NPTEL : Elementary Numerical Analysis (Mathematics)

Co-ordinators : Prof. Rekha P. Kulkarni

NPTEL : Measure and Integration (Mathematics)

Co-ordinators : Prof. Inder K Rana

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

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

Lecture 32 - Jyanayanam: Computation of Rsines

Lecture 33 - Trigonometry and Spherical Trigonometry - Part 1

Lecture 34 - Trigonometry and Spherical Trigonometry - Part 2

Lecture 35 - Trigonometry and Spherical Trigonometry - Part 3

Lecture 36 - Proofs in Indian Mathematics - Part 1

Lecture 37 - Proofs in Indian Mathematics - Part 2

Lecture 38 - Proofs in Indian Mathematics - Part 3

Lecture 39 - Mathematics in Modern India - Part 1

Lecture 40 - Mathematics in Modern India - Part 2

NPTEL : NOC:Measure Theory (Mathematics)

Co-ordinators : Prof. Inder K Rana

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

Co-ordinators : Prof.Inder Kumar Rana

Lecture 1 - Introduction to the Course

Lecture 2 - Concept of a Set, Ways of Representing Sets

Lecture 3 - Venn Diagrams, Operations on Sets

Lecture 4 - Operations on Sets, Cardinal Number, Real Numbers

Lecture 5 - Real Numbers, Sequences

Lecture 6 - Sequences, Convergent Sequences, Bounded Sequences

Lecture 7 - Limit Theorems, Sandwich Theorem, Monotone Sequences, Completeness of Real Numbers

Lecture 8 - Relations and Functions

Lecture 9 - Functions, Graph of a Functions, Function Formulas

Lecture 10 - Function Formulas, Linear Models

Lecture 11 - Linear Models, Elasticity, Linear Functions, Nonlinear Models, Quadratic Functions

Lecture 12 - Quadratic Functions, Quadratic Models, Power Function, Exponential Function

Lecture 13 - Exponential Function, Exponential Models, Logarithmic Function

Lecture 14 - Limit of a Function at a Point, Continuous Functions

Lecture 15 - Limit of a Function at a Point

Lecture 16 - Limit of a Function at a Point, Left and Right Limits

Lecture 17 - Computing Limits, Continuous Functions

Lecture 18 - Applications of Continuous Functions

Lecture 19 - Applications of Continuous Functions, Marginal of a Function

Lecture 20 - Rate of Change, Differentiation

Lecture 21 - Rules of Differentiation

Lecture 22 - Derivatives of Some Functions, Marginal, Elasticity

Lecture 23 - Elasticity, Increasing and Decreasing Functions, Optimization, Mean Value Theorem

Lecture 24 - Mean Value Theorem, Marginal Analysis, Local Maxima and Minima

Lecture 25 - Local Maxima and Minima

Lecture 26 - Local Maxima and Minima, Continuity Test, First Derivative Test, Successive Differentiation

Lecture 27 - Successive Differentiation, Second Derivative Test

Lecture 28 - Average and Marginal Product, Marginal of Revenue and Cost, Absolute Maximum and Minimum

Lecture 29 - Absolute Maximum and Minimum

Lecture 30 - Monopoly Market, Revenue and Elasticity

Lecture 31 - Property of Marginals, Monopoly Market, Publisher v/s Author Problem

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

NPTEL : NOC:Basic Real Analysis (Mathematics)

Co-ordinators : Prof. I. K. Rana

Lecture 1 - Real Numbers and Sequences - Part I

Lecture 2 - Real Numbers and Sequences - Part II

Lecture 3 - Real Numbers and Sequences - Part III

Lecture 4 - Convergence of Sequences - Part I

Lecture 5 - Convergence of Sequences - Part II

Lecture 6 - Convergence of Sequences - Part III

Lecture 7 - The LUB Property and Consequences - Part I

Lecture 8 - The LUB Property and Consequences - Part II

Lecture 9 - The LUB Property and Consequences - Part III

Lecture 10 - Topology of Real Numbers: Closed Sets - Part I

Lecture 11 - Topology of Real Numbers: Closed Sets - Part II

Lecture 12 - Topology of Real Numbers: Closed Sets - Part III

Lecture 13 - Topology of Real Numbers: Limit Points, Interior Points, Open Sets and Compact Sets - Part I

Lecture 14 - Topology of Real Numbers: Limit Points, Interior Points, Open Sets and Compact Sets - Part II

Lecture 15 - Topology of Real Numbers: Limit Points, Interior Points, Open Sets and Compact Sets - Part III

Lecture 16 - Topology of Real Numbers: Compact Sets and Connected Sets - Part I

Lecture 17 - Topology of Real Numbers: Compact Sets and Connected Sets - Part II

Lecture 18 - Topology of Real Numbers: Compact Sets and Connected Sets - Part III

Lecture 19 - Topology of Real Numbers: Connected Sets; Limits and Continuity - Part I

Lecture 20 - Topology of Real Numbers: Connected Sets; Limits and Continuity - Part II

Lecture 21 - Topology of Real Numbers: Connected Sets; Limits and Continuity - Part III

Lecture 22 - Continuity and Uniform continuity - Part I

Lecture 23 - Continuity and Uniform continuity - Part II

Lecture 24 - Continuity and Uniform continuity - Part III

Lecture 25 - Uniform continuity and connected sets - Part I

Lecture 26 - Uniform continuity and connected sets - Part II

Lecture 27 - Uniform continuity and connected sets - Part III

Lecture 28 - Connected sets and continuity - Part I

Lecture 29 - Connected sets and continuity - Part II

Lecture 30 - Connected sets and continuity - Part III

Lecture 31 - Differentiability - Part I

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

Lecture 1 - Integers

Lecture 2 - Divisibility and primes

Lecture 3 - Infinitude of primes

Lecture 4 - Division algorithm and the GCD

Lecture 5 - Computing the GCD and Euclidâ€™s lemma

Lecture 6 - Fundamental theorem of arithmetic

Lecture 7 - Stories around primes

Lecture 8 - Winding up on `Primes' and introducing Congruences'

Lecture 9 - Basic results in congruences

Lecture 10 - Residue classes modulo n

Lecture 11 - Arithmetic modulo n, theory and examples

Lecture 12 - Arithmetic modulo n, more examples

Lecture 13 - Solving linear polynomials modulo n - I

Lecture 14 - Solving linear polynomials modulo n - II

Lecture 15 - Solving linear polynomials modulo n - III

Lecture 16 - Solving linear polynomials modulo n - IV

Lecture 17 - Chinese remainder theorem, the initial cases

Lecture 18 - Chinese remainder theorem, the general case and examples

Lecture 19 - Chinese remainder theorem, more examples

Lecture 20 - Using the CRT, square roots of 1 in â„¤n

Lecture 21 - Wilson's theorem

Lecture 22 - Roots of polynomials over â„¤p

Lecture 23 - Euler ðœ‘-function - I

Lecture 24 - Euler ðœ‘-function - II

Lecture 25 - Primitive roots - I

Lecture 26 - Primitive roots - II

Lecture 27 - Primitive roots - III

Lecture 28 - Primitive roots - IV

Lecture 29 - Structure of Un - I

Lecture 30 - Structure of Un - II

Lecture 31 - Quadratic residues

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

Lecture 32 - Applications

Lecture 33 - Applications (Continued...)

Lecture 34 - The Singular Simplicial Homology

Lecture 35 - Simplicial Homology

Lecture 36 - Simplicial Homology (Continued...)

Lecture 37 - CW-Homology and Cellular Singular Homology

Lecture 38 - Construction of CW-chain complex

Lecture 39 - CW structure and CW homology of Lens Spaces

Lecture 40 - Assorted Topics

Lecture 41 - Some Applications of Homology

Lecture 42 - Applications of LFT

Lecture 43 - Jordan-Brouwer

Lecture 44 - Proof of Lemmas

Lecture 45 - Relation between ?1 and H1

Lecture 46 - All Postponed Proofs

Lecture 47 - Proofs (Continued...)

Lecture 48 - Definitions and Examples

Lecture 49 - Paracompactness

Lecture 50 - Manifolds with Boundary

Lecture 51 - Embeddings and Homotopical Aspects

Lecture 52 - Homotopical Aspects (Continued...)

Lecture 53 - Classification of 1-manifolds

Lecture 54 - Classification of 1-manifolds (Continued...)

Lecture 55 - Triangulation of Manifolds

Lecture 56 - Pseudo-Manifolds

Lecture 57 - One result due to PoincaÅ•e and another due to Munkres

Lecture 58 - Some General Remarks

Lecture 59 - Classification of Compact Surface

Lecture 60 - Final Reduction-Completion of the Proof

Lecture 61 - Proof of Part B

Lecture 62 - Orientability

NPTEL : NOC:Partial Differential Equations (Mathematics)

Co-ordinators : Prof. Sivaji Ganesh

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

Lecture 32 - Ultrafilters and TychonoffÃ¢'s theorem

Lecture 33 - Ultraclosed filters

Lecture 34 - Wallman compactification

Lecture 35 - Wallman compactification (Continued...)

Lecture 36 - Global Separation of Sets

Lecture 37 - More examples

Lecture 38 - Knaster-Kuratowski Example

Lecture 39 - Separation of Sets (Continued...)

Lecture 40 - Definition of dimension and examples

Lecture 41 - Dimensions of subspaces and Unions

Lecture 42 - Sum theorem for higher dimensions

Lecture 43 - Analytic Proof of BrouwerÃ¢'s Fixed Point Theorem

Lecture 44 - Local Separation to Global Separation

Lecture 45 - Partially Ordered sets

Lecture 46 - Principle of Transfinite Induction

Lecture 47 - Order topology

Lecture 48 - Ordinals

Lecture 49 - Ordinal Topology (Continued...)

Lecture 50 - The Long Line

Lecture 51 - Motivation and definition

Lecture 52 - The Exponential Correspondence

Lecture 53 - An Application to Quotient Maps

Lecture 54 - Groups of Homeomoprhisms

Lecture 55 - Definition and Exampels of Manifolds

Lecture 56 - Manifolds with Boundary

Lecture 57 - Homogeneity

Lecture 58 - Homogeneity (Continued...)

Lecture 59 - Classification of 1-dim. manifolds

Lecture 60 - Classification of 1-dim. Manifolds (Continued...)

Lecture 61 - Surfaces

Lecture 62 - Connected Sum

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

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

NPTEL : NOC:Stochastic Processes - 1 (Mathematics)

Co-ordinators : Dr. S. Dharmaraja

Lecture 1 - Introduction and motivation for studying stochastic processes

Lecture 2 - Probability space and conditional probability

Lecture 3 - Random variable and cumulative distributive function

Lecture 4 - Discrete Uniform Distribution, Binomial Distribution, Geometric Distribution, Continuous Uniform Distribution, Exponential Distribution, Normal Distribution and Poisson Distribution

Lecture 5 - Joint Distribution of Random Variables

Lecture 6 - Independent Random Variables, Covariance and Correlation Coefficient and Conditional Distribution

Lecture 7 - Conditional Expectation and Covariance Matrix

Lecture 8 - Generating Functions, Law of Large Numbers and Central Limit Theorem

Lecture 9 - Problems in Random variables and Distributions

Lecture 10 - Problems in Random variables and Distributions (Continued...)

Lecture 11 - Problems in Random variables and Distributions (Continued...)

Lecture 12 - Problems in Random variables and Distributions (Continued...)

Lecture 13 - Problems in Sequences of Random Variables

Lecture 14 - Problems in Sequences of Random Variables (Continued...)

Lecture 15 - Problems in Sequences of Random Variables (Continued...)

Lecture 16 - Problems in Sequences of Random Variables (Continued...)

Lecture 17 - Definition of Stochastic Processes, Parameter and State Spaces

Lecture 18 - Classification of Stochastic Processes

Lecture 19 - Examples of Classification of Stochastic Processes

Lecture 20 - Examples of Classification of Stochastic Processes (Continued...)

Lecture 21 - Bernoulli Process

Lecture 22 - Poisson Process

Lecture 23 - Poisson Process (Continued...)

Lecture 24 - Simple Random Walk and Population Processes

Lecture 25 - Introduction to Discrete time Markov Chain

Lecture 26 - Introduction to Discrete time Markov Chain (Continued...)

Lecture 27 - Examples of Discrete time Markov Chain

Lecture 28 - Examples of Discrete time Markov Chain (Continued...)

Lecture 29 - Introduction to Chapman-Kolmogorov equations

Lecture 30 - State Transition Diagram and Examples

Lecture 31 - Examples

Lecture 32 - Introduction to Classification of States and Periodicity

Lecture 33 - Closed set of States and Irreducible Markov Chain

Lecture 34 - First Passage time and Mean Recurrence Time

Lecture 35 - Recurrent State and Transient State

Lecture 36 - Introduction and example of Classification of states

Lecture 37 - Example of Classification of states (Continued...)

Lecture 38 - Example of Classification of states (Continued...)

Lecture 39 - Example of Classification of states (Continued...)

Lecture 40 - Introduction and Limiting Distribution

Lecture 41 - Example of Limiting Distribution and Ergodicity

Lecture 42 - Stationary Distribution and Examples

Lecture 43 - Examples of Stationary Distributions

Lecture 44 - Time Reversible Markov Chain and Examples

Lecture 45 - Definition of Reducible Markov Chains and Types of Reducible Markov Chains

Lecture 46 - Stationary Distributions and Types of Reducible Markov chains

Lecture 47 - Type of Reducible Markov Chains (Continued...)

Lecture 48 - Gambler's Ruin Problem

Lecture 49 - Introduction to Continuous time Markov Chain

Lecture 50 - Waiting time Distribution

Lecture 51 - Chapman-Kolmogorov Equation

Lecture 52 - Infinitesimal Generator Matrix

Lecture 53 - Introduction and Example Of Continuous time Markov Chain

Lecture 54 - Limiting and Stationary Distributions

Lecture 55 - Time reversible CTMC and Birth Death Process

Lecture 56 - Steady State Distributions, Pure Birth Process and Pure Death Process

Lecture 57 - Introduction to Poisson Process

Lecture 58 - Definition of Poisson Process

Lecture 59 - Superposition and Deposition of Poisson Process

Lecture 60 - Compound Poisson Process and Examples

Lecture 61 - Introduction to Queueing Systems and Kendall Notations

Lecture 62 - M/M/1 Queueing Model

Lecture 63 - Little's Law, Distribution of Waiting Time and Response Time

NPTEL : NOC:Stochastic Processes (Mathematics)

Co-ordinators : Dr. S. Dharmaraja

Lecture 31 - Examples

Lecture 32 - Introduction to Classification of States and Periodicity

Lecture 33 - Closed set of States and Irreducible Markov Chain

Lecture 34 - First Passage time and Mean Recurrence Time

Lecture 35 - Recurrent State and Transient State

Lecture 36 - Introduction and example of Classification of states

Lecture 37 - Example of Classification of states (Continued...)

Lecture 38 - Example of Classification of states (Continued...)

Lecture 39 - Example of Classification of states (Continued...)

Lecture 40 - Introduction and Limiting Distribution

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Lecture 45 - Definition of Reducible Markov Chains and Types of Reducible Markov Chains

Lecture 46 - Stationary Distributions and Types of Reducible Markov chains

Lecture 47 - Type of Reducible Markov Chains (Continued...)

Lecture 48 - Gambler's Ruin Problem

Lecture 49 - Introduction to Continuous time Markov Chain

Lecture 50 - Waiting time Distribution

Lecture 51 - Chapman-Kolmogorov Equation

Lecture 52 - Infinitesimal Generator Matrix

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Lecture 55 - Time reversible CTMC and Birth Death Process

Lecture 56 - Steady State Distributions, Pure Birth Process and Pure Death Process

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Lecture 60 - Compound Poisson Process and Examples

Lecture 61 - Introduction to Queueing Systems and Kendall Notations

Lecture 62 - M/M/1 Queueing Model

Lecture 63 - Little's Law, Distribution of Waiting Time and Response Time

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

Lecture 65 - Examples based on N-step transition matrix

Lecture 66 - Examples (Continued...)

Lecture 67 - Classification of states

Lecture 68 - Classification of states (Continued...)

Lecture 69 - Calculation of N-Step - 9

Lecture 70 - Calculation of N-Step - 10

Lecture 71 - Limiting and Stationary distributions

Lecture 72 - Limiting and Stationary distributions (Continued...)

Lecture 73 - Continuous time Markov chain (CTMC)

Lecture 74 - CTMC (Continued...)

Lecture 75 - State transition diagram and Chapman-Kolmogorov equation

Lecture 76 - Infinitesimal generator and Kolmogorov differential equations

Lecture 77 - Limiting distribution

Lecture 78 - Limiting and Stationary distributions - 1

Lecture 79 - Birth death process

Lecture 80 - Birth death process (Continued...)

Lecture 81 - Poisson process - 1

Lecture 82 - Poisson process (Continued...)

Lecture 83 - Poisson process (Continued...)

Lecture 84 - Non-homogeneous and compound Poisson process

Lecture 85 - Introduction to Queueing Models and Kendall Notation

Lecture 86 - M/M/1 Queueing Model

Lecture 87 - M/M/1 Queueing Model (Continued...)

Lecture 88 - M/M/1 Queueing Model and Burke's Theorem

Lecture 89 - M/M/c Queueing Model

Lecture 90 - M/M/c (Continued...) and M/M/1/N Model

Lecture 91 - Other Markovian Queueing Models

Lecture 92 - Transient Solution of Finite Capacity Markovian Queues

NPTEL : NOC:Statistical Inference (Mathematics)

Co-ordinators : Prof. Nilladri Chaterjee

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

Lecture 1 - Advanced Probability Theory

Lecture 2 - Advanced Probability Theory

Lecture 3 - Advanced Probability Theory

Lecture 4 - Advanced Probability Theory

Lecture 5 - Advanced Probability Theory

Lecture 6 - Advanced Probability Theory

Lecture 7 - Advanced Probability Theory

Lecture 8 - Advanced Probability Theory

Lecture 9 - Advanced Probability Theory

Lecture 10 - Advanced Probability Theory

Lecture 11 - Advanced Probability Theory

Lecture 12 - Advanced Probability Theory

Lecture 13 - Advanced Probability Theory

Lecture 14 - Advanced Probability Theory

Lecture 15 - Advanced Probability Theory

Lecture 16 - Advanced Probability Theory

Lecture 17 - Advanced Probability Theory

Lecture 18 - Advanced Probability Theory

Lecture 19 - Advanced Probability Theory

Lecture 20 - Advanced Probability Theory

Lecture 21 - Advanced Probability Theory

Lecture 22 - Advanced Probability Theory

Lecture 23 - Advanced Probability Theory

Lecture 24 - Advanced Probability Theory

Lecture 25 - Advanced Probability Theory

Lecture 26 - Advanced Probability Theory

Lecture 27 - Advanced Probability Theory

Lecture 28 - Advanced Probability Theory

Lecture 29 - Advanced Probability Theory

Lecture 30 - Advanced Probability Theory

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

Lecture 32 - Order statistics

Lecture 33 - Conditional distributions

Lecture 34 - Random sum

Lecture 35 - Moments and Covariance

Lecture 36 - Variance Covariance matrix

Lecture 37 - Multivariate Normal distribution

Lecture 38 - Probability generating function and Moment generating function

Lecture 39 - Correlation coefficient

Lecture 40 - Conditional Expectation

Lecture 41 - Conditional Expectation (Continued...)

Lecture 42 - Mode of Convergence

Lecture 43 - Mode of Convergence (Continued...)

Lecture 44 - Law of Large Numbers

Lecture 45 - Central Limit Theorem

Lecture 46 - Central Limit Theorem (Continued...)

Lecture 47 - Descriptive Statistics and Sampling Distributions

Lecture 48 - Descriptive Statistics and Sampling Distributions (Continued...)

Lecture 49 - Descriptive Statistics and Sampling Distributions (Continued...)

Lecture 50 - Point estimation

Lecture 51 - Methods of Point estimation

Lecture 52 - Interval Estimation

Lecture 53 - Testing of Statistical Hypothesis

Lecture 54 - Nonparametric Statistical Tests

Lecture 55 - Analysis of Variance

Lecture 56 - Correlation

Lecture 57 - Regression

Lecture 58 - Logistic Regression

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

Lecture 31 - Waiting Times and Multiple Classes in Open Jackson Networks

Lecture 32 - Closed Jackson Networks

Lecture 33 - Closed Jackson Networks, Convolution Algorithm

Lecture 34 - Mean-Value Analysis Algorithm

Lecture 35 - Cyclic Queueing Networks, Extensions of Jackson Networks

Lecture 36 - Renewal Processes

Lecture 37 - Regenerative Processes, Semi-Markov Processes

Lecture 38 - M/G/1 Queues, The Pollaczek-Khinchin Mean Formula

Lecture 39 - M/G/1 Queues, The Pollaczek-Khinchin Transform Formula

Lecture 40 - M/G/1 Queues: Waiting Times and Busy Period

Lecture 41 - M/G/1/K Queues, Additional Insights on M/G/1 Queues

Lecture 42 - M/G/c, M/G/âˆž and M/G/c/c Queues

Lecture 43 - G/M/1 Queues

Lecture 44 - G/G/1 Queues: Lindley's Integral Equation

Lecture 45 - G/G/1 Queues: Bounds

Lecture 46 - Vacation Queues: Introduction, M/M/1 Queues with Vacations

Lecture 47 - M/G/1 Queues with Vacations

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

Lecture 1 - Introduction to Linear Programming Problems

Lecture 2 - Vector space, Linear independence and dependence, basis

Lecture 3 - Moving from one basic feasible solution to another, optimality criteria

Lecture 4 - Basic feasible solutions, existence & derivation

Lecture 5 - Convex sets, dimension of a polyhedron, Faces, Example of a polytope

Lecture 6 - Direction of a polyhedron, correspondence between bfs and extreme points

Lecture 7 - Representation theorem, LPP solution is a bfs, Assignment 1

Lecture 8 - Development of the Simplex Algorithm, Unboundedness, Simplex Tableau

Lecture 9 - Simplex Tableau & algorithm ,Cycling, Blandâ€™s anti-cycling rules, Phase I & Phase II

Lecture 10 - Big-M method,Graphical solutions, adjacent extreme pts and adjacent bfs

Lecture 11 - Assignment 2, progress of Simplex algorithm on a polytope, bounded variable LPP

Lecture 12 - LPP Bounded variable, Revised Simplex algorithm, Duality theory, weak duality theorem

Lecture 13 - Weak duality theorem, economic interpretation of dual variables, Fundamental theorem of duality

Lecture 14 - Examples of writing the dual, complementary slackness theorem

Lecture 15 - Complementary slackness conditions, Dual Simplex algorithm, Assignment 3

Lecture 16 - Primal-dual algorithm

Lecture 17 - Problem in lecture 16, starting dual feasible solution, Shortest Path Problem

Lecture 18 - Shortest Path Problem, Primal-dual method, example

Lecture 19 - Shortest Path Problem-complexity, interpretation of dual variables, post-optimality analysis-changes in the cost vector

Lecture 20 - Assignment 4, postoptimality analysis, changes in b, adding a new constraint, changes in {aij} , Parametric analysis

Lecture 21 - Parametric LPP-Right hand side vector

Lecture 22 - Parametric cost vector LPP

Lecture 23 - Parametric cost vector LPP, Introduction to Min-cost flow problem

Lecture 24 - Mini-cost flow problem-Transportation problem

Lecture 25 - Transportation problem degeneracy, cycling

Lecture 26 - Sensitivity analysis

Lecture 27 - Sensitivity analysis

Lecture 28 - Bounded variable transportation problem, min-cost flow problem

Lecture 29 - Min-cost flow problem

Lecture 30 - Starting feasible solution, Lexicographic method for preventing cycling ,strongly feasible solution

Lecture 31 - Assignment 6, Shortest path problem, Shortest Path between any two nodes,Detection of negative cycles

Lecture 32 - Min-cost-flow Sensitivity analysis Shortest path problem sensitivity analysis

Lecture 33 - Min-cost flow changes in arc capacities , Max-flow problem, assignment 7

Lecture 34 - Problem 3 (assignment 7), Min-cut Max-flow theorem, Labelling algorithm

Lecture 35 - Max-flow - Critical capacity of an arc, starting solution for min-cost flow problem

Lecture 36 - Improved Max-flow algorithm

Lecture 37 - Critical Path Method (CPM)

Lecture 38 - Programme Evaluation and Review Technique (PERT)

Lecture 39 - Simplex Algorithm is not polynomial time- An example

Lecture 40 - Interior Point Methods

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

NPTEL : Probability Theory and Applications (Mathematics)

Co-ordinators : Prof. Prabha Sharma

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

Lecture 1 - Basic Probability

Lecture 2 - Interesting Problems In Probability

Lecture 3 - Random variables, distribution function and independence

Lecture 4 - Chebyshev inequality, Borel-Cantelli Lemmas and related issues

Lecture 5 - Law of Large Number and Central Limit Theorem

Lecture 6 - Conditional Expectation - I

Lecture 7 - Conditional Expectation - II

Lecture 8 - Martingales

Lecture 9 - Brownian Motion - I

Lecture 10 - Brownian Motion - II

Lecture 11 - Brownian Motion - III

Lecture 12 - Ito Integral - I

Lecture 13 - Ito Integral - II

Lecture 14 - Ito Calculus - I

Lecture 15 - Ito Calculus - II

Lecture 16 - Ito Integral In Higher Dimension

Lecture 17 - Application to Ito Integral - I

Lecture 18 - Application to Ito Integral - II

Lecture 19 - Black Scholes Formula - I

Lecture 20 - Black Scholes Formula - II

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

Co-ordinators : Prof. Sudipta Dutta

NPTEL : NOC:Curves and Surfaces (Mathematics)

Co-ordinators : Prof. Sudipta Dutta

Lecture 1 - Level curves and locus, definition of parametric curves, tangent, arc length, arc length parametrisation

Lecture 2 - How much a curve is Â‘curvedÂ’, signed unit normal and signed curvature, rigid motions, constant curvature

Lecture 3 - Curves in R^3, principal normal and binormal, torsion

Lecture 4 - Frenet-Serret formula

Lecture 5 - Simple closed curve and isoperimetric inequality

Lecture 6 - Surfaces and parametric surfaces, examples, regular surface and non-example of regular surface, transition maps.

Lecture 7 - Transition maps of smooth surfaces, smooth function between surfaces, diffeomorphism

Lecture 8 - Reparameterization

Lecture 9 - Tangent, Normal

Lecture 10 - Orientable surfaces

Lecture 11 - Examples of Surfaces

Lecture 12 - First Fundamental Form

Lecture 13 - Conformal Mapping

Lecture 14 - Curvature of Surfaces

Lecture 15 - Euler's Theorem

Lecture 16 - Regular Surfaces locally as Quadratic Surfaces

Lecture 17 - Geodesics

Lecture 18 - Existence of Geodesics, Geodesics on Surfaces of revolution

Lecture 19 - Geodesics on surfaces of revolution; Clairaut's Theorem

Lecture 20 - Pseudosphere

Lecture 21 - Classification of Quadratic Surface

Lecture 22 - Surface Area and Equiareal Map

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

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

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

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

Co-ordinators : Prof. Shalabh

Lecture 1 - Data Science - Why, What, and How?

Lecture 2 - Installation and Working with R

Lecture 3 - Installation and Working with R Studio

Lecture 4 - Calculations with R as a Calculator

Lecture 5 - Calculations with Data Vectors

Lecture 6 - Built-in Commands and Bivariate Plots

Lecture 7 - Logical Operators and Selection of Sample

Lecture 8 - Introduction to Probability

Lecture 9 - Sample Space and Events

Lecture 10 - Set Theory and Events using Venn Diagrams

Lecture 11 - Relative Frequency and Probability

Lecture 12 - Probability and Relative Frequency - An Example

Lecture 13 - Axiomatic Definition of Probability

Lecture 14 - Some Rules of Probability

Lecture 15 - Basic Principles of Counting - Ordered Set, Unordered Set, and Permutations

Lecture 16 - Basic Principles of Counting - Combination

Lecture 17 - Conditional Probability

Lecture 18 - Multiplication Theorem of Probability

Lecture 19 - Bayes' Theorem

Lecture 20 - Independent Events

Lecture 21 - Computation of Probability using R

Lecture 22 - Random Variables - Discrete and Continuous

Lecture 23 - Cumulative Distribution and Probability Density Function

Lecture 24 - Discrete Random Variables, Probability Mass Function and Cumulative Distribution Function

Lecture 25 - Expectation of Variables

Lecture 26 - Moments and Variance

Lecture 27 - Data Based Moments and Variance in R Software

Lecture 28 - Skewness and Kurtosis

Lecture 29 - Quantiles and Tschebyschevâ€™s Inequality

Lecture 30 - Degenerate and Discrete Uniform Distributions

Lecture 31 - Discrete Uniform Distribution in R

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

Co-ordinators : Prof. Shalabh

NPTEL : NOC:Measure Theoretic Probability 1 (Mathematics)

Co-ordinators : Prof. Suprio Bhar

NPTEL : NOC:Foundations of R Software (Mathematics)

Co-ordinators : Prof. Shalabh

Lecture 1

Lecture 2

Lecture 3

Lecture 4

Lecture 5

Lecture 6

Lecture 7

Lecture 8

Lecture 9

Lecture 10

Lecture 11

Lecture 12

Lecture 13

Lecture 14

Lecture 15

Lecture 16

Lecture 17

Lecture 18

Lecture 19

Lecture 20

Lecture 21

Lecture 22

Lecture 23

Lecture 24

Lecture 25

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31

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

Co-ordinators : Prof. Shalabh

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 : NOC:Set Theory and Mathematical Logic (Mathematics)

Co-ordinators : Prof. Amit Kuber

Lecture 1 - Introduction to Set Theory

Lecture 2 - Operations on Sets, and Functions

Lecture 3 - Bijective Functions

Lecture 4 - Equivalence Relations and Partitions

Lecture 5 - Cantor-Schroder-Bernstein Theorem

Lecture 6 - Natural Numbers in ZF Set Theory

Lecture 7 - Standard Number Systems in ZF Set Theory

Lecture 8 - (Finitary) Power Sets and Countability

Lecture 9 - Bijections of the set of real numbers: Dedekind cut and Cantor's middle-third set

Lecture 10 - Bijections of the real numbers: Continued Fractions

Lecture 11 - Principles of Mathematical Induction

Lecture 12 - Ordinal Numbers

Lecture 13 - Ordinal Arithmetic

Lecture 14 - Cardinal Numbers and Cardinal Arithmetic

Lecture 15 - Tutorial - Week 4

Lecture 16 - Partial Orders

Lecture 17 - Lattices

Lecture 18 - Equivalents of the Axiom of Choice (AC): Zorn's Lemma (ZL) and Well-ordering theorem (WOT)

Lecture 19 - Tutorial - Week 5

Lecture 20 - Boolean Algebras

Lecture 21 - Stone's Representation Theorems for Boolean Algebras

Lecture 22 - Some Exercises on Boolean Algebras

Lecture 23 - Ultrafilters in Boolean Algebras

Lecture 24 - Introduction to Mathematical Logic

Lecture 25 - Propositional Logic: Language, Formulas and Valuations

Lecture 26 - Propositional Logic: Logical Equivalence and Lindenbaum-Tarski Algebra

Lecture 27 - Tutorial - Week 7

Lecture 28 - Propositional Logic: Normal Forms of Formulas and Adequacy of Connectives

Lecture 29 - Propositional Logic: Semantic Consequence Relation

Lecture 30 - Propositional Logic: Syntactic Consequence Relation

Lecture 31 - Deduction Theorem (Continued...)

Lecture 32 - Tutorial - Week 8

Lecture 33 - Propositional Logic: Consistency and Soundness Theorem

Lecture 34 - Propositional Logic: Completeness Theorem - Part I

Lecture 35 - Propositional Logic: Completeness Theorem - Part II

Lecture 36 - Compactness Theorem and Konig's Lemma

Lecture 37 - Tutorial - Week 9

Lecture 38 - Introduction to First-Order Predicate Logic

Lecture 39 - Predicate Logic: Terms and Formulas

Lecture 40 - Predicate Logic: Validity of Formulas

Lecture 41 - Tutorial - Week 10

Lecture 42 - Predicate Logic Substructures, Semantic Consequence Relation, and Models of Theories

Lecture 43 - Predicate Logic: Standard Logical Equivalences, Normal Forms, and Definable Sets

Lecture 44 - Tutorial - Week 11

Lecture 45 - Hyperreal Numbers

Lecture 46 - Predicate Logic: Ultraproduct of Structures and Los's Theorem

Lecture 47 - Predicate Logic: Compactness Theorem

Lecture 48 - Tutorial - Week 12

Lecture 49 - Predicate Logic: Lowenheim-Skolem Theorems

Lecture 50 - Predicate Logic: Reduced Products, Categoricity

Lecture 51 - Predicate Logic: Categoricity (Continued...) and Quantifier Elimination

Lecture 52 - Godel's Incompleteness Theorems

NPTEL : NOC:Introduction to Fourier Analysis (Mathematics)

Co-ordinators : Prof. Parasar Mohanty

Lecture 32 - Fourier analysis on finite abelian groups

Lecture 33 - Simultaneously diagonalizable operators and characters

Lecture 34 - Results of Fourier series on finite abelian group

Lecture 35 - Applications in Number theory

Lecture 36 - Fourier transform on R

Lecture 37 - Properties of Fourier transform

Lecture 38 - Inversion formula and convolution

Lecture 39 - Fejer kernel on R

Lecture 40 - Schwartz space

Lecture 41 - Convolution and Good kernel in Schwartz space

Lecture 42 - Multiplication formula and Fourier inversion theorem

Lecture 43 - Plancherel formula and Poisson summation formula

Lecture 44 - Application of Poisson summation formula

Lecture 45 - Weierstrass theorem and Heisenberg uncertainty principle

Lecture 46 - Hermite operator

Lecture 47 - Solution of ODE by using Fourier transform

Lecture 48 - Laplacian equation

Lecture 49 - Poisson kermal and mean value theorem for harmonic functions

Lecture 50 - Wave equation

Lecture 51 - Eigenvalues of Fourier transform

Lecture 52 - Fourier transform on R^n

Lecture 53 - Properties of Fourier transform on R^n

Lecture 54 - Inversion theorem and Plancherel theorem

Lecture 55 - Wave equation, heat equation and Poisson kernel

Lecture 56 - Fourier series in higher dimension

Lecture 57 - Poission summation formula

Lecture 58 - Application of Poission summation formula

Lecture 59 - Radon transform

Lecture 60 - Reconstruction formula

NPTEL : NOC:Ordinary Differential Equations (Mathematics)

Co-ordinators : Prof. Kaushik Bal

NPTEL : NOC:Category Theory (Mathematics)

Co-ordinators : Prof. Amit Kuber

NPTEL : Advanced Engineering Mathematics (Mathematics)

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

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 1 - Motivation with few Examples

Lecture 2 - Single - Step Methods for IVPs

Lecture 3 - Analysis of Single Step Methods

Lecture 4 - Runge - Kutta Methods for IVPs

Lecture 5 - Higher Order Methods/Equations

Lecture 6 - Error - Stability - Convergence of Single Step Methods

Lecture 7 - Tutorial - I

Lecture 8 - Tutorial - II

Lecture 9 - Multi-Step Methods (Explicit)

Lecture 10 - Multi-Step Methods (Implicit)

Lecture 11 - Convergence and Stability of multi step methods

Lecture 12 - General methods for absolute stability

Lecture 13 - Stability Analysis of Multi Step Methods

Lecture 14 - Predictor - Corrector Methods

Lecture 15 - Some Comments on Multi - Step Methods

Lecture 16 - Finite Difference Methods - Linear BVPs

Lecture 17 - Linear/Non - Linear Second Order BVPs

Lecture 18 - BVPS - Derivative Boundary Conditions

Lecture 19 - Higher Order BVPs

Lecture 20 - Shooting Method BVPs

Lecture 21 - Tutorial - III

Lecture 22 - Introduction to First Order PDE

Lecture 23 - Introduction to Second Order PDE

Lecture 24 - Finite Difference Approximations to Parabolic PDEs

Lecture 25 - Implicit Methods for Parabolic PDEs

Lecture 26 - Consistency, Stability and Convergence

Lecture 27 - Other Numerical Methods for Parabolic PDEs

Lecture 28 - Tutorial - IV

Lecture 29 - Matrix Stability Analysis of Finite Difference Scheme

Lecture 30 - Fourier Series Stability Analysis of Finite Difference Scheme

Lecture 31 - Finite Difference Approximations to Elliptic PDEs - I

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

Lecture 32 - Nonlinear programming : constrained optimization techniques

Lecture 33 - Interior and Exterior penulty Function Method

Lecture 34 - Separable Programming Problem

Lecture 35 - Introduction to Geometric Programming

Lecture 36 - Constrained Geometric Programming Problem

Lecture 37 - Dynamic Programming Problem

Lecture 38 - Dynamic Programming Problem (Continued.)

Lecture 39 - Multi Objective Decision Making

Lecture 40 - Multi attribute decision making

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

Lecture 1 - Sets, Classes, Collection

Lecture 2 - Sequence of Sets

Lecture 3 - Ring, Field (Algebra)

Lecture 4 - Sigma-Ring, Sigma-Field, Monotone Class

Lecture 5 - Random Experiment, Events

Lecture 6 - Definitions of Probability

Lecture 7 - Properties of Probability Function - I

Lecture 8 - Properties of Probability Function - II

Lecture 9 - Conditional Probability

Lecture 10 - Independence of Events

Lecture 11 - Problems in Probability - I

Lecture 12 - Problems in Probability - II

Lecture 13 - Random Variables

Lecture 14 - Probability Distribution of a Random Variable - I

Lecture 15 - Probability Distribution of a Random Variable - II

Lecture 16 - Moments

Lecture 17 - Characteristics of Distributions - I

Lecture 18 - Characteristics of Distributions - II

Lecture 19 - Special Discrete Distributions - I

Lecture 20 - Special Discrete Distributions - II

Lecture 21 - Special Discrete Distributions - III

Lecture 22 - Poisson Process - I

Lecture 23 - Poisson Process - II

Lecture 24 - Special Continuous Distributions - I

Lecture 25 - Special Continuous Distributions - II

Lecture 26 - Special Continuous Distributions - III

Lecture 27 - Special Continuous Distributions - IV

Lecture 28 - Special Continuous Distributions - V

Lecture 29 - Normal Distribution

Lecture 30 - Problems on Normal Distribution

Lecture 31 - Problems on Special Distributions - I

Lecture 65 - Basic Definitions

Lecture 66 - Two Types of Errors

Lecture 67 - Neyman-Pearson Fundamental Lemma

Lecture 68 - Applications of N-P Lemma - I

Lecture 69 - Applications of N-P Lemma - II

Lecture 70 - Testing for Normal Mean

Lecture 71 - Testing for Normal Variance

Lecture 72 - Large Sample Test for Variance and Two Sample Problem

Lecture 73 - Paired t-Test

Lecture 74 - Examples

Lecture 75 - Testing Equality of Proportions

Lecture 76 - Chi-Square Test for Goodness Fit - I

Lecture 77 - Chi-Square Test for Goodness Fit - II

Lecture 78 - Testing for Independence in rxc Contingency Table - I

Lecture 79 - Testing for Independence in rxc Contingency Table - II

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

Lecture 1 - Introduction to Optimization

Lecture 2 - Assumptions and Mathematical Modeling of LPP

Lecture 3 - Geometrey of LPP

Lecture 4 - Graphical Solution of LPP - I

Lecture 5 - Graphical Solution of LPP - II

Lecture 6 - Solution of LPP: Simplex Method

Lecture 7 - Simplex Method

Lecture 8 - Introduction to BIG-M Method

Lecture 9 - Algorithm of BIG-M Method

Lecture 10 - Problems on BIG-M Method

Lecture 11 - Two Phase Method: Introduction

Lecture 12 - Two Phase Method: Problem Solution

Lecture 13 - Special Cases of LPP

Lecture 14 - Degeneracy in LPP

Lecture 15 - Sensitivity Analysis - I

Lecture 16 - Sensitivity Analysis - II

Lecture 17 - Problems on Sensitivity Analysis

Lecture 18 - Introduction to Duality Theory - I

Lecture 19 - Introduction to Duality Theory - II

Lecture 20 - Dual Simplex Method

Lecture 21 - Examples on Dual Simplex Method

Lecture 22 - Interger Linear Programming

Lecture 23 - Interger Linear Programming

Lecture 24 - IPP: Branch and BBound Method

Lecture 25 - Mixed Integer Programming Problem

Lecture 26

Lecture 27

Lecture 28

Lecture 29

Lecture 30

Lecture 31 - Introduction to Nonlinear programming

Lecture 32 - Graphical Solution of NLP

Lecture 33 - Types of NLP

Lecture 34 - One dimentional unconstrained optimization

Lecture 35 - Unconstrained Optimization

Lecture 36 - Region Elimination Technique - 1

Lecture 37 - Region Elimination Technique - 2

Lecture 38 - Region Elimination Technique - 3

Lecture 39 - Unconstrained Optimization

Lecture 40 - Unconstrained Optimization

Lecture 41 - Multivariate Unconstrained Optimization - 1

Lecture 42 - Multivariate Unconstrained Optimization - 2

Lecture 43 - Unconstrained Optimization

Lecture 44 - NLP with Equality Constrained - 1

Lecture 45 - NLP with Equality Constrained - 2

Lecture 46 - Constrained NLP - 1

Lecture 47 - Constrained NLP - 2

Lecture 48 - Constrained Optimization

Lecture 49 - Constrained Optimization

Lecture 50 - KKT

Lecture 51 - Constrained Optimization

Lecture 52 - Constrained Optimization

Lecture 53 - Feasible Direction

Lecture 54 - Penalty and barrier method

Lecture 55 - Penalty method

Lecture 56 - Penalty and barrier method

Lecture 57 - Penalty and barrier method

Lecture 58 - Dynamic programming

Lecture 59 - Multi-Objective decision making

Lecture 60 - Multi-Attribute decision making

NPTEL : NOC:Matrix Solver (Mathematics)

Co-ordinators : Prof. Somnath Roy

Lecture 1 - Introduction to Matrix Algebra - I

Lecture 2 - Introduction to Matrix Algebra - II

Lecture 3 - System of Linear Equations

Lecture 4 - Determinant of a Matrix

Lecture 5 - Determinant of a Matrix (Continued...)

Lecture 6 - Gauss Elimination

Lecture 7 - Gauss Elimination (Continued...)

Lecture 8 - LU Decomposition

Lecture 9 - Gauss-Jordon Method

Lecture 10 - Representation of Physical Systems as Matrix Equations

Lecture 11 - Tridiagonal Matrix Algorithm

Lecture 12 - Equations with Singular Matrices

Lecture 13 - Introduction to Vector Space

Lecture 14 - Vector Subspace

Lecture 15 - Column Space and Nullspace of a Matrix

Lecture 16 - Finding Null Space of a Matrix

Lecture 17 - Solving Ax=b when A is Singular

Lecture 18 - Linear Independence and Spanning of a Subspace

Lecture 19 - Basis and Dimension of a Vector Space

Lecture 20 - Four Fundamental Subspaces of a Matrix

Lecture 21 - Left and right inverse of a matrix

Lecture 22 - Orthogonality between the subspaces

Lecture 23 - Best estimate

Lecture 24 - Projection operation and linear transformation

Lecture 25 - Creating orthogonal basis vectors

Lecture 26 - Gram-Schmidt and modified Gram-Schmidt algorithms

Lecture 27 - Comparing GS and modified GS

Lecture 28 - Introduction to eigenvalues and eigenvectors

Lecture 29 - Eigenvlues and eigenvectors for real symmetric matrix

Lecture 30 - Positive definiteness of a matrix

Lecture 31 - Positive definiteness of a matrix (Continued...)

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

Co-ordinators : Prof.Sourav Mukhopadhyay

Lecture 1 - Set Theory

Lecture 2 - Set Operations

Lecture 3 - Set Operations (Continued...)

Lecture 4 - Set of sets

Lecture 5 - Binary relation

Lecture 6 - Equivalence relation

Lecture 7 - Mapping

Lecture 8 - Permutation

Lecture 9 - Binary Composition

Lecture 10 - Groupoid

Lecture 11 - Group

Lecture 12 - Order of an element

Lecture 13 - Subgroup

Lecture 14 - Cyclic Group

Lecture 15 - Subgroup Operations

Lecture 16 - Left Cosets

Lecture 17 - Right Cosets

Lecture 18 - Normal Subgroup

Lecture 19 - Rings

Lecture 20 - Field

Lecture 21 - Vector Spaces

Lecture 22 - Sub-Spaces

Lecture 23 - Linear Span

Lecture 24 - Basis of a Vector Space

Lecture 25 - Dimension of a Vector space

Lecture 26 - Complement of subspace

Lecture 27 - Linear Transformation

Lecture 28 - Linear Transformation (Continued...)

Lecture 29 - More on linear mapping

Lecture 30 - Linear Space

Lecture 31 - Rank of a matrix

NPTEL : NOC:Engineering Mathematics-I (Mathematics)

Co-ordinators : Prof. Jitendra Kumar

Lecture 32 - Integral Calculus Double Integrals: Change of Variables

Lecture 33 - Integral Calculus Double Integrals: Surface Area

Lecture 34 - Integral Calculus Triple Integrals

Lecture 35 - Integral Calculus Triple Integrals (Continued...)

Lecture 36 - System of Linear Equations

Lecture 37 - System of Linear Equations Gauss Elimination

Lecture 38 - System of Linear Equations Gauss Elimination (Continued...)

Lecture 39 - Linear Algebra - Vector Spaces

Lecture 40 - Linear Independence of Vectors

Lecture 41 - Vector Spaces Spanning Set

Lecture 42 - Vector Spaces Basis and Dimension

Lecture 43 - Rank of a Matrix

Lecture 44 - Linear Transformations

Lecture 45 - Linear Transformations (Continued....)

Lecture 46 - Eigenvalues and Eigenvectors

Lecture 47 - Eigenvalues and Eigenvectors (Continued...)

Lecture 48 - Eigenvalues and Eigenvectors (Continued...)

Lecture 49 - Eigenvalues and Eigenvectors (Continued...)

Lecture 50 - Eigenvalues and Eigenvectors: Diagonalization

Lecture 51 - Differential Equations - Introduction

Lecture 52 - First Order Differential Equations

Lecture 53 - Exact Differential Equations

Lecture 54 - Exact Differential Equations (Continued...)

Lecture 55 - First Order Linear Differential Equations

Lecture 56 - Higher Order Linear Differential Equations

Lecture 57 - Solution of Higher Order Homogeneous Linear Equations

Lecture 58 - Solution of Higher Order Non-Homogeneous Linear Equations

Lecture 59 - Solution of Higher Order Non-Homogeneous Linear Equations (Continued...)

Lecture 60 - Cauchy-Euler Equations

NPTEL : NOC:Integral and Vector Calculus (Mathematics)

Co-ordinators : Prof. Hari Shankar Mahato

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

Co-ordinators : Prof. A. Goswami

Lecture 32 - Fourier Transform of Derivative and Integral of a Function

Lecture 33 - Applications of Properties of Fourier Transform - I

Lecture 34 - Applications of Properties of Fourier Transform - II

Lecture 35 - Fourier Transform of Convolution of two functions

Lecture 36 - Parseval's Identity and its Application

Lecture 37 - Evaluation of Definite Integrals using Properties of Fourier Transform

Lecture 38 - Fourier Transform of Dirac Delta Function

Lecture 39 - Representation of a function as Fourier Integral

Lecture 40 - Applications of Fourier Transform to Ordinary Differential Equations - I

Lecture 41 - Applications of Fourier Transform to Ordinary Differential Equations - II

Lecture 42 - Solution of Integral Equations using Fourier Transform

Lecture 43 - Introduction to Partial Differential Equations

Lecture 44 - Solution of Partial Differential Equations using Laplace Transform

Lecture 45 - Solution of Heat Equation and Wave Equation using Laplace Transform

Lecture 46 - Criteria for choosing Fourier Transform, Fourier Sine Transform, Fourier Cosine Transform in solving Partial Differential Equations

Lecture 47 - Solution of Partial Differential Equations using Fourier Cosine Transform and Fourier Sine Transform

Lecture 48 - Solution of Partial Differential Equations using Fourier Transform - I

Lecture 49 - Solution of Partial Differential Equations using Fourier Transform - II

Lecture 50 - Solving problems on Partial Differential Equations using Transform Techniques

Lecture 51 - Introduction to Finite Fourier Transform

Lecture 52 - Solution of Boundary Value Problems using Finite Fourier Transform - I

Lecture 53 - Solution of Boundary Value Problems using Finite Fourier Transform - II

Lecture 54 - Introduction to Mellin Transform

Lecture 55 - Properties of Mellin Transform

Lecture 56 - Examples of Mellin Transform - I

Lecture 57 - Examples of Mellin Transform - II

Lecture 58 - Introduction to Z-Transform

Lecture 59 - Properties of Z-Transform

Lecture 60 - Evaluation of Z-Transform of some functions

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

Co-ordinators : Prof. Somesh Kumar

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

Lecture 32 - Derivation of Fourier Series

Lecture 33 - Fourier Series -Evaluation

Lecture 34 - Convergence of Fourier Series - I

Lecture 35 - Convergence of Fourier Series - II

Lecture 36 - Fourier Series for Even and Odd Functions

Lecture 37 - Half Range Fourier Expansions

Lecture 38 - Differentiation and Integration of Fourier Series

Lecture 39 - Besselâ€™s Inequality and Parsevalâ€™s Identity

Lecture 40 - Complex Form of Fourier Series

Lecture 41 - Fourier Integral Representation of a Function

Lecture 42 - Fourier Sine and Cosine Integrals

Lecture 43 - Fourier Cosine and Sine Transform

Lecture 44 - Fourier Transform

Lecture 45 - Properties of Fourier Transform

Lecture 46 - Evaluation of Fourier Transform - Part 1

Lecture 47 - Evaluation of Fourier Transform - Part 2

Lecture 48 - Introduction to Partial Differential Equations

Lecture 49 - Applications of Fourier Transform to PDEs - Part 1

Lecture 50 - Applications of Fourier Transform to PDEs - Part 2

Lecture 51 - Laplace Transform of Some Elementary Functions

Lecture 52 - Existence of Laplace Transform

Lecture 53 - Inverse Laplace Transform

Lecture 54 - Properties of Laplace Transform

Lecture 55 - Properties of Laplace Transform (Continued...)

Lecture 56 - Properties of Laplace Transform (Continued...)

Lecture 57 - Laplace Transform of Special Functions

Lecture 58 - Laplace Transform of Special Functions (Continued...)

Lecture 59 - Applications of Laplace Transform

Lecture 60 - Applications of Laplace Transform (Continued...)

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

Lecture 32 - Examples of LS data fitting

Lecture 33 - Classification using Least Squares

Lecture 34 - Examples of LS classification

Lecture 35 - Constrained Least Squares

Lecture 36 - Multiobjective Least Squares

Lecture 37 - Eigenvalues and Eigenvectors - Part I

Lecture 38 - Eigenvalues and Eigenvectors - Part II

Lecture 39 - Spectral Decomposition Theorem

Lecture 40 - Positive Definite Matrices

Lecture 41 - Singular Value Decomposition (SVD)

Lecture 42 - Proof of SVD

Lecture 43 - Properties of SVD

Lecture 44 - Another Proof of SVD

Lecture 45 - Low Rank Approximations

Lecture 46 - Principal Component Analysis

Lecture 47 - SVD and Pseudo - Inverse

Lecture 48 - SVD and the Least Squares Problem

Lecture 49 - Sensitivity Analysis of the Least Squares Problem

Lecture 50 - Power Method

Lecture 51 - Directed Graphs and Properties

Lecture 52 - Page Ranking Algorithm

Lecture 53 - Inverse Eigen Value Problem

Lecture 54 - Fastest Mixing Markov Chains on Graphs - Part I

Lecture 55 - Fastest Mixing Markov Chains on Graphs - Part II

Lecture 56 - Sparse Solution and Underdetermined Systems

Lecture 57 - Structured Low Rank Approximations - Part I

Lecture 58 - Structured Low Rank Approximations - Part II

Lecture 59 - Structured Low Rank Approximations - Part III

Lecture 60 - Recap

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 : NOC:Numerical Linear Algebra and Application (Mathematics)

Co-ordinators : Prof. Srinivasa Rao Pentyala

NPTEL : NOC:Mathematics for Machine Learning (Mathematics)

Co-ordinators : Prof. Debjani Chakraborty, Prof. Debashree Guha Adhya

NPTEL : NOC:Advanced Theory of Ordinary Differential Equations (Mathematics)

Co-ordinators : Prof. Hari Sankar Mahato

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

NPTEL : Mathematical Logic (Mathematics)

Co-ordinators : Prof. Arindama Singh

Lecture 32 - Prenex Form Conversion

Lecture 33 - Skolem Form

Lecture 34 - Syntatic Interpretation

Lecture 35 - Herbrand's Theorem

Lecture 36 - Most General Unifiers

Lecture 37 - Resolution Rules

Lecture 38 - Resolution Examples

Lecture 39 - Ariomatic System FC

Lecture 40 - FC and Semidecidability of FL

Lecture 41 - Analytic Tableau for FL

Lecture 42 - Godels Incompleteness Theorems

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

NPTEL : Advanced Complex Analysis (Mathematics)

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

NPTEL : NOC:Discrete Mathematics (Mathematics)

Co-ordinators : Prof. Sourav Chakraborty

NPTEL : Advanced Complex Analysis - Part 2 (Mathematics)

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

Lecture 29 - Proof of the Arzela-Ascoli Theorem for Functions - Equicontinuity Implies Compactness

Lecture 30 - Introduction to the Montel Theorem - the Holomorphic Avatar of the Arzela-Ascoli Theorem & Why you get Equicontinuity for Free

Lecture 31 - Completion of Proof of the Montel Theorem - the Holomorphic Avatar of the Arzela-Ascoli Theorem

Lecture 32 - Introduction to Marty\'s Theorem - the Meromorphic Avatar of the Montel & Arzela-Ascoli Theorems

Lecture 33 - Proof of one direction of Marty\'s Theorem - the Meromorphic Avatar of the Montel & Arzela-Ascoli Theorems - Normal Uniform Boundedness of Spherical Derivatives Implies Normal Sequential Compactness

Lecture 34 - Proof of the other direction of Marty\'s Theorem - the Meromorphic Avatar of the Montel & Arzela-Ascoli Theorems - Normal Sequential Compactness Implies Normal Uniform Boundedness of Spherical Derivatives

Lecture 35 - Normal Convergence at Infinity and Hurwitz\'s Theorems for Normal Limits of Analytic and Meromorphic Functions at Infinity

Lecture 36 - Normal Sequential Compactness, Normal Uniform Boundedness and Montel\'s & Marty\'s Theorems at Infinity

Lecture 37 - Local Analysis of Normality and the Zooming Process - Motivation for Zalcman\'s Lemma

Lecture 38 - Characterizing Normality at a Point by the Zooming Process and the Motivation for Zalcman\'s Lemma

Lecture 39 - Local Analysis of Normality and the Zooming Process - Motivation for Zalcman\'s Lemma

Lecture 40 - Montel\'s Deep Theorem - The Fundamental Criterion for Normality or Fundamental Normality Test based on Omission of Values

Lecture 41 - Proofs of the Great and Little Picard Theorems

Lecture 42 - Royden\'s Theorem on Normality Based On Growth Of Derivatives

Lecture 43 - Schottky\'s Theorem - Uniform Boundedness from a Point to a Neighbourhood & Problem Solving Session

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

Lecture 1 - Lesson 1 - Introduction, Motivation

Lecture 2 - Lesson 2 - Part 1 - Mathematical Preliminaries, Polynomial Interpolation - 1

Lecture 3 - Lesson 2 - Part 2 - Mathematical Preliminaries, Polynomial Interpolation - 1

Lecture 4 - Lesson 3 - Part 1 - Polynomial Interpolation - 2

Lecture 5 - Lesson 3 - Part 2 - Polynomial Interpolation - 2

Lecture 6 - Lesson 4 - Polynomial Interpolation - 3

Lecture 7 - Lagrange Interpolation Polynomial, Error In Interpolation - 1

Lecture 8 - Lagrange Interpolation Polynomial, Error In Interpolation - 1

Lecture 9 - Error In Interpolation - 2

Lecture 10 - Error In Interpolation - 2

Lecture 11 - Divide Difference Interpolation Polynomial

Lecture 12 - Properties Of Divided Difference, Introduction To Inverse Interpolation

Lecture 13 - Properties Of Divided Difference, Introduction To Inverse Interpolation

Lecture 14 - Inverse Interpolation, Remarks on Polynomial Interpolation

Lecture 15 - Numerical Differentiation - 1 Taylor Series Method

Lecture 16 - Numerical Differentiation - 2 Method Of Undetermined Coefficients

Lecture 17 - Numerical Differentiation - 2 Polynomial Interpolation Method

Lecture 18 - Numerical Differentiation - 3 Operator Method Numerical Integration - 1

Lecture 19 - Numerical Integration - 2 Error in Trapezoidal Rule Simpson's Rule

Lecture 20 - Numerical Integration - 3 Error in Simpson's Rule Composite in Trapezoidal Rule, Error

Lecture 21 - Numerical Integration - 4 Composite Simpsons Rule , Error Method of Undetermined Coefficients

Lecture 22 - Numerical Integration - 5 Gaussian Quadrature (Two-Point Method)

Lecture 23 - Numerical Integrature - 5 Gaussian Quadrature (Three-Point Method) Adaptive Quadrature

Lecture 24 - Numerical Solution of Ordinary Differential Equation (ODE) - 1

Lecture 25 - Numerical Solution Of ODE-2 Stability , Single-Step Methods - 1 Taylor Series Method

Lecture 26 - Numerical Solution Of ODE-3 Examples of Taylor Series Method Euler's Method

Lecture 27 - Numerical Solution Of ODE-4 Runge-Kutta Methods

Lecture 28 - Numerical Solution Of ODE-5 Example For RK-Method Of Order 2 Modified Euler's Method

Lecture 29 - Numerical Solution Of Ordinary Differential Equations - 6 Predictor-Corrector Methods (Adam-Moulton)

Lecture 30 - Numerical Solution Of Ordinary Differential Equations - 7

Lecture 31 - Numerical Solution Of Ordinary Differential Equations - 8

Lecture 32 - Numerical Solution of Ordinary Differential Equations - 9

Lecture 33 - Numerical Solution of Ordinary Differential Equations - 10

Lecture 34 - Numerical Solution of Ordinary Differential Equations - 11

Lecture 35 - Root Finding Methods - 1 The Bisection Method - 1

Lecture 36 - Root Finding Methods - 2 The Bisection Method - 2

Lecture 37 - Root Finding Methods - 3 Newton-Raphson Method - 1

Lecture 38 - Root Finding Methods - 4 Newton-Raphson Method - 2

Lecture 39 - Root Finding Methods - 5 Secant Method, Method Of false Position

Lecture 40 - Root Finding Methods - 6 Fixed Point Methods - 1

Lecture 41 - Root Finding Methods - 7 Fixed Point Methods - 2

Lecture 42 - Root Finding Methods - 8 Fixed Point Iteration Methods - 3

Lecture 43 - Root Finding Methods - 9 Practice Problems

Lecture 44 - Solution Of Linear Systems Of Equations - 1

Lecture 45 - Solution Of Linear Systems Of Equations - 2

Lecture 46 - Solution Of Linear Systems Of Equations - 3

Lecture 47 - Solution Of Linear Systems Of Equations - 4

Lecture 48 - Solution Of Linear Systems Of Equations - 5

Lecture 49 - Solution Of Linear Systems Of Equations - 6

Lecture 50 - Solution Of Linear Systems Of Equations - 7

Lecture 51 - Solution Of Linear Systems Of Equations - 8 Iterative Method - 1

Lecture 52 - Solution Of Linear Systems Of Equations - 8 Iterative Method - 2

Lecture 53 - Matrix Eigenvalue Problems - 2 Power Method - 2

Lecture 54 - Practice Problems

NPTEL : NOC:Graph Theory (Mathematics)

Co-ordinators : Dr. Soumen Maity

NPTEL : NOC:Transform Techniques for Engineers (Mathematics)

Co-ordinators : Prof. Srinivasa Manam

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 65 - Problem solving

Lecture 66 - Free Modules (finitely generated)

Lecture 67 - Determinants

Lecture 68 - Primary Decomposition

Lecture 69 - Problem solving

Lecture 70 - Finitely generated modules and the Noetherian condition

Lecture 71 - Counterexamples to the Noetherian condition

Lecture 72 - Generators and relations for Finitely Generated Modules

Lecture 73 - General Linear Group over a Commutative Ring

Lecture 74 - Equivalence of Matrices

Lecture 75 - Smith Canonical Form for a Euclidean domain

Lecture 76 - solved_problems1

Lecture 77 - Smith Canonical Form for PID

Lecture 78 - Structure of finitely generated modules over a PID

Lecture 79 - Structure of a finitely generated abelian group

Lecture 80 - Similarity of Matrices

Lecture 81 - Deciding Similarity

Lecture 82 - Rational Canonical Form

Lecture 83 - Jordan Canonical Form

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 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

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 32 - A descriptive language for convergence

Lecture 33 - Limit laws

Lecture 34 - Subsequences

Lecture 35 - Examples of convergent and divergent sequences

Lecture 36 - Some special sequences-CORRECT

Lecture 37 - Monotone sequences

Lecture 38 - Bolzano-Weierstrass theorem

Lecture 39 - The Cauchy Criterion

Lecture 40 - MCT implies completeness

Lecture 41 - Definition and examples of infinite series

Lecture 42 - Cauchy tests-Corrected

Lecture 43 - Tests for convergence

Lecture 44 - Erdos_s proof on divergence of reciprocals of primes

Lecture 45 - Resolving Zeno_s paradox

Lecture 46 - Absolute and conditional convergence

Lecture 47 - Absolute convergence continued

Lecture 48 - The number e

Lecture 49 - Grouping terms of an infinite series

Lecture 50 - The Cauchy product

Lecture 51 - WEEK 5 - INTRODUCTION

Lecture 52 - The role of topology in real analysis

Lecture 53 - Open and closed sets

Lecture 54 - Basic properties of adherent and limit points

Lecture 55 - Basic properties of open and closed sets

Lecture 56 - Definition of continuity

Lecture 57 - Deep dive into epsilon-delta

Lecture 58 - Negating continuity

Lecture 59 - The functions x and x2

Lecture 60 - Limit laws

Lecture 61 - Limit of sin x_x

Lecture 62 - Relationship between limits and continuity

Lecture 63 - Global continuity and open sets

Lecture 64 - Continuity of square root

Lecture 98 - Linearity of integral

Lecture 99 - Sets of measure zero

Lecture 100 - The Riemann-Lebesgue theorem

Lecture 101 - Consequences of the Riemann-Lebesgue theorem

Lecture 102 - WEEK 10 and 11 - INTRODUCTION

Lecture 103 - The fundamental theorem of calculus

Lecture 104 - Taylor's theorem-Integral form of remainder

Lecture 105 - Notation for Taylor polynomials

Lecture 106 - Smooth functions and Taylor series

Lecture 107 - Power series

Lecture 108 - Definition of uniform convergence

Lecture 109 - The exponential function

Lecture 110 - The inverse function theorem

Lecture 111 - The Logarithm

Lecture 112 - Trigonometric functions

Lecture 113 - The number Pi

Lecture 114 - The graphs of sin and cos

Lecture 115 - The Basel problem

Lecture 116 - Improper integrals

Lecture 117 - The Integral test

Lecture 118 - Weierstrass approximation theorem

Lecture 119 - Bernstein Polynomials

Lecture 120 - Properties of Bernstein polynomials

Lecture 121 - Proof of Weierstrass approximation theorem

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

Co-ordinators : Prof. Sarthok Sircar

Lecture 1 - Introduction / Euler Lagrange Equations - Part 1

Lecture 2 - Introduction / Euler Lagrange Equations - Part 2

Lecture 3 - Introduction / Euler Lagrange Equations - Part 3

Lecture 4 - Introduction / Euler Lagrange Equations - Part 4

Lecture 5 - Introduction / Euler Lagrange Equations - Part 5

Lecture 6 - Introduction / Euler Lagrange Equations - Part 6

Lecture 7 - Special cases / Invariance, Existence and Uniqueness of solutions - Part 1

Lecture 8 - Special cases / Invariance, Existence and Uniqueness of solutions - Part 2

Lecture 9 - Special cases / Invariance, Existence and Uniqueness of solutions - Part 3

Lecture 10 - Special cases / Invariance, Existence and Uniqueness of solutions - Part 4

Lecture 11 - Special cases / Invariance, Existence and Uniqueness of solutions - Part 5

Lecture 12 - Special cases / Invariance, Existence and Uniqueness of solutions - Part 6

Lecture 13 - Generalization / Numerical solution of Euler Lagrange Equations - Part 1

Lecture 14 - Generalization / Numerical solution of Euler Lagrange Equations - Part 2

Lecture 15 - Generalization / Numerical solution of Euler Lagrange Equations - Part 3

Lecture 16 - Generalization / Numerical solution of Euler Lagrange Equations - Part 4

Lecture 17 - Generalization / Numerical solution of Euler Lagrange Equations - Part 5

Lecture 18 - Generalization / Numerical solution of Euler Lagrange Equations - Part 6

Lecture 19 - Isoperimetric Problems - Part 1

Lecture 20 - Isoperimetric Problems - Part 2

Lecture 21 - Isoperimetric Problems - Part 3

Lecture 22 - Isoperimetric Problems - Part 4

Lecture 23 - Isoperimetric Problems - Part 5

Lecture 24 - Isoperimetric Problems - Part 6

Lecture 25 - Problems with Holononomic and non- Holononomic Constraints, Variable Endpts - Part 1

Lecture 26 - Problems with Holononomic and non- Holononomic Constraints, Variable Endpts - Part 2

Lecture 27 - Problems with Holononomic and non- Holononomic Constraints, Variable Endpts - Part 3

Lecture 28 - Problems with Holononomic and non- Holononomic Constraints, Variable Endpts - Part 4

Lecture 29 - Problems with Holononomic and non- Holononomic Constraints, Variable Endpts - Part 5

Lecture 30 - Problems with Holononomic and non- Holononomic Constraints, Variable Endpts - Part 6

Lecture 31 - Broken extremals / Hamiltonian Formulation - Part 1

NPTEL : NOC:Introduction to Galois Theory (Mathematics)

Co-ordinators : Prof. Krishna Hanumanthu

Lecture 32 - Kummer extensions - Part 1

Lecture 33 - Kummer extensions - Part 2

Lecture 34 - Kummer extensions - Part 3

Lecture 35 - Cyclotomic extensions - Part 1

Lecture 36 - Cyclotomic extensions - Part 2

Lecture 37 - Solvability by radicals

Lecture 38 - Characterizations of solvability - Part 1

Lecture 39 - Characterizations of solvability - Part 2

Lecture 40 - Discriminants, Galois groups of polynomials

Lecture 41 - Quartics are solvable

Lecture 42 - Solvable groups - Part 1

Lecture 43 - Solvable groups - Part 2

Lecture 44 - Solvable groups - Part 3

Lecture 45 - Insolvability of quintics

Lecture 46 - Problem Session - Part 10

Lecture 47 - Problem Session - Part 11

Lecture 48 - Problem Session - Part 12

Lecture 49 - Problem Session - Part 13

NPTEL : NOC:Basic Calculus 1 (Mathematics)

Co-ordinators : Prof. Arindama Singh

Lecture 65 - The washer method - Part 1

Lecture 66 - The washer method - Part 2

Lecture 67 - Volumes by cylindrical shells - Part 1

Lecture 68 - Volumes by cylindrical shells - Part 2

Lecture 69 - Lengths oc curves - Part 1

Lecture 70 - Lengths oc curves - Part 2

Lecture 71 - Areas of surface of revolution - Part 1

Lecture 72 - Areas of surface of revolution - Part 2

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 65 - Bimodules

Lecture 66 - Tensor products of bimodules

Lecture 67 - Tensor products of modules over commutative rings

Lecture 68 - Extension of scalars

Lecture 69 - Problem session - tensor products of vector spaces

Lecture 70 - Some Properties of the tensor product

Lecture 71 - F-algebras

Lecture 72 - Composition Series

Lecture 73 - Schreierâ€™s Theorem

Lecture 74 - Ascending and Descending Chain Conditions

Lecture 75 - Existence of Jordan-Holder Series

Lecture 76 - The Jordan-Holder Theorem

Lecture 77 - Examples related to the Jordan-Holder Theorem

Lecture 78 - The Jordan-Holder Theorem for Groups

Lecture 79 - Indecomposable Modules

Lecture 80 - Direct Sum Decompositions

Lecture 81 - Decomposition as a sum of Indecomposables

Lecture 82 - The Endomorphism Ring of an Indecomposable Module

Lecture 83 - Krull-Schmidt Theorem

Lecture 84 - Krull-Schmidt Examples

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

Co-ordinators : Prof. Auditya Sharma

Lecture 1 - Introduction to complex numbers

Lecture 2 - The triangle inequality

Lecture 3 - The de Moivre formula

Lecture 4 - Roots of unity

Lecture 5 - Functions of a complex variable and the notion of continuity

Lecture 6 - Derivative of a complex function

Lecture 7 - Differentiation rules for a complex function

Lecture 8 - Cauchy-Riemann Equations

Lecture 9 - Sufficient conditions for differentiability

Lecture 10 - Cauchy-Riemann conditions in polar coordinates

Lecture 11 - More persepective on differentiability

Lecture 12 - The value of the derivative

Lecture 13 - Analytic functions

Lecture 14 - Harmonic functions

Lecture 15 - The exponential function

Lecture 16 - Complex logarithm

Lecture 17 - Complex exponents

Lecture 18 - Trigonometric functions of complex variables

Lecture 19 - Hyperbolic functions of complex variables

Lecture 20 - Inverse Trigonometric and Hyperbolic functions

Lecture 21 - Branch of a multivalued function

Lecture 22 - Contour Integrals

Lecture 23 - Green's Theorem

Lecture 24 - Path dependence of the contour intergal

Lecture 25 - Antiderivatives

Lecture 26 - The Cauchy theorem

Lecture 27 - Crossing contours and multiply connected domains

Lecture 28 - Cauchy Integral formula

Lecture 29 - Derivatives of an analytic function

Lecture 30 - Liouville's theorem and the Fundamental theorem of algebra

Lecture 31 - Taylor Series

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 1 - Metric Spaces

Lecture 2 - Examples of metric spaces

Lecture 3 - Loads of definitions

Lecture 4 - Normed vector spaces

Lecture 5 - Examples of normed vector spaces

Lecture 6 - Basic properties open closed sets metric

Lecture 7 - Continuity in metric spaces

Lecture 8 - Equivalent metrics and product spaces

Lecture 9 - Completeness

Lecture 10 - Completeness (Continued...)

Lecture 11 - Completeness of B(x,y)

Lecture 12 - Completion

Lecture 13 - Compactness

Lecture 14 - The Bolzano-Weierstrass Property

Lecture 15 - Open covers and Compactness

Lecture 16 - The Heine-Borel Theorem for Metric Spaces

Lecture 17 - Connectedness

Lecture 18 - Path-Connectedness

Lecture 19 - Connected Components

Lecture 20 - The Arzela-Ascolli theorem

Lecture 21 - Upper and lower limits

Lecture 22 - The Stone-Weierstrass theorem

Lecture 23 - All norms are equivalent

Lecture 24 - Vector-valued functions

Lecture 25 - Scalar-valued functions of a vector variable

Lecture 26 - Directional derivatives and the gradient

Lecture 27 - Interpretation and properties of the gradient

Lecture 28 - Higher-order partial derivatives

Lecture 29 - The derivative as a linear map

Lecture 30 - Examples of differentiation

Lecture 31 - Properties of the derivative map

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 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

Lecture 1 - Introduction to Topology

Lecture 2 - Basic Set theory

Lecture 3 - Mathematical Logic - Part 1

Lecture 4 - Mathematical Logic - Part 2

Lecture 5 - Functions

Lecture 6 - Finite Sets - Part 1

Lecture 7 - Finite Sets - Part 2

Lecture 8 - Infinite Sets

Lecture 9 - Infinite Sets and Axiom of Choice

Lecture 10 - Definition of aTopology

Lecture 11 - Examples of different topologies

Lecture 12 - Basis for a topology

Lecture 13 - Various topologies on the real line

Lecture 14 - Comparison of topologies - Part 1: Finer and coarser topologies

Lecture 15 - Comparison of topologies - Part 2: Comparing the various topologies on R

Lecture 16 - Basis and Sub-basis for a topology

Lecture 17 - Various topologies: the subspace topology

Lecture 18 - The Product topology

Lecture 19 - Topologies on arbitrary Cartesian products

Lecture 20 - Metric topology - Part 1

Lecture 21 - Metric topology - Part 2

Lecture 22 - Metric topology - Part 3

Lecture 23 - Closed Sets

Lecture 24 - Closure and Limit points

Lecture 25 - Continuous functions

Lecture 26 - Construction of continuous functions

Lecture 27 - Continuous functions on metric spaces - Part 1

Lecture 28 - Continuous functions on metric spaces - Part 2

Lecture 29 - Connectedness

Lecture 30 - Some conditions for Connectedness

Lecture 31 - Connectedness of the Real Line

NPTEL : NOC:Operator Theory (Mathematics)

Co-ordinators : Prof. G. Ramesh

Lecture 32 - Decomposition of spectrum

Lecture 33 - Computing spectrum: Examples

Lecture 34 - Approximate spectrum

Lecture 35 - Approximate spectrum: Properties

Lecture 36 - Numerical bounds

Lecture 37 - Compact Operators

Lecture 38 - Compact Operators; Properties

Lecture 39 - Spectral Theorem: Compact Self-Adjoint Operators

Lecture 40 - Spectral Theorem: Consequences

Lecture 41 - Compact Normal Operators

Lecture 42 - Compact Operators Singular value Decomposition

Lecture 43 - Fredholm Alternative Theorem

Lecture 44 - Orthogonal decomposition of self-adjoint operators

Lecture 45 - Spectral family; Properties - I

Lecture 46 - Spectral family; Properties - II

Lecture 47 - Spectral theorem Self adjoint Operators

Lecture 48 - Spectral theorem Examples

Lecture 49 - Spectral theorem: Consequences

Lecture 50 - Continuous functional Calculus

Lecture 51 - Spectral mapping theorem

NPTEL : NOC:Measure and Integration (Mathematics)

Co-ordinators : Prof. S. Kesavan

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

Co-ordinators : Prof. Balasubramaniam Jayaram

Lecture 32 - Fuzzy Relational Inference - MISO Case

Lecture 33 - Fuzzy Relational Inference - Multiple Rules

Lecture 34 - Fuzzy Inferencing Schemes - A Visual Illustration

Lecture 35 - Similarity Based Reasoning

Lecture 36 - SBR : Mamdani Fuzzy Systems

Lecture 37 - Introduction to Building a Mamdani FIS

Lecture 38 - Contrast Enhancement in Images: An FIS Approach

Lecture 39 - Takagi-Sugeno-Kang Fuzzy Systems

Lecture 40 - Fuzzy Inference Systems - Interpolativity

Lecture 41 - Interpolativity of FRI - Single SISO Rule

Lecture 42 - Fuzzy Relational Equations

Lecture 43 - Interpolativity of FRI - Multiple SISO Rules

Lecture 44 - Similarity Based Reasoning- Interpolativity

Lecture 45 - FRI~SBR : FITA~FATI : Some Connections

Lecture 46 - Continuous Models of FRI

Lecture 47 - Continuous Models of CRI and BKS

Lecture 48 - Continuous Models of SBR

Lecture 49 - Extensionality of a Fuzzy Set

Lecture 50 - Robustness of CRI

Lecture 51 - Robustness of BKS

Lecture 52 - Robustness of SBR

Lecture 53 - Monotonicity of an FIS

Lecture 54 - Monotonicity of an FRI

Lecture 55 - Monotonicity of an SBR

Lecture 56 - Functional (In)Equalities involving FLCs

Lecture 57 - Suitability of BKS with Yager's Implications

Lecture 58 - Law of Importation and Hierarchical CRI

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

Co-ordinators : Prof. Siva Athreya

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

NPTEL : NOC:Introduction to Algebraic Geometry (Mathematics)

Co-ordinators : Prof. Arijit Dey

Lecture 32 - Ring of Germs of Regular Functions at a point, Field of Rational Functions

Lecture 33 - Tutorial 5 : Sheafification

Lecture 34 - Ring of Regular Functions, Local Ring at a Point,and Field of Rational Functions of an AffineVariety

Lecture 35 - Equivalence of Categories of the Category of Affine Varieties over a Field k and the Category

Lecture 36 - Equivalence of Categories of the Category of Affine Varieties over a Field k (Continued...)

Lecture 37 - Some Examples, Open Immersions and Closed Immersions

Lecture 38 - Product of Quasi-affine Varieties

Lecture 39 - Diagonal Morphisms, Abstract Varieties

Lecture 40 - Tutorial 6 : Normal Varieties and Normalization of a Variety

Lecture 41 - Projective Varieties Revisited - Part 1

Lecture 42 - Projective Varieties Revisited - Part 2

Lecture 43 - Global Regular Functions on ProjectiveVarieties are Constants - Part 1

Lecture 44 - Global Regular Functions on ProjectiveVarieties are Constants - Part 2

Lecture 45 - Product of Prevarieties - Part 1

Lecture 46 - Product of Prevarieties - Part 2

Lecture 47 - Tutorial 7 : A Result on Tensor Products of k-algebras

Lecture 48 - Morphisms of Prevarieties - Part 1

Lecture 49 - Morphisms of Prevarieties - Part 2

Lecture 50 - Finite Morphisms - Part 1

Lecture 51 - Finite Morphisms - Part 2

Lecture 52 - Fiber Products

Lecture 53 - Tutorial 8 : Finite Morphisms

Lecture 54 - Immersions

Lecture 55 - Fiber Products, Separatedness

Lecture 56 - Criterion of Separatedness

Lecture 57 - Proper Morphisms and Complete Varieties

Lecture 58 - Tutorial 9 : Closed Immersions and Graph of a Morphism

Lecture 59 - Projective Varieties are Complete

Lecture 60 - Zariski Tangent Space, Singular and Nonsingular Points

Lecture 61 - Smooth Points Form a Non-empty Open Subset

Lecture 62 - Blow-Ups, Rational Maps and Birational Maps

Lecture 63 - Tutorial 10 : Zariski Tangent Space at a Point of an Affine Variety

Lecture 64 - Blow-Ups (Continued...)

NPTEL : NOC:Introduction to Statistics (Mathematics)

Co-ordinators : Prof. Sameen Naqvi

NPTEL : NOC:Probability Theory for Data Science (Mathematics)

Co-ordinators : Prof. Ishapathik Das

Lecture 32 - Properties of the Joint Cumulative Distribution Function of a Bivariate Random Variable

Lecture 33 - Independence Between Two Random Variables

Lecture 34 - Examples of Joint Cumulative Distribution Functions, Marginals, and Independence

Lecture 35 - Joint Probability Mass Function, Marginal Probability Mass Function, Examples

Lecture 36 - Numerical Examples on Bivariate Discrete Random Variables and the Concept of Joint Probability

Lecture 37 - Marginal Probability Density Function, Independence, and Examples

Lecture 38 - Numerical Examples on Probability Density Function

Lecture 39 - Conditional Probability Mass Function

Lecture 40 - Conditional Probability Density Function

Lecture 41 - Moments for Bivariate Random Variables

Lecture 42 - Association Between Two Random Variables

Lecture 43 - Numerical Examples on Moments for Bivariate Random Variables

Lecture 44 - Conditional Mean and Variance for Discrete Random Variables

Lecture 45 - Conditional Mean and Variance for Continuous Random Variables

Lecture 46 - Numerical Examples on Conditional Mean and Variance

Lecture 47 - Multivariate Random Variables

Lecture 48 - Multivariate Probability Density Function and Independence

Lecture 49 - Moments of a Multivariate Random Variable

Lecture 50 - Numerical Examples on Joint Probability Mass Functions

Lecture 51 - Numerical Examples on Joint Probability Density Functions

Lecture 52 - Multinomial Distribution and Multivariate Normal Distribution

Lecture 53 - Transformation of Random Variables

Lecture 54 - Theorem on Transformation of Random Variables

Lecture 55 - Transformation of Multivariate Random Variables

Lecture 56 - Examples of Transformation of Bivariate Random Variables

Lecture 57 - Convolution and Example on Transformation of n-variate Random Variables

Lecture 58 - Transformation of Discrete Random Variables

Lecture 59 - Moment Generating Functions

Lecture 60 - Example of Moment Generating Functions

Lecture 61 - Moment Generating Functions for the Transformation of Random Variables

Lecture 62 - Chebyshev's Inequality

Lecture 63 - Notions of Convergence, Law of Large Numbers, and the Central Limit Theorem

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

Lecture 1 - Introduction to linear differential equations

Lecture 2 - Linear dependence, independence and Wronskian of functions

Lecture 3 - Solution of second-order homogenous linear differential equations with constant coefficients - I

Lecture 4 - Solution of second-order homogenous linear differential equations with constant coefficients - II

Lecture 5 - Method of undetermined coefficients

Lecture 6 - Methods for finding Particular Integral for second-order linear differential equations with constant coefficients - I

Lecture 7 - Methods for finding Particular Integral for second-order linear differential equations with constant coefficients - II

Lecture 8 - Methods for finding Particular Integral for second-order linear differential equations with constant coefficients - III

Lecture 9 - Euler-Cauchy equations

Lecture 10 - Method of reduction for second-order linear differential equations

Lecture 11 - Method of variation of parameters

Lecture 12 - Solution of second order differential equations by changing dependent variable

Lecture 13 - Solution of second order differential equations by changing independent variable

Lecture 14 - Solution of higher-order homogenous linear differential equations with constant coefficients

Lecture 15 - Methods for finding Particular Integral for higher-order linear differential equations

Lecture 16 - Formulation of Partial differential equations

Lecture 17 - Solution of LagrangeÂ’s equation - I

Lecture 18 - Solution of LagrangeÂ’s equation - II

Lecture 19 - Solution of first order nonlinear equations - I

Lecture 20 - Solution of first order nonlinear equations - II

Lecture 21 - Solution of first order nonlinear equations - III

Lecture 22 - Solution of first order nonlinear equations - IV

Lecture 23 - Introduction to Laplace transforms

Lecture 24 - Laplace transforms of some standard functions

Lecture 25 - Existence theorem for Laplace transforms

Lecture 26 - Properties of Laplace transforms - I

Lecture 27 - Properties of Laplace transforms - II

Lecture 28 - Properties of Laplace transforms - III

Lecture 29 - Properties of Laplace transforms - IV

Lecture 30 - Convolution theorem for Laplace transforms - I

Lecture 31 - Convolution theorem for Laplace transforms - II

Lecture 32 - Initial and final value theorems for Laplace transforms

Lecture 33 - Laplace transforms of periodic functions

Lecture 34 - Laplace transforms of Heaviside unit step function

Lecture 35 - Laplace transforms of Dirac delta function

Lecture 36 - Applications of Laplace transforms - I

Lecture 37 - Applications of Laplace transforms - II

Lecture 38 - Applications of Laplace transforms - III

Lecture 39 - ZÂ–transform and inverse Z-transform of elementary functions

Lecture 40 - Properties of Z-transforms - I

Lecture 41 - Properties of Z-transforms - II

Lecture 42 - Initial and final value theorem for Z-transforms

Lecture 43 - Convolution theorem for Z-transforms

Lecture 44 - Applications of Z-transforms - I

Lecture 45 - Applications of Z-transforms - II

Lecture 46 - Applications of Z-transforms - III

Lecture 47 - Fourier series and its convergence - I

Lecture 48 - Fourier series and its convergence - II

Lecture 49 - Fourier series of even and odd functions

Lecture 50 - Fourier half-range series

Lecture 51 - ParsevelÂ’s Identity

Lecture 52 - Complex form of Fourier series

Lecture 53 - Fourier integrals

Lecture 54 - Fourier sine and cosine integrals

Lecture 55 - Fourier transforms

Lecture 56 - Fourier sine and cosine transforms

Lecture 57 - Convolution theorem for Fourier transforms

Lecture 58 - Applications of Fourier transforms to BVP - I

Lecture 59 - Applications of Fourier transforms to BVP - II

Lecture 60 - Applications of Fourier transforms to BVP - III

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

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

Lecture 1 - Definition and classification of linear integral equations

Lecture 2 - Conversion of IVP into integral equations

Lecture 3 - Conversion of BVP into an integral equations

Lecture 4 - Conversion of integral equations into differential equations

Lecture 5 - Integro-differential equations

Lecture 6 - Fredholm integral equation with separable kernel: Theory

Lecture 7 - Fredholm integral equation with separable kernel: Examples

Lecture 8 - Solution of integral equations by successive substitutions

Lecture 9 - Solution of integral equations by successive approximations

Lecture 10 - Solution of integral equations by successive approximations: Resolvent kernel

Lecture 11 - Fredholm integral equations with symmetric kernels: Properties of eigenvalues and eigenfunctions

Lecture 12 - Fredholm integral equations with symmetric kernels: Hilbert Schmidt theory

Lecture 13 - Fredholm integral equations with symmetric kernels: Examples

Lecture 14 - Construction of Green function - I

Lecture 15 - Construction of Green function - II

Lecture 16 - Green function for self adjoint linear differential equations

Lecture 17 - Green function for non-homogeneous boundary value problem

Lecture 18 - Fredholm alternative theorem - I

Lecture 19 - Fredholm alternative theorem - II

Lecture 20 - Fredholm method of solutions

Lecture 21 - Classical Fredholm theory: Fredholm first theorem - I

Lecture 22 - Classical Fredholm theory: Fredholm first theorem - II

Lecture 23 - Classical Fredholm theory: Fredholm second theorem and third theorem

Lecture 24 - Method of successive approximations

Lecture 25 - Neumann series and resolvent kernels - I

Lecture 26 - Neumann series and resolvent kernels - II

Lecture 27 - Equations with convolution type kernels - I

Lecture 28 - Equations with convolution type kernels - II

Lecture 29 - Singular integral equations - I

Lecture 30 - Singular integral equations - II

Lecture 31 - Cauchy type integral equations - I

Lecture 32 - Cauchy type integral equations - II

Lecture 33 - Cauchy type integral equations - III

Lecture 34 - Cauchy type integral equations - IV

Lecture 35 - Cauchy type integral equations - V

Lecture 36 - Solution of integral equations using Fourier transform

Lecture 37 - Solution of integral equations using Hilbert transform - I

Lecture 38 - Solution of integral equations using Hilbert transform - II

Lecture 39 - Calculus of variations: Introduction

Lecture 40 - Calculus of variations: Basic concepts - I

Lecture 41 - Calculus of variations: Basic concepts - II

Lecture 42 - Calculus of variations: Basic concepts and Euler equation

Lecture 43 - Euler equation: Some particular cases

Lecture 44 - Euler equation : A particular case and Geodesics

Lecture 45 - Brachistochrone problem and Euler equation - I

Lecture 46 - Euler's equation - II

Lecture 47 - Functions of several independent variables

Lecture 48 - Variational problems in parametric form

Lecture 49 - Variational problems of general type

Lecture 50 - Variational derivative and invariance of Euler's equation

Lecture 51 - Invariance of Euler's equation and isoperimetric problem - I

Lecture 52 - Isoperimetric problem - II

Lecture 53 - Variational problem involving a conditional extremum - I

Lecture 54 - Variational problem involving a conditional extremum - II

Lecture 55 - Variational problems with moving boundaries - I

Lecture 56 - Variational problems with moving boundaries - II

Lecture 57 - Variational problems with moving boundaries - III

Lecture 58 - Variational problems with moving boundaries; One sided variation

Lecture 59 - Variational problem with a movable boundary for a functional dependent on two functions

Lecture 60 - Hamilton's principle: Variational principle of least action

NPTEL : NOC:Nonlinear Programming (Mathematics)

Co-ordinators : S. K. Gupta

NPTEL : NOC:Numerical Methods (Mathematics)

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

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 32 - Gradient (Identities), Divergence and Curl (Identities)

Lecture 33 - Some Identities on Divergence and Curl

Lecture 34 - Line Integral (I)

Lecture 35 - Applications of Line Integrals

Lecture 36 - Green's Theorem

Lecture 37 - Surface Area

Lecture 38 - Surface Integral

Lecture 39 - Divergence Theorem of Gauss

Lecture 40 - Stoke's Theorem

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

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

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

Lecture 1 - Introduction to Mathematical Modeling

Lecture 2 - Discrete Time Linear Models in Population Dynamics - I

Lecture 3 - Discrete Time Linear Models in Population Dynamics - II

Lecture 4 - Discrete Time Linear Age Structured Models

Lecture 5 - Numerical Methods to Compute Eigen Values

Lecture 6 - Discrete Time Non-Linear Models in Population Dynamics - II

Lecture 7 - Analysis on Logistic Difference Equation

Lecture 8 - Classifications of Bifurcation

Lecture 9 - Discrete Time Non - Linear Models in Population Dynamics - II

Lecture 10 - Discrete Time Prey - Predator Model

Lecture 11 - Introduction to Continuous Time Models

Lecture 12 - Solution of First Order First Degree Differential Equations

Lecture 13 - Continuous Time Models in Population Dynamics - I

Lecture 14 - Continuous Time Models in Population Dynamics - II

Lecture 15 - Stability and Linearization of System of Ordinary Differential Equations

Lecture 16 - Continuous Time Single Species Models

Lecture 17 - Qualitative Solution of Differential Equations - Phase Diagrams - I

Lecture 18 - Qualitative Solution of Differential Equations - Phase Diagrams - II

Lecture 19 - Continuous Time Lotka - Volterra Competition Model

Lecture 20 - Continuous Time Prey - Predator Model

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

NPTEL : NOC:EXCELing with Mathematical Modeling (Mathematics)

Co-ordinators : Prof. Sandip Banerjee

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

Co-ordinators : Prof. Vittal Rao

NPTEL : Ordinary Differential Equations and Applications (Mathematics)

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

Lecture 1 - General Introduction

Lecture 2 - Examples

Lecture 3 - Examples (Continued - I)

Lecture 4 - Examples (Continued - II)

Lecture 5 - Linear Algebra

Lecture 6 - Linear Algebra (Continued - I)

Lecture 7 - Linear Algebra (Continued - II)

Lecture 8 - Analysis

Lecture 9 - Analysis (Continued...)

Lecture 10 - First Order Linear Equations

Lecture 11 - Exact Equations

Lecture 12 - Second Order Linear Equations

Lecture 13 - Second Order Linear Equations (Continued - I)

Lecture 14 - Second Order Linear Equations (Continued - II)

Lecture 15 - Well-posedness and Examples of IVP

Lecture 16 - Gronwall's Lemma

Lecture 17 - Basic Lemma and Uniqueness Theorem

Lecture 18 - Picard's Existence and Uniqueness Theorem

Lecture 19 - Picard's Existence and Uniqueness (Continued...)

Lecture 20 - Cauchy Peano Existence Theorem

Lecture 21 - Existence using Fixed Point Theorem

Lecture 22 - Continuation of Solutions

Lecture 23 - Series Solution

Lecture 24 - General System and Diagonalizability

Lecture 25 - 2 by 2 systems and Phase Plane Analysis

Lecture 26 - 2 by 2 systems and Phase Plane Analysis (Continued...)

Lecture 27 - General Systems

Lecture 28 - General Systems (Continued...) and Non-homogeneous Systems

Lecture 29 - Basic Definitions and Examples

Lecture 30 - Stability Equilibrium Points

Lecture 31 - Stability Equilibrium Points (Continued - I)

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

Lecture 5 - Examples of subspaces

Lecture 6 - Examples of subspaces (Continued...)

Lecture 7 - Sum of subspaces

Lecture 8 - System of linear equations

Lecture 9 - Gauss elimination

Lecture 10 - Generating system, linear independence and bases

Lecture 11 - Examples of a basis of a vector space

Lecture 12 - Review of univariate polynomials

Lecture 13 - Examples of univariate polynomials and rational functions

Lecture 14 - More examples of a basis of vector spaces

Lecture 15 - Vector spaces with finite generating system

Lecture 16 - Steinitzs exchange theorem and examples

Lecture 17 - Examples of finite dimensional vector spaces

Lecture 18 - Dimension formula and its examples

Lecture 19 - Existence of a basis

Lecture 20 - Existence of a basis (Continued...)

Lecture 21 - Existence of a basis (Continued...)

Lecture 22 - Introduction to Linear Maps

Lecture 23 - Examples of Linear Maps

Lecture 24 - Linear Maps and Bases

Lecture 25 - Pigeonhole principle in Linear Algebra

Lecture 26 - Interpolation and the rank theorem

Lecture 27 - Examples

Lecture 28 - Direct sums of vector spaces

Lecture 29 - Projections

Lecture 30 - Direct sum decomposition of a vector space

Lecture 31 - Dimension equality and examples

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

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

Co-ordinators : Prof. Harish Seshadri

Lecture 32 - Lie groups - 2

Lecture 33 - Integral curve and flows - 1

Lecture 34 - Integral curve and flows - 2

Lecture 35 - Integral curve and flows - 3

Lecture 36 - Complete vector fields

Lecture 37 - Vector fields and smooth maps

Lecture 38 - Lie Brackets - 1

Lecture 39 - Lie brackets - 2

Lecture 40 - Lie brackets - 3

Lecture 41 - Lie algebras of matrix groups - 1

Lecture 42 - Lie algebras of matrix groups - 2

Lecture 43 - Exponential map

Lecture 44 - Frobenius theorems

Lecture 45 - Tensors and differential forms - 1

Lecture 46 - Tensors and differential forms - 2

Lecture 47 - Pull-back form

Lecture 48 - Symmetric Tensors

Lecture 49 - Alternating Tensors - 1

Lecture 50 - Alternating Tensors - 2

Lecture 51 - Alternating Tensors - 3

Lecture 52 - Alternating Tensors - 4

Lecture 53 - Alternating Tensors - 5

Lecture 54 - Alternating Tensors - 6

Lecture 55 - Alternating Tensors - 7

Lecture 56 - Alternating Tensors - 8

Lecture 57 - Alternating Tensors - 9

Lecture 58 - Differential forms on manifolds - 1

Lecture 59 - Differential forms on manifolds - 2

Lecture 60 - The Exterior derivative - 1

Lecture 61 - The Exterior derivative - 2

Lecture 62 - The Exterior derivative - 3

Lecture 63 - The Exterior derivative - 4

Lecture 64 - The Exterior derivative - 5

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

Co-ordinators : Prof. E. K. Narayanan

Lecture 32 - Lebesgue set which is not Borel

Lecture 33 - L^p spaces

Lecture 34 - L^p norm

Lecture 35 - Completeness of L^p

Lecture 36 - Properties of L^p spaces

Lecture 37 - Examples of L^p spaces

Lecture 38 - Product sigma algebra

Lecture 39 - Product measures - I

Lecture 40 - Product measures - II

Lecture 41 - Fubini's theorem - I

Lecture 42 - Fubini's theorem - II

Lecture 43 - Completeness of product measures

Lecture 44 - Polar coordinates

Lecture 45 - Applications of Fubini's theorem

Lecture 46 - Complex measures - I

Lecture 47 - Complex measures - II

Lecture 48 - Absolutely continuous measures

Lecture 49 - L^2 space

Lecture 50 - Continuous linear functionals

Lecture 51 - Radon-Nikodym theorem - I

Lecture 52 - Radon Nikodym theorem - II

Lecture 53 - Consequences of Radon-Nikodym theorem - I

Lecture 54 - Consequences of Radon-Nikodym theorem - II

Lecture 55 - Continuous linear functionals on L^p spaces - I

Lecture 56 - Continuous linear functionals on L^p spaces - II

Lecture 57 - Riesz representation theorem - I

Lecture 58 - Riesz representation theorem - II

Lecture 59 - Hardy-Littlewood maximal function

Lecture 60 - Lebesgue differentiation theorem

Lecture 61 - Absolutely continuous functions - I

Lecture 62 - Absolutely continuous functions - II

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

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

Lecture 32 - Solving characteristic polynomials, eigenvectors properties

Lecture 33 - Similarity

Lecture 34 - Diagonalization

Lecture 35 - Relationship between eigenvalues of BA and AB

Lecture 36 - Eigenvector and principle of biorthogonality

Lecture 37 - Unitary matrices

Lecture 38 - Properties of unitary matrices

Lecture 39 - Unitary equivalence

Lecture 40 - Schur's triangularization theorem

Lecture 41 - Cayley-Hamilton theorem

Lecture 42 - Uses of cayley-hamilton theorem and diagonalizability revisited

Lecture 43 - Normal matrices: Definition and fundamental properties

Lecture 44 - Fundamental properties of normal matrices

Lecture 45 - QR decomposition and canonical forms

Lecture 46 - Jordan canonical form

Lecture 47 - Determining the Jordan form of a matrix

Lecture 48 - Properties of the Jordan canonical form - Part 1

Lecture 49 - Properties of the Jordan canonical form - Part 2

Lecture 50 - Properties of convergent matrices

Lecture 51 - Polynomials and matrices

Lecture 52 - Other canonical forms and factorization of matrices: Gaussian elimination and LU factorization

Lecture 53 - LU decomposition

Lecture 54 - LU decomposition with pivoting

Lecture 55 - Solving pivoted system and LDM decomposition

Lecture 56 - Cholesky decomposition and uses

Lecture 57 - Hermitian and symmetric matrix

Lecture 58 - Properties of hermitian matrices

Lecture 59 - Variational characterization of Eigenvalues: Rayleigh-Ritz theorem

Lecture 60 - Variational characterization of eigenvalues (Continued...)

Lecture 61 - Courant-Fischer theorem

Lecture 62 - Summary of Rayliegh-Ritz and Courant-Fischer theorems

Lecture 63 - Weyl's theorem

Lecture 64 - Positive semi-definite matrix, monotonicity theorem and interlacing theorems

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

Co-ordinators : Prof. E K Narayanan

Lecture 32 - Equivalence of various forms of spectral theorems - II

Lecture 33 - Spectrum of a self-adjoint operator - I

Lecture 34 - Spectrum of a self-adjoint operator - II

Lecture 35 - Commuting family of self-adjoint operators

Lecture 36 - Continuous functional calculus for commuting family of self-adjoint operators - I

Lecture 37 - Continuous functional calculus for commuting family of self-adjoint operators - II

Lecture 38 - Fugledeâ€™s theorem

Lecture 39 - Spectral theorem for commuting finite family of normal operators

Lecture 40 - Multiplicity theory

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

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

Lecture 32 - A more general extension result

Lecture 33 - Notion of the trace

Lecture 34 - A compactness theorem

Lecture 35 - Equivalent norms

Lecture 36 - Sobolev lemma

Lecture 37 - Sobolev lemma (Continued...)

Lecture 38 - Analysis near the boundary

Lecture 39 - Trace in the upper half space

Lecture 40 - Trace in the upper half space

Lecture 41 - Supplementary lecture

Lecture 42 - Supplementary lecture

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

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

NPTEL : NOC:Introduction to Group Theory (Mathematics)

Co-ordinators : Prof. R. Venkatesh

NPTEL : NOC:Introduction to Lie Algebras (Mathematics)

Co-ordinators : Prof. R. Venkatesh

Lecture 1 - An Introduction to Lie Algebras

Lecture 2 - Lie subalgebra and Homomorphism

Lecture 3 - Some Problems

Lecture 4 - Ideals and Quotient algebras

Lecture 5 - Isomorphism theorems

Lecture 6 - Correspondence between ideals

Lecture 7 - Low dimensional Lie algebra - 1

Lecture 8 - Low dimensional Lie algebra - 2

Lecture 9 - Some more definitions

Lecture 10 - Solvable and nilpotent Lie algebra

Lecture 11 - Nilpotent Lie algebra

Lecture 12 - The invariance Lemma

Lecture 13 - Engel's and Lie's Theorem

Lecture 14 - Engel's and Lie's Theorem (Continued...)

Lecture 15 - Lie's Theorem

Lecture 16 - Basics of Representation Theory

Lecture 17 - Basics of Representation Theory (Continued...)

Lecture 18 - Schur's lemma

Lecture 19 - Finite dimensional representations of of sl2(C)

Lecture 20 - Classification of finite dimensional representations of sl2(C)

Lecture 21 - Complete reducibility of finite dimensional representation of sl2(C) - Part 1

Lecture 22 - Complete reducibility of finite dimensional representation of sl2(C) - Part 2

Lecture 23 - Applications of Lie's and Engel's theorem

Lecture 24 - Applications of Weyl's Theorem for sl2(C)

Lecture 25 - New representations form given representations

Lecture 26 - Primary decomposition Theorem and Jordan-Chevalley decomposition

Lecture 27 - Cartan's criteria for solvability

Lecture 28 - Cartan's criteria for semisimplicity and its consequences

Lecture 29 - Abstract Jordan decomposition in semisimple Lie algebras

Lecture 30 - Casimir element of a representation of a semisimple Lie algebra

Lecture 31 - Weyl's Theorem of complete reducibility for semisimple Lie algebras

NPTEL : NOC:Representation Theory of General Linear Lie Algebra (Mathematics)

Co-ordinators : Prof. R. Venkatesh