R

Lecture 45 - Multiple Linear Regression Analysis : Basic Concepts

Lecture 46 - Multiple Linear Regression Analysis : OLSE, Fitted Model and Residuals

Lecture 47 - Multiple Linear Regression Analysis : Model Fitting With R Software

Lecture 48 - Multiple Linear Regression Analysis : Properties of OLSE and Maximum Likelihood Estimation

Lecture 49 - Multiple Linear Regression Analysis : Test of Hypothesis and Confidence Interval Estimation on Individual Regression Coefficients

Lecture 50 - Analysis of Variance and Implementation in R Software

Lecture 51 - Goodness of Fit and Implementation in R Software

Lecture 52 - Variable Selection using LASSO Regression : Introduction and Basic Concepts

Lecture 53 - Variable Selection using LASSO Regression : LASSO with R

NPTEL : NOC:Measure Theoretic Probability 1 (Mathematics)

Co-ordinators : Prof. Suprio Bhar

NPTEL : NOC:Foundations of R Software (Mathematics)

Co-ordinators : Prof. Shalabh

NPTEL : NOC:Foundations of R Software (In Hindi) (Mathematics)

Co-ordinators : Prof. Shalabh

Lecture 31

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:An Introduction to Hyperbolic Geometry (Mathematics)

Co-ordinators : Prof. Abhijit Pal

NPTEL : NOC:A Primer to Mathematical Optimization (Mathematics)

Co-ordinators : Prof. Debdas Ghosh

NPTEL : NOC:Measure Theoretic Probability 2 (Mathematics)

Co-ordinators : Prof. Suprio Bhar

NPTEL : Advanced Engineering Mathematics (Mathematics)

Co-ordinators : Dr. P. Panigrahi, Prof. J. Kumar, Prof. P.D. Srivastava, Prof. Somesh Kumar

Lecture 32 - Laws of Probability - I

Lecture 33 - Laws of Probability - II

Lecture 34 - Problems in Probability

Lecture 35 - Random Variables

Lecture 36 - Special Discrete Distributions

Lecture 37 - Special Continuous Distributions

Lecture 38 - Joint Distributions and Sampling Distributions

Lecture 39 - Point Estimation

Lecture 40 - Interval Estimation

Lecture 41 - Basic Concepts of Testing of Hypothesis

Lecture 42 - Tests for Normal Populations

NPTEL : Functional Analysis (Mathematics)

Co-ordinators : Prof. P.D. Srivastava

NPTEL : Numerical methods of Ordinary and Partial Differential Equations (Mathematics)

Co-ordinators : Dr. G.P. Raja Sekhar

Lecture 32 - Finite Difference Approximations to Elliptic PDEs - II

Lecture 33 - Finite Difference Approximations to Elliptic PDEs - III

Lecture 34 - Finite Difference Approximations to Elliptic PDEs - IV

Lecture 35 - Finite Difference Approximations to Hyperbolic PDEs - I

Lecture 36 - Finite Difference Approximations to Hyperbolic PDEs - II

Lecture 37 - Method of characteristics for Hyperbolic PDEs - I

Lecture 38 - Method of characterisitcs for Hyperbolic PDEs - II

Lecture 39 - Finite Difference Approximations to 1st order Hyperbolic PDEs

Lecture 40 - Summary, Appendices, Remarks

NPTEL : Optimization (Mathematics)

Co-ordinators : Prof. A. Goswami, Dr. Debjani Chakraborty

Lecture 1 - Optimization - Introduction

Lecture 2 - Formulation of LPP

Lecture 3 - Geometry of LPP and Graphical Solution of LPP

Lecture 4 - Solution of LPP : Simplex Method

Lecture 5 - Big - M Method

Lecture 6 - Two - Phase Method

Lecture 7 - Special Cases in Simple Applications

Lecture 8 - Introduction to Duality Theory

Lecture 9 - Dual Simplex Method

Lecture 10 - Post Optimaility Analysis

Lecture 11 - Integer Programming - I

Lecture 12 - Integer Programming - II

Lecture 13 - Introduction to Transportation Problems

Lecture 14 - Solving Various types of Transportation Problems

Lecture 15 - Assignment Problems

Lecture 16 - Project Management

Lecture 17 - Critical Path Analysis

Lecture 18 - PERT

Lecture 19 - Shortest Path Algorithm

Lecture 20 - Travelling Salesman Problem

Lecture 21 - Classical optimization techniques : Single variable optimization

Lecture 22 - Unconstarined multivariable optimization

Lecture 23 - Nonlinear programming with equality constraint

Lecture 24 - Nonlinear programming KKT conditions

Lecture 25 - Numerical optimization : Region elimination techniques

Lecture 26 - Numerical optimization : Region elimination techniques (Continued.)

Lecture 27 - Fibonacci Method

Lecture 28 - Golden Section Methods

Lecture 29 - Interpolation Methods

Lecture 30 - Unconstarined optimization techniques : Direct search method

Lecture 31 - Unconstarined optimization techniques : Indirect search method

NPTEL : Probability and Statistics (Mathematics)

Co-ordinators : Prof. Somesh Kumar

NPTEL : Regression Analysis (Mathematics)

Co-ordinators : Dr. Soumen Maity

NPTEL : Statistical Inference (Mathematics)

Co-ordinators : Prof. Somesh Kumar

NPTEL : A Basic Course in Real Analysis (Mathematics)

Co-ordinators : Prof. P.D. Srivastava

NPTEL : Statistical Methods for Scientists and Engineers (Mathematics)

Co-ordinators : Prof. Somesh Kumar

NPTEL : NOC:Probability and Statistics (Mathematics)

Co-ordinators : Prof. Somesh Kumar

NPTEL : NOC:Applied Multivariate Statistical Modeling (Mathematics)

Co-ordinators : Dr J Maiti

NPTEL : NOC:Partial Differential Equations (PDE) for Engineers - Solution by Separation of Variables (Mathematics)

Co-ordinators : Prof. S. De

NPTEL : NOC:Introductory Course in Real Analysis (Mathematics)

Co-ordinators : Prof. P.D. Srivastava

NPTEL : NOC:Modeling Transport Phenomena of Microparticles (Mathematics)

Co-ordinators : Dr. G.P. Raja Sekhar, Prof. Somnath Bhattacharyya

NPTEL : NOC:Constrained and Unconstrained Optimization (Mathematics)

Co-ordinators : Dr. Debjani Chakraborty, Prof. A. Goswami

NPTEL : NOC:Matrix Solver (Mathematics)

Co-ordinators : Prof. Somnath Roy

NPTEL : NOC:Introduction to Abstract and Linear Algebra (Mathematics)

Co-ordinators : Prof.Sourav Mukhopadhyay

NPTEL : NOC:Engineering Mathematics-I (Mathematics)

Co-ordinators : Prof. Jitendra Kumar

NPTEL : NOC:Integral and Vector Calculus (Mathematics)

Co-ordinators : Prof. Hari Shankar Mahato

Lecture 1 - Partition, Riemann intergrability and One example

Lecture 2 - Partition, Riemann intergrability and One example (Continued...)

Lecture 3 - Condition of integrability

Lecture 4 - Theorems on Riemann integrations

Lecture 5 - Examples

Lecture 6 - Examples (Continued...)

Lecture 7 - Reduction formula

Lecture 8 - Reduction formula (Continued...)

Lecture 9 - Improper Integral

Lecture 10 - Improper Integral (Continued...)

Lecture 11 - Improper Integral (Continued...)

Lecture 12 - Improper Integral (Continued...)

Lecture 13 - Introduction to Beta and Gamma Function

Lecture 14 - Beta and Gamma Function

Lecture 15 - Differentiation under Integral Sign

Lecture 16 - Differentiation under Integral Sign (Continued...)

Lecture 17 - Double Integral

Lecture 18 - Double Integral over a Region E

Lecture 19 - Examples of Integral over a Region E

Lecture 20 - Change of variables in a Double Integral

Lecture 21 - Change of order of Integration

Lecture 22 - Triple Integral

Lecture 23 - Triple Integral (Continued...)

Lecture 24 - Area of Plane Region

Lecture 25 - Area of Plane Region (Continued...)

Lecture 26 - Rectification

Lecture 27 - Rectification (Continued...)

Lecture 28 - Surface Integral

Lecture 29 - Surface Integral (Continued...)

Lecture 30 - Surface Integral (Continued...)

Lecture 31 - Volume Integral, Gauss Divergence Theorem

NPTEL : NOC:Transform Calculus and its applications in Differential Equations (Mathematics)

Co-ordinators : Prof. A. Goswami

NPTEL : NOC:Statistical Inference (2019) (Mathematics)

Co-ordinators : Prof. Somesh Kumar

Lecture 32 - Testing of Hypotheses : Basic Concepts - II

Lecture 33 - Neyman Pearson Fundamental Lemma - I

Lecture 34 - Neyman Pearson Fundamental Lemma - II

Lecture 35 - Application of NP-Lemma - I

Lecture 36 - Application of NP-Lemma - II

Lecture 37 - UMP Tests - I

Lecture 38 - UMP Tests - II

Lecture 39 - UMP Tests - III

Lecture 40 - UMP Tests - IV

Lecture 41 - UMP Unbiased Tests - I

Lecture 42 - UMP Unbiased Tests - II

Lecture 43 - UMP Unbiased Tests - III

Lecture 44 - UMP Unbiased Tests - IV

Lecture 45 - Applications of UMP Unbiased Tests - I

Lecture 46 - Applications of UMP Unbiased Tests - II

Lecture 47 - Unbiased Test for Normal Populations - I

Lecture 48 - Unbiased Test for Normal Populations - II

Lecture 49 - Unbiased Test for Normal Populations - III

Lecture 50 - Unbiased Test for Normal Populations - IV

Lecture 51 - Likelihood Ratio Tests - I

Lecture 52 - Likelihood Ratio Tests - II

Lecture 53 - Likelihood Ratio Tests - III

Lecture 54 - Likelihood Ratio Tests - IV

Lecture 55 - Likelihood Ratio Tests - V

Lecture 56 - Likelihood Ratio Tests - VI

Lecture 57 - Likelihood Ratio Tests - VII

Lecture 58 - Likelihood Ratio Tests - VIII

Lecture 59 - Test for Goodness of Fit - I

Lecture 60 - Test for Goodness of Fit - II

Lecture 61 - Interval Estimation - I

Lecture 62 - Interval Estimation - II

Lecture 63 - Interval Estimation - III

Lecture 64 - Interval Estimation - IV

NPTEL : NOC:Mathematical Methods for Boundary Value Problems (Mathematics)

Co-ordinators : Prof. Somnath Bhattacharyya

NPTEL : NOC:Engineering Mathematics-II (Mathematics)

Co-ordinators : Prof. Jitendra Kumar

NPTEL : NOC:Advanced Calculus For Engineers (Mathematics)

Co-ordinators : Prof. Somesh Kumar, Prof. Jitendra Kumar

Lecture 32 - Improper Integral - Part 2

Lecture 33 - Improper Integral - Part 3

Lecture 34 - Improper Integral - Part 4

Lecture 35 - Beta and Gamma Function - Part 1

Lecture 36 - Beta and Gamma Function - Part 2

Lecture 37 - Differentiation under the Integral Sign

Lecture 38 - Double Integrals - Part 1

Lecture 39 - Double Integrals - Part 2

Lecture 40 - Double Integrals - Part 3

Lecture 41 - Double Integrals - Part 4

Lecture 42 - Double Integrals - Part 5

Lecture 43 - Double Integrals - Part 6

Lecture 44 - Triple Integrals - Part 1

Lecture 45 - Triple Integrals - Part 2

Lecture 46 - Vector Functions

Lecture 47 - Vector and Scalar Fields

Lecture 48 - Divergence and Curl of a Vector Field

Lecture 49 - Line Integrals

Lecture 50 - Conservative Vector Fields

Lecture 51 - Green's Theorem

Lecture 52 - Surface Integrals - Part 1

Lecture 53 - Surface Integrals - Part 2

Lecture 54 - Stokes' Theorem

Lecture 55 - Divergence Theorem

Lecture 56 - Application of Derivatives

Lecture 57 - Application of Derivatives (Continued...)

Lecture 58 - Properties of Gradient, Divergence and Curl

Lecture 59 - Properties of Gradient, Divergence and Curl (Continued...)

Lecture 60 - Curl and Integrals

NPTEL : NOC:Rings and Modules (Mathematics)

Co-ordinators : Prof. Ramakrishna Nanduri, Prof. Mousumi Mandal

NPTEL : NOC:Advanced Computational Techniques (Mathematics)

Co-ordinators : Prof. Somnath Bhattacharyya

NPTEL : NOC:Applied Linear Algebra in AI and ML (Mathematics)

Co-ordinators : Prof. Swanand Khare

NPTEL : NOC:Advanced Engineering Mathematics (2023) (Mathematics)

Co-ordinators : Prof. H S Mahato

NPTEL : NOC:Essentials of Topology (Mathematics)

Co-ordinators : Prof. S. P. Tiwari

NPTEL : An Introduction to Riemann Surfaces and Algebraic Curves: Complex 1-Tori and Elliptic Curves (Mathematics)

Co-ordinators : Dr. T.E. Venkata Balaji

NPTEL : Linear Algebra (Mathematics)

Co-ordinators : Dr. K.C. Sivakumar

Lecture 31 - Triangulability, Diagonalization in Terms of the Minimal Polynomial

Lecture 32 - Independent Subspaces and Projection Operators

Lecture 33 - Direct Sum Decompositions and Projection Operators - I

Lecture 34 - Direct Sum Decompositions and Projection Operators - II

Lecture 35 - The Primary Decomposition Theorem and Jordan Decomposition

Lecture 36 - Cyclic Subspaces and Annihilators

Lecture 37 - The Cyclic Decomposition Theorem - I

Lecture 38 - The Cyclic Decomposition Theorem - II. The Rational Form

Lecture 39 - Inner Product Spaces

Lecture 40 - Norms on Vector spaces. The Gram-Schmidt Procedure I

Lecture 41 - The Gram-Schmidt Procedure II. The QR Decomposition

Lecture 42 - Bessel's Inequality, Parseval's Indentity, Best Approximation

Lecture 43 - Best Approximation: Least Squares Solutions

Lecture 44 - Orthogonal Complementary Subspaces, Orthogonal Projections

Lecture 45 - Projection Theorem. Linear Functionals

Lecture 46 - The Adjoint Operator

Lecture 47 - Properties of the Adjoint Operation. Inner Product Space Isomorphism

Lecture 48 - Unitary Operators

Lecture 49 - Unitary operators - II. Self-Adjoint Operators - I.

Lecture 50 - Self-Adjoint Operators - II - Spectral Theorem

Lecture 51 - Normal Operators - Spectral Theorem

NPTEL : Mathematical Logic (Mathematics)

Co-ordinators : Prof. Arindama Singh

NPTEL : Real Analysis (Mathematics)

Co-ordinators : Prof. S.H. Kulkarni

NPTEL : Dynamic Data Assimilation: An Introduction (Mathematics)

Co-ordinators : Prof. S. Lakshmivarahan

NPTEL : NOC:An Invitation to Mathematics (Mathematics)

Co-ordinators : Prof. Sankaran Vishwanath

Lecture 1 - Introduction

Lecture 2 - Long division

Lecture 3 - Applications of Long division

Lecture 4 - Lagrange interpolation

Lecture 5 - The 0-1 idea in other contexts - dot and cross product

Lecture 6 - Taylors formula

Lecture 7 - The Chebyshev polynomials

Lecture 8 - Counting number of monomials - several variables

Lecture 9 - Permutations, combinations and the binomial theorem

Lecture 10 - Combinations with repetition, and counting monomials

Lecture 11 - Combinations with restrictions, recurrence relations

Lecture 12 - Fibonacci numbers; an identity and a bijective proof

Lecture 13 - Permutations and cycle type

Lecture 14 - The sign of a permutation, composition of permutations

Lecture 15 - Rules for drawing tangle diagrams

Lecture 16 - Signs and cycle decompositions

Lecture 17 - Sorting lists of numbers, and crossings in tangle diagrams

Lecture 18 - Real and integer valued polynomials

Lecture 19 - Integer valued polynomials revisited

Lecture 20 - Functions on the real line, continuity

Lecture 21 - The intermediate value property

Lecture 22 - Visualizing functions

Lecture 23 - Functions on the plane, Rigid motions

Lecture 24 - More examples of functions on the plane, dilations

Lecture 25 - Composition of functions

Lecture 26 - Affine and Linear transformations

Lecture 27 - Length and Area dilation, the derivative

Lecture 28 - Examples-I

Lecture 29 - Examples-II

Lecture 30 - Linear equations, Lagrange interpolation revisited

Lecture 31 - Completed Matrices in combinatorics

NPTEL : Advanced Complex Analysis (Mathematics)

Co-ordinators : Dr. T.E. Venkata Balaji

NPTEL : NOC:Discrete Mathematics (Mathematics)

Co-ordinators : Prof. Sourav Chakraborty

Lecture 1 - Course Introduction

Lecture 2 - Sets, Relations and Functions

Lecture 3 - Propositional Logic and Predicate Logic

Lecture 4 - Propositional Logic and Predicate Logic (Part 2)

Lecture 5 - Elementary Number Theory

Lecture 6 - Formal Proofs

Lecture 7 - Direct Proofs

Lecture 8 - Case Study

Lecture 9 - Case Study (Part 2)

Lecture 10 - Sets, Relations, Function and Logic

Lecture 11 - Proof by Contradiction (Part 1)

Lecture 12 - Proof by Contradiction (Part 2)

Lecture 13 - Proof by Contraposition

Lecture 14 - Proof by Counter Example

Lecture 15 - Mathematical Induction (Part 1)

Lecture 16 - Mathematical Induction (Part 2)

Lecture 17 - Mathematical Induction (Part 3)

Lecture 18 - Mathematical Induction (Part 4)

Lecture 19 - Mathematical Induction (Part 5)

Lecture 20 - Mathematical Induction (Part 6)

Lecture 21 - Mathematical Induction (Part 7)

Lecture 22 - Mathematical Induction (Part 8)

Lecture 23 - Introduction to Graph Theory

Lecture 24 - Handshake Problem

Lecture 25 - Tournament Problem

Lecture 26 - Tournament Problem (Part 2)

Lecture 27 - Ramsey Problem

Lecture 28 - Ramsey Problem (Part 2)

Lecture 29 - Properties of Graphs

Lecture 30 - Problem 1

Lecture 31 - Problem 2

Lecture 32 - Problem 3 & 4

Lecture 33 - Counting for Selection

Lecture 34 - Counting for Distribution

Lecture 35 - Counting for Distribution (Part 2)

Lecture 36 - Some Counting Problems

Lecture 37 - Counting using Recurrence Relations

Lecture 38 - Counting using Recurrence Relations (Part 2)

Lecture 39 - Solving Recurrence Relations (Part 1)

Lecture 40 - Solving Recurrence Relations (Part 2)

Lecture 41 - Asymptotic Relations (Part 1)

Lecture 42 - Asymptotic Relations (Part 2)

Lecture 43 - Asymptotic Relations (Part 3)

Lecture 44 - Asymptotic Relations (Part 4)

Lecture 45 - Generating Functions (Part 1)

Lecture 46 - Generating Functions (Part 2)

Lecture 47 - Generating Functions (Part 3)

Lecture 48 - Generating Functions (Part 4)

Lecture 49 - Proof Techniques

Lecture 50 - Modeling: Graph Theory and Linear Programming

Lecture 51 - Combinatorics

NPTEL : Advanced Complex Analysis - Part 2 (Mathematics)

Co-ordinators : Dr. T.E. Venkata Balaji

Lecture 1 - Properties of the Image of an Analytic Function - Introduction to the Picard Theorems

Lecture 2 - Recalling Singularities of Analytic Functions - Non-isolated and Isolated Removable, Pole and Essential Singularities

Lecture 3 - Recalling Riemann's Theorem on Removable Singularities

Lecture 4 - Casorati-Weierstrass Theorem; Dealing with the Point at Infinity -- Riemann Sphere and Riemann Stereographic Projection

Lecture 5 - Neighborhood of Infinity, Limit at Infinity and Infinity as an Isolated Singularity

Lecture 6 - Studying Infinity - Formulating Epsilon-Delta Definitions for Infinite Limits and Limits at Infinity

Lecture 7 - When is a function analytic at infinity ?

Lecture 8 - Laurent Expansion at Infinity and Riemann\'s Removable Singularities Theorem for the Point at Infinity

Lecture 9 - The Generalized Liouville Theorem - Little Brother of Little Picard and Analogue of Casorati-Weierstrass; Failure of Cauchy\'s Theorem at Infinity

Lecture 10 - Morera\'s Theorem at Infinity, Infinity as a Pole and Behaviour at Infinity of Rational and Meromorphic Functions

Lecture 11 - Residue at Infinity and Introduction to the Residue Theorem for the Extended Complex Plane - Residue Theorem for the Point at Infinity

Lecture 12 - Proofs of Two Avatars of the Residue Theorem for the Extended Complex Plane and Applications of the Residue at Infinity

Lecture 13 - Infinity as an Essential Singularity and Transcendental Entire Functions

Lecture 14 - Meromorphic Functions on the Extended Complex Plane are Precisely Quotients of Polynomials

Lecture 15 - The Ubiquity of Meromorphic Functions - The Nerves of the Geometric Network Bridging Algebra, Analysis and Topology

Lecture 16 - Continuity of Meromorphic Functions at Poles and Topologies of Spaces of Functions

Lecture 17 - Why Normal Convergence, but Not Globally Uniform Convergence, is the Inevitable in Complex Analysis

Lecture 18 - Measuring Distances to Infinity, the Function Infinity and Normal Convergence of Holomorphic Functions in the Spherical Metric

Lecture 19 - The Invariance Under Inversion of the Spherical Metric on the Extended Complex Plane

Lecture 20 - Introduction to Hurwitz\'s Theorem for Normal Convergence of Holomorphic Functions in the Spherical Metric

Lecture 21 - Completion of Proof of Hurwitz\'s Theorem for Normal Limits of Analytic Functions in the Spherical Metric

Lecture 22 - Hurwitz\'s Theorem for Normal Limits of Meromorphic Functions in the Spherical Metric

Lecture 23 - What could the Derivative of a Meromorphic Function Relative to the Spherical Metric Possibly Be ?

Lecture 24 - Defining the Spherical Derivative of a Meromorphic Function

Lecture 25 - Well-definedness of the Spherical Derivative of a Meromorphic Function at a Pole and Inversion-invariance of the Spherical Derivative

Lecture 26 - Topological Preliminaries - Translating Compactness into Boundedness

Lecture 27 - Introduction to the Arzela-Ascoli Theorem - Passing from abstract Compactness to verifiable Equicontinuity

Lecture 28 - Proof of the Arzela-Ascoli Theorem for Functions - Abstract Compactness Implies Equicontinuity

NPTEL : Basic Algebraic Geometry : Varieties, Morphisms, Local Rings, Function Fields and Nonsingularity (Mathematics)

Co-ordinators : Dr. T.E. Venkata Balaji

NPTEL : NOC:Introduction to Commutative Algebra (Mathematics)

Co-ordinators : Prof. A.V.Jayanthan

NPTEL : NOC:Differential Equations (Mathematics)

Co-ordinators : Prof. Srinivasa Manam

NPTEL : NOC:Numerical Analysis (Mathematics)

Co-ordinators : Prof. R. Usha

NPTEL : NOC:Graph Theory (Mathematics)

Co-ordinators : Dr. Soumen Maity

Lecture 1 - Basic Concepts

Lecture 2 - Basic Concepts - 1

Lecture 3 - Eulerian and Hamiltonian Graph

Lecture 4 - Eulerian and Hamiltonian Graph - 1

Lecture 5 - Bipartite Graph

Lecture 6 - Bipartite Graph

Lecture 7 - Diameter of a graph; Isomorphic graphs

Lecture 8 - Diameter of a graph; Isomorphic graphs

Lecture 9 - Minimum Spanning Tree

Lecture 10 - Minimum Spanning Trees (Continued...)

Lecture 11 - Minimum Spanning Trees (Continued...)

Lecture 12 - Minimum Spanning Trees (Continued...)

Lecture 13 - Maximum Matching in Bipartite Graph

Lecture 14 - Maximum Matching in Bipartite Graph - 1

Lecture 15 - Hall's Theorem and Konig's Theorem

Lecture 16 - Hall's Theorem and Konig's Theorem - 1

Lecture 17 - Independent Set and Edge Cover

Lecture 18 - Independent Set and Edge Cover - 1

Lecture 19 - Matching in General Graphs

Lecture 20 - Proof of Halls Theorem

Lecture 21 - Stable Matching

Lecture 22 - Gale-Shapley Algorithm

Lecture 23 - Graph Connectivity

Lecture 24 - Graph Connectivity - 1

Lecture 25 - 2-Connected Graphs

Lecture 26 - 2-Connected Graphs - 1

Lecture 27 - Subdivision of an edge; 2-edge-connected graphs

Lecture 28 - Problems Related to Graphs Connectivity

Lecture 29 - Flow Network

Lecture 30 - Residual Network and Augmenting Path

Lecture 31 - Augmenting Path Algorithm

NPTEL : NOC:Transform Techniques for Engineers (Mathematics)

Co-ordinators : Prof. Srinivasa Manam

Lecture 1 - Introduction to Fourier series

Lecture 2 - Fourier seriesÂ - ExamplesÂ

Lecture 3 - Complex Fourier seriesÂ

Lecture 4 - Conditions for the Convergence of Fourier SeriesÂ

Lecture 5 - Conditions for the Convergence of Fourier Series (Continued...)

Lecture 6 - Use of Delta function in the Fourier series convergence

Lecture 7 - More Examples on Fourier Series of a Periodic Signal

Lecture 8 - Gibb's Phenomenon in the Computation of Fourier Series

Lecture 9 - Properties of Fourier Transform of a Periodic Signal

Lecture 10 - Properties of Fourier transform (Continued...)

Lecture 11 - Parseval's Identity and Recap of Fourier series

Lecture 12 - Fourier integral theorem-an informal proof

Lecture 13 - Definition of Fourier transforms

Lecture 14 - Fourier transform of a Heavyside function

Lecture 15 - Use of Fourier transforms to evaluate some integrals

Lecture 16 - Evaluation of an integral- Recall of complex function theory

Lecture 17 - Properties of Fourier transforms of non-periodic signals

Lecture 18 - More properties of Fourier transforms

Lecture 19 - Fourier integral theorem - proof

Lecture 20 - Application of Fourier transform to ODE's

Lecture 21 - Application of Fourier transforms to differential and integral equations

Lecture 22 - Evaluation of integrals by Fourier transforms

Lecture 23 - D'Alembert's solution by Fourier transform

Lecture 24 - Solution of Heat equation by Fourier transform

Lecture 25 - Solution of Heat and Laplace equations by Fourier transform

Lecture 26 - Introduction to Laplace transform

Lecture 27 - Laplace transform of elementary functions

Lecture 28 - Properties of Laplace transforms

Lecture 29 - Properties of Laplace transforms (Continued...)

Lecture 30 - Methods of finding inverse Laplace transform

Lecture 31 - Heavyside expansion theorem

NPTEL : NOC:Introduction to Probability and Statistics (Mathematics)

Co-ordinators : Prof. G. Srinivasan

NPTEL : NOC:Introduction to Abstract Group Theory (Mathematics)

Co-ordinators : Prof. Krishna Hanumanthu

NPTEL : NOC:Groups: Motion, Symmetry and Puzzles (Mathematics)

Co-ordinators : Prof. Amit Kulshrestha

NPTEL : NOC:Introduction to Rings and Fields (Mathematics)

Co-ordinators : Prof. Krishna Hanumanthu

NPTEL : NOC:Probabilistic Methods in PDE (Mathematics)

Co-ordinators : Prof. Anindya Goswami

Lecture 32 - Remark on Tychonoff's Theorem

Lecture 33 - Widderâ€™s result and its extension on heat equation

Lecture 34 - Solution to the mixed initial boundary value problemÂ

Lecture 35 - The Feynman-Kac formulaÂ

Lecture 36 - Kacâ€™s theorem on the stochastic representation of solution to a second-order linear ODE - Part 1

Lecture 37 - Kacâ€™s theorem on the stochastic representation of solution to a second-order linear ODE - Part 2

Lecture 38 - Geometric Brownian motion

Lecture 39 - A system of stochastic differential equations in application

Lecture 40 - Brownian bridge

Lecture 41 - Simulation of stochastic differential equations

Lecture 42 - Stochastic differential equations: Uniqueness

Lecture 43 - Stochastic differential equations: Existence - Part 1

Lecture 44 - Stochastic differential equations: Existence - Part 2

Lecture 45 - Stochastic differential equations: Existence - Part 3

Lecture 46 - Stochastic differential equations: Weak solution

Lecture 47 - Functional Stochastic Differential Equations

Lecture 48 - Statement of Dirichlet and Cauchy problems with variable coefficients elliptic operators

Lecture 49 - Cauchy Problem with variable coefficients: Feynman-Kac formula - Part 1

Lecture 50 - Cauchy Problem with variable coefficients: Feynman-Kac formula - Part 2

Lecture 51 - Semigroup of bounded linear operators on Banach space - Part 1

Lecture 52 - Semigroup of bounded linear operators on Banach space - Part 2

Lecture 53 - Growth property of C0 semigroup

Lecture 54 - Unique semigroup generated by a bounded linear operator

Lecture 55 - Homogeneous initial value problem

Lecture 56 - Mild solution to homogeneous initial value problem

Lecture 57 - Mild solution to inhomogeneous initial value problem

Lecture 58 - Sufficient condition for existence of classical solution of IVP

Lecture 59 - Tutorial on Resolvant operator

Lecture 60 - Feynman-Kac formula and the formula of variations of constants

Lecture 61 - Non-autonomous evolution problem and mild/generalized solution

Lecture 62 - Sufficient condition for existence of an evolution system

Lecture 63 - Y-valued solution

Lecture 64 - mild/generalized solution to Semi-linear Evolution Problem

NPTEL : NOC:Linear Algebra (Prof. Pranav Haridas) (Mathematics)

Co-ordinators : Prof. Pranav Haridas

NPTEL : NOC:Algebra - I (Mathematics)

Co-ordinators : Prof. Amritanshu Prasad, Prof. S. Viswanath

Lecture 1 - Permutations

Lecture 2 - Group Axioms

Lecture 3 - Order and Conjugacy

Lecture 4 - Subgroups

Lecture 5 - Problem solving

Lecture 6 - Group Actions

Lecture 7 - Cosets

Lecture 8 - Group Homomorphisms

Lecture 9 - Normal subgroups

Lecture 10 - Qutient Groups

Lecture 11 - Product and Chinese Remainder Theorem

Lecture 12 - Dihedral Groups

Lecture 13 - Semidirect products

Lecture 14 - Problem solving

Lecture 15 - The Orbit Counting Theorem

Lecture 16 - Fixed points of group actions

Lecture 17 - Second application: Fixed points of group actions

Lecture 18 - Sylow Theorem - a preliminary proposition

Lecture 19 - Sylow Theorem - I

Lecture 20 - Problem solving - I

Lecture 21 - Problem solving - II

Lecture 22 - Sylow Theorem - II

Lecture 23 - Sylow Theorem - III

Lecture 24 - Problem solving - I

Lecture 25 - Problem solving - II

Lecture 26 - Free Groups - I

Lecture 27 - Free Groups - IIa

Lecture 28 - Free Groups - IIb

Lecture 29 - Free Groups - III

Lecture 30 - Free Groups - IV

Lecture 31 - Problem Solving/Examples

NPTEL : NOC:Computational Commutative Algebra (Mathematics)

Co-ordinators : Prof. Manoj Kummini

NPTEL : NOC:Laplace Transform (Mathematics)

Co-ordinators : Prof. Indrava Roy

NPTEL : NOC:Measure Theory (Prof. Indrava Roy) (Mathematics)

Co-ordinators : Prof. Indrava Roy

Lecture 1 - Finite Sets and Cardinality

Lecture 2 - Infinite Sets and the Banach-Tarski Paradox - Part 1

Lecture 3 - Infinite Sets and the Banach-Tarski Paradox - Part 2

Lecture 4 - Elementary Sets and Elementary measure - Part 1

Lecture 5 - Elementary Sets and Elementary measure - Part 2

Lecture 6 - Properties of elementary measure - Part 1

Lecture 7 - Properties of elementary measure - Part 2

Lecture 8 - Uniqueness of elementary measure and Jordan measurability - Part 1

Lecture 9 - Uniqueness of elementary measure and Jordan measurability - Part 2

Lecture 10 - Characterization of Jordan measurable sets and basic properties of Jordan measure - Part 1

Lecture 11 - Characterization of Jordan measurable sets and basic properties of Jordan measure - Part 2

Lecture 12 - Examples of Jordan measurable sets-I

Lecture 13 - Examples of Jordan measurable sets-II - Part 1

Lecture 14 - Examples of Jordan measurable sets-II - Part 2

Lecture 15 - Jordan measure under Linear transformations - Part 1

Lecture 16 - Jordan measure under Linear transformations - Part 2

Lecture 17 - Connecting the Jordan measure with the Riemann integral - Part 1

Lecture 18 - Connecting the Jordan measure with the Riemann integral - Part 2

Lecture 19 - Outer measure - Motivation and Axioms of outer measure

Lecture 20 - Comparing Inner Jordan measure, Lebesgue outer measure and Jordan Outer measure

Lecture 21 - Finite additivity of outer measure on Separated sets, Outer regularity - Part 1

Lecture 22 - Finite additivity of outer measure on Separated sets, Outer regularity - Part 2

Lecture 23 - Lebesgue measurable class of sets and their Properties - Part 1

Lecture 24 - Lebesgue measurable class of sets and their Properties - Part 2

Lecture 25 - Equivalent criteria for lebesgue measurability of a subset - Part 1

Lecture 26 - Equivalent criteria for lebesgue measurability of a subset - Part 2

Lecture 27 - The measure axioms and the Borel-Cantelli Lemma

Lecture 28 - Properties of the Lebesgue measure: Inner regularity,Upward and Downwar Monotone convergence theorem, and Dominated convergence theorem for sets - Part 1

Lecture 29 - Properties of the Lebesgue measure: Inner regularity,Upward and Downwar Monotone convergence theorem, and Dominated convergence theorem for sets - Part 2

Lecture 30 - Lebesgue measurability under Linear transformation, Construction of Vitali Set - Part 1

Lecture 31 - Lebesgue measurability under Linear transformation, Construction of Vitali Set - Part 2

Lecture 32 - Abstract measure spaces: Boolean and Sigma-algebras

Lecture 33 - Abstract measure and Caratheodory Measurability - Part 1

Lecture 34 - Abstract measure and Caratheodory Measurability - Part 2

Lecture 35 - Abstrsct measure and Hahn-Kolmogorov Extension

Lecture 36 - Lebesgue measurable class vs Caratheodory extension of usual outer measure on R^d

Lecture 37 - Examples of Measures defined on R^d via Hahn Kolmogorov extension - Part 1

Lecture 38 - Examples of Measures defined on R^d via Hahn Kolmogorov extension - Part 2

Lecture 39 - Measurable functions: definition and basic properties - Part 1

Lecture 40 - Measurable functions: definition and basic properties - Part 2

Lecture 41 - Egorov's theorem: abstract version

Lecture 42 - Lebesgue integral of unsigned simple measurable functions: definition and properties

Lecture 43 - Lebesgue integral of unsigned measurable functions: motivation, definition and basic properties

Lecture 44 - Fundamental convergence theorems in Lebesgue integration: Monotone convergence theorem, Tonelli's theorem and Fatou's lemma

Lecture 45 - Lebesgue integral for complex and real measurable functions: the space of L^1 functions

Lecture 46 - Basic properties of L^1-functions and Lebesgue's Dominated convergence theorem

Lecture 47 - L^1 functions on R^d: Egorov's theorem revisited (Littlewood's third principle)

Lecture 48 - L^1 functions on R^d: Statement of Lusin's theorem (Littlewood's second principle), Density of simple functions, step functions, and continuous compactly supported functions in L^1

Lecture 49 - L^1 functions on R^d: Proof of Lusin's theorem, space of L^1 functions as a metric space

Lecture 50 - L^1 functions on R^d: the Riesz-Fischer theorem

Lecture 51 - Various modes of convergence of measurable functions

Lecture 52 - Easy implications from one mode of convergence to another

Lecture 53 - Implication map for modes of convergence with various examples

Lecture 54 - Uniqueness of limits across various modes of convergence

Lecture 55 - Some criteria for reverse implications for modes of convergence

Lecture 56 - Riesz Representation theorem- Motivation

Lecture 57 - Basics on Locally compact Hausdorff spaces

Lecture 58 - Borel and Radon measures on LCH spaces

Lecture 59 - Properties of Radon measures and Lusin's theorem on LCH spaces

Lecture 60 - Riesz Representation theorem - Complete statement and proof - Part 1

Lecture 61 - Riesz Representation theorem - Complete statement and proof - Part 2

Lecture 62 - Examples of measures constructed using RRT

Lecture 63 - Theorems of Tonelli and Fubini- interchanging the order of integration for repeated integrals: motivation and discussion of product measure spaces

Lecture 64 - Product measures

Lecture 65 - Tonelli's theorem for sets - Part 1

Lecture 66 - Tonelli's theorem for sets - Part 2

Lecture 67 - Fubini-Tonelli theorem: interchanging order of integration for measurable and L^1 functions on sigma-finite measure spaces

Lecture 68 - Lebesgue's differentiation theorem: introduction and motivation

Lecture 69 - Lebesgue's differentiation theorem: statement and proof - Part 1

Lecture 70 - Lebesgue's differentiation theorem: statement and proof - Part 2

Lecture 71 - DIfferentiation theorems: Almost everywhere differentiability for Monotone and Bounded Variation functions - Part 1

Lecture 72 - DIfferentiation theorems: Almost everywhere differentiability for Monotone and Bounded Variation functions - Part 2

Lecture 73 - Riesz's Rising Sun Lemma

Lecture 74 - Differentiation theorem for monone continuous functions

Lecture 75 - Differentation theorem for general monotone functions and Second fundamental theorem of calculus for absolutely continuous functions

NPTEL : NOC:Complex Analysis (Mathematics)

Co-ordinators : Prof. Pranav Haridas

Lecture 1 - Field of Complex Numbers

Lecture 2 - Conjugation and Absolute value

Lecture 3 - Topology on Complex plane

Lecture 4 - Topology on Complex Plane (Continued...)

Lecture 5 - Problem Session

Lecture 6 - Isometries on the Complex Plane

Lecture 7 - Functions on the Complex Plane

Lecture 8 - Complex differentiability

Lecture 9 - Power Series

Lecture 10 - Differentiation of power series

Lecture 11 - Problem Session

Lecture 12 - Cauchy-Riemann equations

Lecture 13 - Harmonic functions

Lecture 14 - MÃ¶bius transformations

Lecture 15 - Problem session

Lecture 16 - Curves in the complex plane

Lecture 17 - Complex Integration over curves

Lecture 18 - First Fundamental theorem of Calculus

Lecture 19 - Second Fundamental theorem of Calculus

Lecture 20 - Problem session

Lecture 21 - Homotopy of curves

Lecture 22 - Cauchy-Goursat theorem

Lecture 23 - Cauchy's theorem

Lecture 24 - Problem Session

Lecture 25 - Cauchy Integral Formula

Lecture 26 - Principle of analytic continuation and Cauchy estimates

Lecture 27 - Further consequences of Cauchy Integral Formula

Lecture 28 - Problem session

Lecture 29 - Winding number

Lecture 30 - Open mapping theorem

Lecture 31 - Schwarz reflection principle

NPTEL : NOC:Real Analysis - I (Mathematics)

Co-ordinators : Prof. Jaikrishnan J

Lecture 1 - WEEK 1 - INTRODUCTION

Lecture 2 - Why study Real Analysis

Lecture 3 - Square root of 2

Lecture 4 - Wason's selection task

Lecture 5 - Zeno's Paradox

Lecture 6 - Basic set theory

Lecture 7 - Basic logic

Lecture 8 - Quantifiers

Lecture 9 - Proofs

Lecture 10 - Functions and relations

Lecture 11 - Axioms of Set Theory

Lecture 12 - Equivalence relations

Lecture 13 - What are the rationals

Lecture 14 - Cardinality

Lecture 15 - WEEK 2 - INTRODUCTION

Lecture 16 - Field axioms

Lecture 17 - Order axioms

Lecture 18 - Absolute value

Lecture 19 - The completeness axiom

Lecture 20 - Nested intervals property

Lecture 21 - NIP+APâ‡' Completeness

Lecture 22 - Existence of square roots

Lecture 23 - Uncountability of the real numbers

Lecture 24 - Density of rationals and irrationals

Lecture 25 - WEEK 3 - INTRODUCTION

Lecture 26 - Motivation for infinite sums

Lecture 27 - Definition of sequence and examples

Lecture 28 - Definition of convergence

Lecture 29 - Uniqueness of limits

Lecture 30 - Achilles and the tortoise

Lecture 31 - Deep dive into the definition of convergence

NPTEL : NOC:Variational Calculus and its applications in Control Theory and Nanomechanics (Mathematics)

Co-ordinators : Prof. Sarthok Sircar

NPTEL : NOC:Introduction to Galois Theory (Mathematics)

Co-ordinators : Prof. Krishna Hanumanthu

Lecture 1 - Motivation and overview of the course

Lecture 2 - Review of group theory

Lecture 3 - Review of ring theory - I

Lecture 4 - Review of ring theory - II

Lecture 5 - Review of field theory - I

Lecture 6 - Review of field theory - II

Lecture 7 - Review of field theory - III

Lecture 8 - Problem Session - Part 1

Lecture 9 - Problem Session - Part 2

Lecture 10 - Beginning of Galois theory

Lecture 11 - Fixed fields

Lecture 12 - Theorem I on fixed fields

Lecture 13 - Theorem II on fixed fields

Lecture 14 - Galois extensions, Galois groups

Lecture 15 - Normal extensions

Lecture 16 - Problem Session - Part 3

Lecture 17 - Problem Session - Part 4

Lecture 18 - Separable extension - Part 1

Lecture 19 - Separable extension - Part 2

Lecture 20 - Characterization of Galois extensions - Part 1

Lecture 21 - Characterization of Galois extensions - Part 2

Lecture 22 - Examples of Galois extensions

Lecture 23 - Motivating the main theorem of Galois theory

Lecture 24 - Main theorem of Galois theory - Part 1

Lecture 25 - Main theorem of Galois theory - Part 2

Lecture 26 - Fundamental theorem of algebra

Lecture 27 - Problem Session - Part 5

Lecture 28 - Problem Session - Part 6

Lecture 29 - Problem Session - Part 7

Lecture 30 - Problem Session - Part 8

Lecture 31 - Problem Session - Part 9

NPTEL : NOC:Basic Calculus 1 (Mathematics)

Co-ordinators : Prof. Arindama Singh

NPTEL : NOC:Functional Analysis (Mathematics)

Co-ordinators : Prof. Kesavan

NPTEL : NOC:Mathematical Methods in Physics 1 (Mathematics)

Co-ordinators : Prof. Auditya Sharma

Lecture 32 - Matrix representations

Lecture 33 - Eigenvalues and Eigenvectors of matrices

Lecture 34 - Defective matrices

Lecture 35 - Eigenvalues and eigenvectors: useful results

Lecture 36 - Transformation of Basis

Lecture 37 - A class of invertible matrices

Lecture 38 - Diagonalization of matrices

Lecture 39 - Diagonalizability of matrices

Lecture 40 - Functions of matrices

Lecture 41 - SHM and waves

Lecture 42 - Periodic functions

Lecture 43 - Average value of a function

Lecture 44 - Piecewise continuous functions

Lecture 45 - Orthogonal basis: Fourier series

Lecture 46 - Fourier coefficients

Lecture 47 - Dirichlet Conditions

Lecture 48 - Complex Form of Fourier Series

Lecture 49 - Other intervals: arbitrary period

Lecture 50 - Even and Odd Functions

Lecture 51 - Differentiating Fourier series

Lecture 52 - Parseval's theorem

Lecture 53 - Fourier series to Fourier transforms

Lecture 54 - Fourier Sine and Cosine transforms

Lecture 55 - Parseval's theorem for Fourier series

Lecture 56 - Ordinary Differential equations

Lecture 57 - First order ODEs

Lecture 58 - Linear first order ODEs

Lecture 59 - Orthogonal Trajectories

Lecture 60 - Exact differential equations

Lecture 61 - Special first order ODEs

Lecture 62 - Solutions of linear first-order ODEs

Lecture 63 - Revisit linear first-order ODEs

Lecture 64 - ODEs in disguise

NPTEL : NOC:Computational Mathematics with SageMath (Mathematics)

Co-ordinators : Prof. Ajit Kumar

Lecture 32 - Solving system of linear Equations in SageMath

Lecture 33 - Vector Spaces in SageMath

Lecture 34 - Basis and dimensions of vector spaces in SageMath

Lecture 35 - Matrix Spaces with SageMath

Lecture 36 - Linear Transformations - Part 1 with SageMath

Lecture 37 - Linear Transformations - Part 2 with SageMath

Lecture 38 - Eigenvalues and Eigenvectors - Part 1 with SageMath

Lecture 39 - Eigenvalues and Eigenvectors - Part 2 with SageMath

Lecture 40 - Inner Product - Part 1 with SageMath

Lecture 41 - Inner Product - Part 2 with SageMath

Lecture 42 - Orthogonal Decomposition with SageMath

Lecture 43 - Least Square Solution with SageMath

Lecture 44 - Singular Value Decomposition (SVD) with SageMath

Lecture 45 - Application of SVD to image processing

Lecture 46 - Solving System of linear ODE using Eigenvalues and Eigenvectors

Lecture 47 - Google Page Rank Algorithm using SageMath

Lecture 48 - Finding Roots of algebraic and transcendental equations in SageMath

Lecture 49 - Numerical Solutions of System of linear equations in SageMath

Lecture 50 - Interpolations in SageMath

Lecture 51 - Numerical Integration in SageMath

Lecture 52 - Numerical Eigenvalues

Lecture 53 - Solving 1st and 2nd order ODE with SageMath

Lecture 54 - Euler's Method to solve 1st order ODE with SageMath

Lecture 55 - Fourth Order Runge-Kutta Method

Lecture 56 - RK4 method for System of ODE and Applications

Lecture 57 - Solving ODE using Laplace Transforms in SageMath

Lecture 58 - Introduction to Linear Programming Problems (LPP)

Lecture 59 - Solving Linear Programming Problmes using Graphical Methods

Lecture 60 - Basics Definitions and Results in LPP

Lecture 61 - Theory of Simplex Method

Lecture 62 - Simplex Methods in SageMath - Part 1

Lecture 63 - Simplex Methods in SageMath - Part 2

Lecture 64 - Simplex Methods in Matrix Form

NPTEL : NOC:Introduction to Probability (with examples using R) (Mathematics)

Co-ordinators : Prof. Siva Athreya

NPTEL : NOC:Algebra-II (Mathematics)

Co-ordinators : Prof. Amritanshu Prasad, Prof. S. Viswanath

Lecture 32 - Solved problems (Week 4)

Lecture 33 - Artinâ€™s Theorem - Part 1

Lecture 34 - Artinâ€™s Theorem - Part 2

Lecture 35 - Finite Galois Extensions

Lecture 36 - The fundamental theorem of Galois Theory - 1

Lecture 37 - The fundamental theorem of Galois Theory - 2

Lecture 38 - Solved problems (Week 5)

Lecture 39 - Cyclotomic extensions

Lecture 40 - Irreducibility of the cyclotomic polynomial

Lecture 41 - Application: Constructibility of regular n-gons.

Lecture 42 - Insolvability of the general quintic - Part 1

Lecture 43 - Insolvability of the general quintic - Part 2

Lecture 44 - Insolvability of the general quintic - Part 3

Lecture 45 - What is category theory (and why is it important)?

Lecture 46 - Definition of a category

Lecture 47 - Monomorphisms, epimorphisms, and isomorphisms

Lecture 48 - Categories: First Problem Session

Lecture 49 - Initial and Terminal Objects

Lecture 50 - Products and Coproducts

Lecture 51 - Categories: Second Problem Session

Lecture 52 - Functors

Lecture 53 - The Category of Categories

Lecture 54 - Natural Transformations

Lecture 55 - Functor Categories

Lecture 56 - Categories: Third Problem Session

Lecture 57 - Adjunction

Lecture 58 - Categories: Fourth Problem Session

Lecture 59 - Tensor products of Z-modules

Lecture 60 - Free abelian groups and quotient groups

Lecture 61 - Construction of the tensor product

Lecture 62 - Problem session

Lecture 63 - Tensor product of R-modules

Lecture 64 - Functoriality of the tensor product

NPTEL : NOC:Mathematical Methods in Physics 2 (Mathematics)

Co-ordinators : Prof. Auditya Sharma

Lecture 32 - Laurent Series

Lecture 33 - Convergence

Lecture 34 - Differentiation and integration of power series

Lecture 35 - Isolated Singularities

Lecture 36 - Residues

Lecture 37 - Residue Theorem

Lecture 38 - Evaluation of integrals - I

Lecture 39 - Evaluation of integrals - II

Lecture 40 - Analytic Continuation

Lecture 41 - Introduction of orthogonal polynomials

Lecture 42 - How to construct orthogonal polynomials

Lecture 43 - The weight function

Lecture 44 - Recursion relations

Lecture 45 - Differential equation satisfied by the orthogonal polynomials

Lecture 46 - Hermite polynomials

Lecture 47 - Properties of Hemite polynomials

Lecture 48 - Legendre polynomials

Lecture 49 - Legendre polynomials: recurrence relation

Lecture 50 - Differential equation corresponding to Legendre polynomials

Lecture 51 - The generating function corresponding to Legendre polynomials

Lecture 52 - Laguerre Polynomials

Lecture 53 - Laguerre Polynomials: recurrence relation

Lecture 54 - Laguerre polynomials: differential equation

Lecture 55 - Laguerre polynomials: generating function

Lecture 56 - Bessel functions: series defination

Lecture 57 - Bessel functions: recurrence relations

Lecture 58 - Bessel functions: differential equation

Lecture 59 - Bessel functions of integral order: generating function

Lecture 60 - Bessel functions: orthogonality

Lecture 61 - Classification of Second Order PDEs

Lecture 62 - Canonical Forms for Hyperbolic PDEs

Lecture 63 - Canonical Forms for Parabolic PDEs

Lecture 64 - Canonical Forms for Elliptic PDEs

NPTEL : NOC:Real Analysis - II (Mathematics)

Co-ordinators : Prof. Jaikrishnan J

Lecture 32 - The mean-value theorem

Lecture 33 - Differentiating under the integral sign

Lecture 34 - Higher-order derivatives

Lecture 35 - Symmetry of the second derivative

Lecture 36 - Taylor's theorem

Lecture 37 - Taylor's theorem with remainder

Lecture 38 - The Banach fixed point theorem

Lecture 39 - Newton's method

Lecture 40 - The inverse function theorem

Lecture 41 - Diffeomorphismsm and local diffeomorphisms

Lecture 42 - The implicit function theorem

Lecture 43 - Tangent space to a hypersurface

Lecture 44 - The definition of a manifold

Lecture 45 - Examples and non examples of manifolds

Lecture 46 - The tangent space to a manifold

Lecture 47 - Maxima and minima in several variables

Lecture 48 - The Hessian and extrema

Lecture 49 - Completing the squares

Lecture 50 - Constrained extrema and lagrange multipliers

Lecture 51 - Curves

Lecture 52 - Rectifiability and arc-length

Lecture 53 - The Riemann integral revisited

Lecture 54 - Monotone sequences of functions

Lecture 55 - Upper functions and their integrals

Lecture 56 - Riemann integrable functions as upper functions

Lecture 57 - Lebesgue integrable functions

Lecture 58 - Approximation of Lebesgure integrable functions

Lecture 59 - Levi monotone convergence theorem for step functions

Lecture 60 - Monotone convergence theorem for upper functions

Lecture 61 - Monotone convergence theorem for Lebesgue integrable functions

Lecture 62 - The Lebesgue dominated convergence theorem

Lecture 63 - Applications of the convergence theorems

Lecture 64 - The problem of measure

Lecture 65 - The Lebesgue integral on unbounded intervals

Lecture 66 - Measurable functions

Lecture 67 - Solution to the problem of measure

Lecture 68 - The Lebesgue integral on arbitrary subsets

Lecture 69 - Square integrable functions

Lecture 70 - Norms and inner-products on complex vector spaces

Lecture 71 - Convergence in L2

Lecture 72 - The Riesz-Fischer theorem

Lecture 73 - Multiple Riemann integration

Lecture 74 - Multiple Lebesgue integration

NPTEL : NOC:Sobolev Spaces and Partial Differential Equations (Mathematics)

Co-ordinators : Prof. Kesavan

Lecture 32 - Extension theorems - Part 1

Lecture 33 - Extension theorems - Part 2

Lecture 34 - Poincare's inequlity

Lecture 35 - Exercises - Part 4

Lecture 36 - Exercises - Part 5

Lecture 37 - Imbedding theorems

Lecture 38 - Imbedding theorems: Case p less than N - Part 1

Lecture 39 - Imbedding theorems: Case p = N - Part 2

Lecture 40 - Imbedding theorems: Case p greater than N - Part 3

Lecture 41 - Compactness theorems - Part 1

Lecture 42 - Compactness theorems - Part 2

Lecture 43 - Compactness theorems - Part 3

Lecture 44 - The spaces W^{s,p}

Lecture 45 - spaces W^{s,p} and Trace spaces

Lecture 46 - Trace theory - Part 1

Lecture 47 - Trace theory - Part 2

Lecture 48 - Trace theory - Part 3

Lecture 49 - Trace theory - Part 4

Lecture 50 - Exercises - Part 6

Lecture 51 - Exercises - Part 7

Lecture 52 - Abstract variational problems - Part 1

Lecture 53 - Abstract variational problems - Part 2

Lecture 54 - Weak solutions of elliptic boundary value problems - Part 1

Lecture 55 - Weak solutions of elliptic boundary value problems - Part 2

Lecture 56 - Neumann problems

Lecture 57 - The Biharmonic operator

Lecture 58 - The elasticity system

Lecture 59 - Exercises - Part 8

Lecture 60 - Exercises - Part 9

Lecture 61 - Exercises - Part 9

Lecture 62 - Maximum Principles - Part 1

Lecture 63 - Maximum Principles - Part 2

Lecture 64 - Exercises - Part 10

Lecture 65 - Exercises - Part 11

Lecture 66 - Eigenvalue problems - Part 1

Lecture 67 - Eigenvalue problems - Part 2

Lecture 68 - Eigenvalue problems - Part 3

Lecture 69 - Exercises - Part 12

Lecture 70 - Exercises - Part 13

Lecture 71 - Unbounded operators - Part 1

Lecture 72 - Unbounded operators - Part 2

Lecture 73 - The exponential map

Lecture 74 - C_0 Semigroups - Part 1

Lecture 75 - C_0 Semigroups - Part 2

Lecture 76 - Infinitesimal generators of contraction semigroups

Lecture 77 - Hille-Yosida theorem

Lecture 78 - Regularity

Lecture 79 - Contraction semigroups on Hilbert spaces

Lecture 80 - Self-adjoint case and the case of isometries

Lecture 81 - The heat equation

Lecture 82 - The wave equation

Lecture 83 - The Schrodinger equation

Lecture 84 - The inhomogeneous equation

Lecture 85 - Exercises - 14

NPTEL : NOC:Combinatorics (Mathematics)

Co-ordinators : Prof. Narayanan N

Lecture 32 - Paths Walks, Cycles

Lecture 33 - Digraphs and functional digraphs

Lecture 34 - Componenets, Connectivity, Bipartite graphs

Lecture 35 - Acyclic graphs

Lecture 36 - Graph colouring

Lecture 37 - Mycielski graphs

Lecture 38 - Product of graphs

Lecture 39 - Menger's theorem

Lecture 40 - System of Distinct representatives

Lecture 41 - Planar graphs

Lecture 42 - Euler identity

Lecture 43 - Map colouring problem - History

Lecture 44 - The Discharging Method - Part 1

Lecture 45 - The Discharging Method - Part 2

Lecture 46 - Introduction to Group actions

Lecture 47 - Colouring and symmetries - examples

Lecture 48 - Bursides lemma

Lecture 49 - Proof of Bursides lemma

Lecture 50 - Polya's theorem

Lecture 51 - Species of structures- definitions and examples

Lecture 52 - Associated seris and Product of species

Lecture 53 - Species: Substitution and Derivative

Lecture 54 - Species: Pointing and countilg labelled trees

Lecture 55 - Review and Further directions

Lecture 56 - More on further topics

Lecture 57 - Linear Algebra method: Ultra short introduction

Lecture 58 - Probabiistic Method: Ultra short introduction

NPTEL : NOC:Our Mathematical Senses (Mathematics)

Co-ordinators : Prof. Vijay Ravikumar

NPTEL : NOC:Algebraic Combinatorics (Mathematics)

Co-ordinators : Prof. Amritanshu Prasad, Prof. Sankaran Viswanath

NPTEL : NOC:An Invitation to Topology (Mathematics)

Co-ordinators : Prof. Indrava Roy

NPTEL : NOC:Operator Theory (Mathematics)

Co-ordinators : Prof. G. Ramesh

NPTEL : NOC:Measure and Integration (Mathematics)

Co-ordinators : Prof. S. Kesavan

Lecture 32 - Fatou's lemma

Lecture 33 - Integrable functions

Lecture 34 - Dominated convergence theorem

Lecture 35 - Dominated convergence theorem: Applications

Lecture 36 - Absolute continuity

Lecture 37 - Integration on the real line

Lecture 38 - Examples

Lecture 39 - Weierstrass' theorem

Lecture 40 - Exercises

Lecture 41 - Exercises

Lecture 42 - Vitali covering lemma

Lecture 43 - Monotonic functions

Lecture 44 - Functions of bounded variation

Lecture 45 - Functions of bounded variation

Lecture 46 - Functions of bounded variation

Lecture 47 - Differentiation of an indefinite integral

Lecture 48 - Absolute continuity

Lecture 49 - Exercises

Lecture 50 - Product spaces

Lecture 51 - Product spaces: measurable functions

Lecture 52 - Product measure

Lecture 53 - Fubini's theorem

Lecture 54 - Examples

Lecture 55 - Examples

Lecture 56 - Integration of radial functions

Lecture 57 - Measure of the unit ball in N dimensions

Lecture 58 - Exercises

Lecture 59 - Signed measures

Lecture 60 - Hahn and Jordan decompositions

Lecture 61 - Upper,lower and totaal variations of a signed measure; Absolute continuity

Lecture 62 - Absolute continuity

Lecture 63 - Radon-Nikodym theorem

Lecture 64 - Radon-Nikodym theorem

NPTEL : NOC:Approximate Reasoning using Fuzzy Set Theory (Mathematics)

Co-ordinators : Prof. Balasubramaniam Jayaram

NPTEL : NOC:Probability-II with Examples Using R (Mathematics)

Co-ordinators : Prof. Siva Athreya

Lecture 1 - Continuous Random Variables - Part 1

Lecture 2 - Continuous Random Variables - Part 2

Lecture 3 - R Set Up

Lecture 4 - Exponential and Normal Random Variable

Lecture 5 - Normal Random Variable

Lecture 6 - Distribution Function

Lecture 7 - Normal Distribution

Lecture 8 - Problem Solving for Week 12 - Part 2

Lecture 9 - Joint Distribution of Continuous Random Variables

Lecture 10 - Marginal Density and Independence

Lecture 11 - Uniform Distribution in R2

Lecture 12 - Problem Solving

Lecture 13 - Bivariate Normal - Part 1

Lecture 14 - Problem Solving 1 - Calculating Probabilities

Lecture 15 - Problem Solving 2 - Quadratic Equation, Random Coefficients

Lecture 16 - Conditional Density

Lecture 17 - Sums of Independent Random Variables

Lecture 18 - Quotient of Independent Random Variables

Lecture 19 - Simulating Bivariate Normal Random Variables

Lecture 20 - Problem Solving Conditional Density

Lecture 21 - Expectation and Variance of Continuous Random Variables

Lecture 22 - Revisit of Variance and Expectation

Lecture 23 - Revisit of Properties of Variance

Lecture 24 - Covariance and Correlation

Lecture 25 - Conditional Expectation and Conditional Variance

Lecture 26 - Analysis of Variance Formula

Lecture 27 - Problem Solving Expectations

Lecture 28 - Moment Generating Function

Lecture 29 - Moments and Moment Generating Function

Lecture 30 - Bivariate Normal - Part 2

Lecture 31 - Problem Solving Conditional Expectation and Conditional Variance

Lecture 32 - Sampling Distribution and Sample Mean

Lecture 33 - Weak Law of Large Numbers

Lecture 34 - Revisit Weak Law of Large Numbers

Lecture 35 - Problem Solving

Lecture 36 - Demoivre-Laplace Central Limit Theorem and Normal Random Variables

Lecture 37 - Revisit Normal Random Variables

Lecture 38 - Normal Tables, Mean and Variance

Lecture 39 - Problem Solving

Lecture 40 - Bivariate Normal Random Variables_Characterisation

Lecture 41 - Bivariate Normal Random Variables_Independence

Lecture 42 - Problem Solving

Lecture 43 - Bivariate Normal Random Variables Joint Density Calculation - Part 1

Lecture 44 - Bivariate Normal Random Variables Joint Density Calculation - Part 2

Lecture 45 - Problem Solving - Review of Transformation of Random Variables

NPTEL : NOC:Predictive Analytics - Regression and Classification (Mathematics)

Co-ordinators : Prof. Sourish Das

Lecture 32 - Bootstrap Regression

Lecture 33 - Hands on with R for Bootstrap Regression

Lecture 34 - Hands on with Python: Handle multicollinearity with Ridge correction

Lecture 35 - Hands on with Julia: Implemente Chennai Temperature Analysis with Julia and CRRao

Lecture 36 - Introduction to logistic Regression

Lecture 37 - Maximum Likelihood Estimate for Logistic Regression

Lecture 38 - Hands on with R for Logistic Regression

Lecture 39 - Hands on with R: Measure Time performance of R code

Lecture 40 - Statistical Inference of Logistic Regression

Lecture 41 - Hands on with R with Iris Dataset

Lecture 42 - Multi-Class Classification with Discriminant Analysis

Lecture 43 - Hands on with R: Implement LDA

Lecture 44 - Effect of Feature Engineer in Logistic Regression

Lecture 45 - Logistic Regression to Deep Learning Neural Network

Lecture 46 - Hands on with R: Feature Engineer in Logistic Regression

Lecture 47 - Generalised Linear Model

Lecture 48 - Hands on with R: Poisson Regression with Football Data

Lecture 49 - Gaussian Process Regression

Lecture 50 - Hands on with R: Implement GP Regression from scratch

Lecture 51 - Tree Structured Regression

Lecture 52 - Hands on with R: Implement Tree Regression and Random Forest with Simulated Data

Lecture 53 - Hands on with R: Implement Tree Regression and Random Forest with EPL football Data

Lecture 54 - Hands on with Python : Analysis of Bangalore House Price Data

Lecture 55 - Hands on with R: Prediction of Bangalore House Price

Lecture 56 - Hands on with R: More Prediction of Bangalore House Price

Lecture 57 - Hands on with R: Some Correction with Bangalore House Price Data Prediction

Lecture 58 - Hands on with R: Classify fake bank note with GLM

Lecture 59 - Hands on with R: Dynamic Pricing with Cheese Data

Lecture 60 - Hands on with Julia - Bayesian Logistic Regression with Horse Shoe Prior - Genetic Data Analysis

Lecture 61 - Hands on with Julia - Bayesian Poisson Regression with Horse Shoe Prior English Premier League Data

Lecture 62 - Why Julia is Future for Data Science Projects ?

Lecture 63 - Concluding Remarks

Lecture 64 - Course Review

NPTEL : NOC:Introduction to Algebraic Geometry (Mathematics)

Co-ordinators : Prof. Arijit Dey

NPTEL : Discrete Mathematics (Mathematics)

Co-ordinators : Dr. Aditi Gangopadhyay, Dr. Sugata Gangopadhyay, Dr. Tanuja Srivastava

NPTEL : NOC:Mathematical Methods and its Applications (Mathematics)

Co-ordinators : Prof. P.N. Agarwal, S. K. Gupta

NPTEL : NOC:Integral Equations, Calculus of Variations and its Applications (Mathematics)

Co-ordinators : Prof.D. N Pandey, Prof. P.N. Agarwal

NPTEL : NOC:Nonlinear Programming (Mathematics)

Co-ordinators : S. K. Gupta

Lecture 1 - Convex Sets and Functions

Lecture 2 - Properties of Convex Functions - I

Lecture 3 - Properties of Convex Functions - II

Lecture 4 - Properties of Convex Functions- III

Lecture 5 - Convex Programming Problems

Lecture 6 - KKT optimality conditions

Lecture 7 - Quadratic Programming Problems - I

Lecture 8 - Quadratic Programming Problems - II

Lecture 9 - Separable Programming - I

Lecture 10 - Separable Programming - II

Lecture 11 - Geometric Programming - I

Lecture 12 - Geometric Programming - II

Lecture 13 - Geometric Programming - III

Lecture 14 - Dynamic Programming - I

Lecture 15 - Dynamic Programming - II

Lecture 16 - Dynamic programming approach to find shortest path in any network

Lecture 17 - Dynamic Programming - IV

Lecture 18 - Search Techniques - I

Lecture 19 - Search Techniques - II

Lecture 20 - Search Techniques - III

NPTEL : NOC:Numerical Methods (Mathematics)

Co-ordinators : Prof. Sanjeev Kumar, Prof. Ameeya Kumar Nayak

Lecture 1 - Introduction to error analysis and linear systems

Lecture 2 - Gaussian elimination with Partial pivoting

Lecture 3 - LU decomposition

Lecture 4 - Jacobi and Gauss Seidel methods

Lecture 5 - Iterative methods-II

Lecture 6 - Introduction to Non-linear equations and Bisection method

Lecture 7 - Regula Falsi and Secant methods

Lecture 8 - Newton-Raphson method

Lecture 9 - Fixed point iteration method

Lecture 10 - System of Nonlinear equations

Lecture 11 - Introduction to Eigenvalues and Eigenvectors

Lecture 12 - Similarity Transformations and Gershgorin Theorem

Lecture 13 - Jacobi's Method for Computing Eigenvalues

Lecture 14 - Power Method

Lecture 15 - Inverse Power Method

Lecture 16 - Interpolation - Part I (Introduction to Interpolation)

Lecture 17 - Interpolation - Part II (Some basic operators and their properties)

Lecture 18 - Interpolation - Part III (Newtonâ€™s Forward/ Backward difference and derivation of general error)

Lecture 19 - Interpolation - Part IV (Error in approximating a function by a polynomial using Newtonâ€™s Forward and Backward difference formula)

Lecture 20 - Interpolation - Part V (Solving problems using Newton's Forward and Backward difference formula)

Lecture 21 - Interpolation - Part VI (Central difference formula)

Lecture 22 - Interpolation - Part VII (Lagrange interpolation formula with examples)

Lecture 23 - Interpolation - Part VIII (Divided difference interpolation with examples)

Lecture 24 - Interpolation - Part IX (Hermite's interpolation with examples)

Lecture 25 - Numerical differentiation - Part I (Introduction to numerical differentiation by interpolation formula)

Lecture 26 - Numerical differentiation - Part II (Numerical differentiation based on Lagrangeâ€™s interpolation with examples)

Lecture 27 - Numerical differentiation - Part III (Numerical differentiation based on Divided difference formula with examples)

Lecture 28 - Numerical differentiation - Part IV (Maxima and minima of a tabulated function and differentiation errors)

Lecture 29 - Numerical differentiation - Part V (Differentiation based on finite difference operators)

Lecture 30 - Numerical differentiation - Part VI (Method of undetermined coefficients and Derivatives with unequal intervals)

Lecture 31 - Numerical Integration - Part I (Methodology of Numerical Integration and Rectangular rule)

Lecture 32 - Numerical Integration - Part II (Quadrature formula and Trapezoidal rule with associated errors)merical Integration Part-I (Methodology of Numerical Integration and Rectangular rule)

Lecture 33 - Numerical Integration - Part III (Simpsons 1/3rd rule with associated errors)

Lecture 34 - Numerical Integration - Part IV (Composite Simpsons 1/3rd rule and Simpsons 3/8th rule with examples)

Lecture 35 - Numerical Integration - Part V (Gauss Legendre 2-point and 3-point formula with examples)

Lecture 36 - Introduction to Ordinary Differential equations

Lecture 37 - Numerical methods for ODE-1

Lecture 38 - Numerical Methods - II

Lecture 39 - R-K Methods for solving ODEs

Lecture 40 - Multi-step Method for solving ODEs

NPTEL : NOC:Numerical Linear Algebra (Mathematics)

Co-ordinators : Prof.D. N Pandey, Prof. P.N. Agrawal

Lecture 32 - Matrix Norms - II

Lecture 33 - Convergent Matrices - I

Lecture 34 - Convergent Matrices - II

Lecture 35 - Stability of non linear system

Lecture 36 - Condition number of a matrix: Elementary Properties

Lecture 37 - Sensitivity Analysis - I

Lecture 38 - Sensitivity Analysis - II

Lecture 39 - Residual Theorem

Lecture 40 - Nearness to Singularity

Lecture 41 - Estimation of the Condition Number

Lecture 42 - Singular value decomposition of a matrix - I

Lecture 43 - Singular value decomposition of a matrix - II

Lecture 44 - Orthonormal Projections

Lecture 45 - Algebraic and geometric properties of SVD

Lecture 46 - SVD and their applications

Lecture 47 - Perturbation theorem for singular values

Lecture 48 - Outer product expansion of a matrix

Lecture 49 - Least square solutions - I

Lecture 50 - Least square solutions - II

Lecture 51 - Householder matrices

Lecture 52 - Householder matrices and their applications

Lecture 53 - Householder QR factorization - I

Lecture 54 - Householder QR factorization - II

Lecture 55 - Basic theorems on eigenvalues and QR method

Lecture 56 - Power Method

Lecture 57 - Rate of Convergence of Power Method

Lecture 58 - Applications of Power Method with Shift

Lecture 59 - Jacobi Method - I

Lecture 60 - Jacobi Method - II

NPTEL : NOC:Numerical Methods - Finite Difference Approach (Mathematics)

Co-ordinators : Prof. Ameeya Kumar Nayak

NPTEL : NOC:Multivariable Calculus (Mathematics)

Co-ordinators : Dr. Sanjeev Kumar, S. K. Gupta

Lecture 1 - Functions of several variables

Lecture 2 - Limits for multivariable functions - I

Lecture 3 - Limits for multivariable functions - II

Lecture 4 - Continuity of multivariable functions

Lecture 5 - Partial Derivatives - I

Lecture 6 - Partial Derivatives - II

Lecture 7 - Differentiability - I

Lecture 8 - Differentiability - II

Lecture 9 - Chain rule - I

Lecture 10 - Chain rule - II

Lecture 11 - Change of variables

Lecture 12 - Eulerâ€™s theorem for homogeneous functions

Lecture 13 - Tangent planes and Normal lines

Lecture 14 - Extreme values - I

Lecture 15 - Extreme values - II

Lecture 16 - Lagrange multipliers

Lecture 17 - Taylorâ€™s theorem

Lecture 18 - Error approximation

Lecture 19 - Polar-curves

Lecture 20 - Multiple Integrals

Lecture 21 - Change Of Order Of Integration

Lecture 22 - Change of Variables in Multiple Integral

Lecture 23 - Introduction to Gamma Function

Lecture 24 - Introduction to Beta Function

Lecture 25 - Properties of Beta and Gamma Functions - I

Lecture 26 - Properties of Beta and Gamma Functions - II

Lecture 27 - Dirichlet's Integral

Lecture 28 - Applications of Multiple Integrals

Lecture 29 - Vector Differentiation

Lecture 30 - Gradient of a Scalar Field and Directional Derivative

Lecture 31 - Normal Vector and Potential field

NPTEL : NOC:Ordinary and Partial Differential Equations and Applications (Mathematics)

Co-ordinators : Prof.D. N Pandey, Prof. P.N. Agrawal

Lecture 32 - Origins and Classification of First Order PDE

Lecture 33 - Initial Value Problem for Quasi-linear First Order Equations

Lecture 34 - Existence and Uniqueness of Solutions

Lecture 35 - Surfaces orthogonal to a given system of surfaces

Lecture 36 - Nonlinear PDE of first order

Lecture 37 - Cauchy method of characteristics - I

Lecture 38 - Cauchy method of characteristics - II

Lecture 39 - Compatible systems of first order equations

Lecture 40 - Charpitâ€™s method - I

Lecture 41 - Charpitâ€™s method - II

Lecture 42 - Second Order PDE with Variable Coefficients

Lecture 43 - Classification and Canonical Form of Second Order PDE - I

Lecture 44 - Classification and Canonical Form of Second Order PDE - II

Lecture 45 - Classification and Characteristic Curves of Second Order PDEs

Lecture 46 - Review of Integral Transforms - I

Lecture 47 - Review of Integral Transforms - II

Lecture 48 - Review of Integral Transforms - II

Lecture 49 - Review of Integral Transforms - III

Lecture 50 - Laplace Equation - I

Lecture 51 - Laplace Equation - II

Lecture 52 - Laplace and Poisson Equations

Lecture 53 - One dimensional wave equation and its solution - I

Lecture 54 - One dimensional wave equation and its solution - II

Lecture 55 - One dimensional wave equation and its solution - III

Lecture 56 - Two dimensional wave equation and its solution - I

Lecture 57 - Solution of non-homogeneous wave equation

Lecture 58 - Solution of homogeneous diffusion equation - I

Lecture 59 - Solution of homogeneous diffusion equation - II

Lecture 60 - Duhamelâ€™s principle

NPTEL : NOC:Matrix Analysis with Applications (Mathematics)

Co-ordinators : Dr. Sanjeev Kumar, S. K. Gupta

NPTEL : NOC:Mathematical Modelling: Analysis and Applications (Mathematics)

Co-ordinators : Prof. Ameeya Kumar Nayak

NPTEL : NOC:Dynamical System and Control (Mathematics)

Co-ordinators : Prof.D. N Pandey, Dr. N. Sukavanam

NPTEL : NOC:Advanced Engineering Mathematics (Mathematics)

Co-ordinators : Prof. P.N. Agarwal

NPTEL : NOC:Higher Engineering Mathematics (Mathematics)

Co-ordinators : Prof. P.N. Agarwal

NPTEL : NOC:Operations Research (Mathematics)

Co-ordinators : Prof. Kusumdeep

NPTEL : NOC:Essential Mathematics for Machine Learning (Mathematics)

Co-ordinators : Prof. S.K. Gupta, Dr. Sanjeev Kumar

Lecture 32 - Basic Concepts of Calculus - II

Lecture 33 - Basic Concepts of Calculus - III

Lecture 34 - Basic Concepts of Calculus - IV

Lecture 35 - Basic Concepts of Calculus - V

Lecture 36 - Calculus in Python

Lecture 37 - Convex Sets and Functions

Lecture 38 - Properties of convex functions - I

Lecture 39 - Properties of Convex functions - II

Lecture 40 - Introduction to Optimization

Lecture 41 - Unconstrained Optimization

Lecture 42 - Constrained Optimization - I

Lecture 43 - Constrained Optimization - II

Lecture 44 - Steepest Descent method

Lecture 45 - Newton's and Penalty function method

Lecture 46 - Optimization using Python

Lecture 47 - Operations on Sets

Lecture 48 - Review on Probability

Lecture 49 - Bayes' theorem and Random variables

Lecture 50 - Expectation and Variance

Lecture 51 - Discrete probability distributions

Lecture 52 - Continuous probability distributions

Lecture 53 - Joint probability distribution and covariance

Lecture 54 - Introduction to SVM

Lecture 55 - Error Minimizing LPP

Lecture 56 - Concepts of Duality

Lecture 57 - Hard Margin classifier

Lecture 58 - Soft margin classifier

Lecture 59 - SVM using Python - I

Lecture 60 - SVM using Python - II

NPTEL : NOC:Advanced Linear Algebra (Mathematics)

Co-ordinators : Prof. Premananda Bera

Lecture 32 - Application of Invariant Subspaces - II

Lecture 33 - Direct Sum Decompositions - I

Lecture 34 - Direct Sum Decompositions - II

Lecture 35 - Invariant Direct Sums - I

Lecture 36 - Invariant Direct Sums - II

Lecture 37 - Decomposition of space and Operator - I

Lecture 38 - Decomposition of Space and Operator - II

Lecture 39 - Applications of Primary Decomposition Theorem - I

Lecture 40 - Applications of Primary Decomposition Theorem - II

Lecture 41 - Applications of Primary Decomposition Theorem - III

Lecture 42 - Inner Products - I

Lecture 43 - Inner Products - II

Lecture 44 - Inner Product Spaces - I

Lecture 45 - Inner Product Spaces - II

Lecture 46 - Best Approximation in I.P.S.

Lecture 47 - Orthogonal Projection in I.P.S.

Lecture 48 - Linear Functionals and Adjoints - I

Lecture 49 - Linear Functionals and Adjoints - II

Lecture 50 - Linear Functionals and Adjoints - III

Lecture 51 - Linear Functionals and Adjoints - IV

Lecture 52 - Isomorphism in Inner Product Spaces

Lecture 53 - Unitary Operators - I

Lecture 54 - Unitary Operators - II

Lecture 55 - Application of Unitary O. and Initiation of Normal Operator

Lecture 56 - Normal Operator - I

Lecture 57 - Normal Operator - II

Lecture 58 - Normal Operator and It's Spectral Resolution

Lecture 59 - Singular Value Decomposition of a Matrix

Lecture 60 - Forms on Inner product Spaces

NPTEL : Advanced Matrix Theory and Linear Algebra for Engineers (Mathematics)

Co-ordinators : Prof. Vittal Rao

Lecture 1 - Prologue - Part 1

Lecture 2 - Prologue - Part 2

Lecture 3 - Prologue - Part 3

Lecture 4 - Linear Systems - Part 1

Lecture 5 - Linear Systems - Part 2

Lecture 6 - Linear Systems - Part 3

Lecture 7 - Linear Systems - Part 4

Lecture 8 - Vector Spaces - Part 1

Lecture 9 - Vector Spaces - Part 2

Lecture 10 - Linear Independence and Subspaces - Part 1

Lecture 11 - Linear Independence and Subspaces - Part 2

Lecture 12 - Linear Independence and Subspaces - Part 3

Lecture 13 - Linear Independence and Subspaces - Part 4

Lecture 14 - Basis - Part 1

Lecture 15 - Basis - Part 2

Lecture 16 - Basis - Part 3

Lecture 17 - Linear Transformations - Part 1

Lecture 18 - Linear Transformations - Part 2

Lecture 19 - Linear Transformations - Part 3

Lecture 20 - Linear Transformations - Part 4

Lecture 21 - Linear Transformations - Part 5

Lecture 22 - Inner Product and Orthogonality - Part 1

Lecture 23 - Inner Product and Orthogonality - Part 2

Lecture 24 - Inner Product and Orthogonality - Part 3

Lecture 25 - Inner Product and Orthogonality - Part 4

Lecture 26 - Inner Product and Orthogonality - Part 5

Lecture 27 - Inner Product and Orthogonality - Part 6

Lecture 28 - Diagonalization - Part 1

Lecture 29 - Diagonalization - Part 2

Lecture 30 - Diagonalization - Part 3

Lecture 31 - Diagonalization - Part 4

NPTEL : Ordinary Differential Equations and Applications (Mathematics)

Co-ordinators : Prof. A.K. Nandakumaran, Prof. Raju K. George, Prof. P.S. Datti

NPTEL : NOC:Linear Algebra (Mathematics)

Co-ordinators : Prof. Dilip P. Patil

Lecture 32 - Dual spaces

Lecture 33 - Dual spaces (Continued...)

Lecture 34 - Quotient spaces

Lecture 35 - Homomorphism theorem of vector spaces

Lecture 36 - Isomorphism theorem of vector spaces

Lecture 37 - Matrix of a linear map

Lecture 38 - Matrix of a linear map (Continued...)

Lecture 39 - Matrix of a linear map (Continued...)

Lecture 40 - Change of bases

Lecture 41 - Computational rules for matrices

Lecture 42 - Rank of a matrix

Lecture 43 - Computation of the rank of a matrix

Lecture 44 - Elementary matrices

Lecture 45 - Elementary operations on matrices

Lecture 46 - LR decomposition

Lecture 47 - Elementary Divisor Theorem

Lecture 48 - Permutation groups

Lecture 49 - Canonical cycle decomposition of permutations

Lecture 50 - Signature of a permutation

Lecture 51 - Introduction to multilinear maps

Lecture 52 - Multilinear maps (Continued...)

Lecture 53 - Introduction to determinants

Lecture 54 - Determinants (Continued...)

Lecture 55 - Computational rules for determinants

Lecture 56 - Properties of determinants and adjoint of a matrix

Lecture 57 - Adjoint-determinant theorem

Lecture 58 - The determinant of a linear operator

Lecture 59 - Determinants and Volumes

Lecture 60 - Determinants and Volumes (Continued...)

Lecture 1 - Introduction to Algebraic Structures - Rings and Fields

Lecture 2 - Definition of Vector Spaces

Lecture 3 - Examples of Vector Spaces

Lecture 4 - Definition of subspaces

NPTEL : NOC:An Introduction to Smooth Manifolds (Mathematics)

Co-ordinators : Prof. Harish Seshadri

NPTEL : NOC:Measure Theory (Prof. E. K. Narayanan) (Mathematics)

Co-ordinators : Prof. E. K. Narayanan

NPTEL : NOC:Introduction to Algebraic Geometry and Commutative Algebra (Mathematics)

Co-ordinators : Prof. Dilip P. Patil

NPTEL : NOC:First Course on Partial Differential Equations-I (Mathematics)

Co-ordinators : Prof. P. S. Datti, Prof. A. K. Nandakumaran

Lecture 32 - One dimensional heat equation - 5

Lecture 33 - One dimensional heat equation - 6

Lecture 34 - One dimensional wave equation - 1

Lecture 35 - One dimensional wave equation - 2

Lecture 36 - One dimensional wave equation - 3

Lecture 37 - One dimensional wave equation - 4

Lecture 38 - One dimensional wave equation - 5

Lecture 39 - One dimensional wave equation - 6

Lecture 40 - One dimensional wave equation - 7

Lecture 41 - One dimensional wave equation - 8

NPTEL : NOC:First Course on Partial Differential Equations - II (Mathematics)

Co-ordinators : Prof. A. K. Nandakumaran

NPTEL : Matrix Theory (Mathematics)

Co-ordinators : Prof. Chandra Murthy

NPTEL : NOC:C* Algebras and Spectral Theorem (Mathematics)

Co-ordinators : Prof. E K Narayanan

NPTEL : NOC:Advanced Partial Differential Equations (Part I: Distributions and Sobolev Spaces) (Mathematics)

Co-ordinators : Prof. P.S. Datti, Prof. A K Nandakumaran

Lecture 1 - Introduction - 1

Lecture 2 - Preliminaries - 1

Lecture 3 - Preliminaries - 2

Lecture 4 - Priliminaries - 3

Lecture 5 - Priliminaries - 4

Lecture 6 - Preliminaries - 5

Lecture 7 - Prelimunaries - 6

Lecture 8 - Preliminaries - 7

Lecture 9 - Preliminaries - 8

Lecture 10 - Preliminaries - 9

Lecture 11 - Introduction to Distributions

Lecture 12 - Properties and Examples

Lecture 13 - Convergence of distributions

Lecture 14 - Convergence of distributions

Lecture 15 - Calculus in the space of distributions

Lecture 16 - Further discussion on Distributions

Lecture 17 - Order and support of a distribution

Lecture 18 - Laplace and Poisson equations - Distributions with compact support

Lecture 19 - Validity of the definition of the support

Lecture 20 - Convolution and Fourier transform of distributions

Lecture 21 - The Schwartz space andAKN Lec 15 its dual

Lecture 22 - Fourier transform of a tempered distribution, convolution

Lecture 23 - Properties of Convolution

Lecture 24 - Further discussion on Fourier transform and convolution

Lecture 25 - Convolution of two distributions

Lecture 26 - Convolution of distributions

Lecture 27 - Introduction to Sobolev spaces

Lecture 28 - Properties of Sobloev Spaces

Lecture 29 - Extension and Density results

Lecture 30 - General Extension result

Lecture 31 - Integration on a smooth surface