

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Elementary Numerical Analysis

Subject Co-ordinator - Prof. Rekha P. Kulkarni

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction  
Lecture 2 - Polynomial Approximation  
Lecture 3 - Interpolating Polynomials  
Lecture 4 - Properties of Divided Difference  
Lecture 5 - Error in the Interpolating polynomial  
Lecture 6 - Cubic Hermite Interpolation  
Lecture 7 - Piecewise Polynomial Approximation  
Lecture 8 - Cubic Spline Interpolation  
Lecture 9 - Tutorial 1  
Lecture 10 - Numerical Integration  
Lecture 11 - Composite Numerical Integration  
Lecture 12 - Gauss 2-point Rule  
Lecture 13 - Gauss 2-point Rule  
Lecture 14 - Convergence of Gaussian Integration  
Lecture 15 - Tutorial 2  
Lecture 16 - Numerical Differentiation  
Lecture 17 - Gauss Elimination  
Lecture 18 - L U decomposition  
Lecture 19 - Cholesky decomposition  
Lecture 20 - Gauss Elimination with partial pivoting  
Lecture 21 - Vector and Matrix Norms  
Lecture 22 - Perturbed Linear Systems  
Lecture 23 - Ill-conditioned Linear System  
Lecture 24 - Tutorial 3  
Lecture 25 - Effect of Small Pivots  
Lecture 26 - Solution of Non-linear Equations  
Lecture 27 - Quadratic Convergence of Newton's Method  
Lecture 28 - Jacobi Method  
Lecture 29 - Gauss-Seidel Method

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- Lecture 30 - Tutorial 4
- Lecture 31 - Initial Value Problem
- Lecture 32 - Multi-step Methods
- Lecture 33 - Predictor-Corrector Formulae
- Lecture 34 - Boundary Value Problems
- Lecture 35 - Eigenvalues and Eigenvectors
- Lecture 36 - Spectral Theorem
- Lecture 37 - Power Method
- Lecture 38 - Inverse Power Method
- Lecture 39 - Q R Decomposition
- Lecture 40 - Q R Method

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Measure and Integration

Subject Co-ordinator - Prof. Inder K Rana

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction, Extended Real numbers
- Lecture 2 - Algebra and Sigma Algebra of a subset of a set
- Lecture 3 - Sigma Algebra generated by a class
- Lecture 4 - Monotone Class
- Lecture 5 - Set function
- Lecture 6 - The Length function and its properties
- Lecture 7 - Countably additive set functions on intervals
- Lecture 8 - Uniqueness Problem for Measure
- Lecture 9 - Extension of measure
- Lecture 10 - Outer measure and its properties
- Lecture 11 - Measurable sets
- Lecture 12 - Lebesgue measure and its properties
- Lecture 13 - Characterization of Lebesgue measurable sets
- Lecture 14 - Measurable functions
- Lecture 15 - Properties of measurable functions
- Lecture 16 - Measurable functions on measure spaces
- Lecture 17 - Integral of non negative simple measurable functions
- Lecture 18 - Properties of non negative simple measurable functions
- Lecture 19 - Monotone convergence theorem & Fatou's Lemma
- Lecture 20 - Properties of Integral functions & Dominated Convergence Theorem
- Lecture 21 - Dominated Convergence Theorem and applications
- Lecture 22 - Lebesgue Integral and its properties
- Lecture 23 - Denseness of continuous function
- Lecture 24 - Product measures, an Introduction
- Lecture 25 - Construction of Product Measure
- Lecture 26 - Computation of Product Measure - I
- Lecture 27 - Computation of Product Measure - II
- Lecture 28 - Integration on Product spaces
- Lecture 29 - Fubini's Theorems

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Lebesgue Measure and integral on  $\mathbb{R}^2$
- Lecture 31 - Properties of Lebesgue Measure and integral on  $\mathbb{R}^n$
- Lecture 32 - Lebesgue integral on  $\mathbb{R}^2$
- Lecture 33 - Integrating complex-valued functions
- Lecture 34 -  $L_p$  - spaces
- Lecture 35 -  $L^2(X, S, \mu)$
- Lecture 36 - Fundamental Theorem of calculus for Lebesgue Integral - I
- Lecture 37 - Fundamental Theorem of calculus for Lebesgue Integral - II
- Lecture 38 - Absolutely continuous measures
- Lecture 39 - Modes of convergence
- Lecture 40 - Convergence in Measure

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Mathematics in India - From Vedic Period to Modern Times

Subject Co-ordinator - Prof. M.D. Srinivas, Prof. K. Ramasubramanian, Prof. M.S. Sriram

Co-ordinating Institute - Centre for Policy Studies, Chennai | IIT - Bombay | University of Madras, Chennai

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Indian Mathematics
- Lecture 2 - Vedas and Sulbasutras - Part 1
- Lecture 3 - Vedas and Sulbasutras - Part 2
- Lecture 4 - Panini's Astadhyayi
- Lecture 5 - Pingala's Chandahsastra
- Lecture 6 - Decimal place value system
- Lecture 7 - Aryabhata's Aryabhata - Part 1
- Lecture 8 - Aryabhata's Aryabhata - Part 2
- Lecture 9 - Aryabhata's Aryabhata - Part 3
- Lecture 10 - Aryabhata's Aryabhata - Part 4 and Introduction to Jaina Mathematics
- Lecture 11 - Brahmasphutasiddhanta of Brahmagupta - Part 1
- Lecture 12 - Brahmasphutasiddhanta of Brahmagupta - Part 2
- Lecture 13 - Brahmasphutasiddhanta of Brahmagupta - Part 3
- Lecture 14 - Brahmasphutasiddhanta of Brahmagupta - Part 4 and The Bakhshali Manuscript
- Lecture 15 - Mahavira's Ganitasarasangraha - Part 1
- Lecture 16 - Mahavira's Ganitasarasangraha - Part 2
- Lecture 17 - Mahavira's Ganitasarasangraha - Part 3
- Lecture 18 - Development of Combinatorics - Part 1
- Lecture 19 - Development of Combinatorics - Part 2
- Lecture 20 - Lilavati of Bhaskaracarya - Part 1
- Lecture 21 - Lilavati of Bhaskaracarya - Part 2
- Lecture 22 - Lilavati of Bhaskaracarya - Part 3
- Lecture 23 - Bijaganita of Bhaskaracarya - Part 1
- Lecture 24 - Bijaganita of Bhaskaracarya - Part 2
- Lecture 25 - Ganitakaumudi of Narayana Pandita - Part 1
- Lecture 26 - Ganitakaumudi of Narayana Pandita - Part 2
- Lecture 27 - Ganitakaumudi of Narayana Pandita - Part 3
- Lecture 28 - Magic Squares - Part 1
- Lecture 29 - Magic Squares - Part 2

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Development of Calculus in India - Part 1
- Lecture 31 - Development of Calculus in India - Part 2
- Lecture 32 - Jyanayanam
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Measure Theory

Subject Co-ordinator - Prof. Inder K Rana

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - (1A) Introduction, Extended Real Numbers
- Lecture 2 - (1B) Introduction, Extended Real Numbers
- Lecture 3 - (2A) Algebra and Sigma Algebra of Subsets of a Set
- Lecture 4 - (2B) Algebra and Sigma Algebra of Subsets of a Set
- Lecture 5 - (3A) Sigma Algebra generated by a Class
- Lecture 6 - (3B) Sigma Algebra generated by a Class
- Lecture 7 - (4A) Monotone Class
- Lecture 8 - (4B) Monotone Class
- Lecture 9 - (5A) Set Functions
- Lecture 10 - (5B) Set Functions
- Lecture 11 - (6A) The Length Function and its Properties
- Lecture 12 - (6B) The Length Function and its Properties
- Lecture 13 - (7A) Countably Additive Set Functions on Intervals
- Lecture 14 - (7B) Countably Additive Set Functions on Intervals
- Lecture 15 - (8A) Uniqueness Problem for Measure
- Lecture 16 - (8B) Uniqueness Problem for Measure
- Lecture 17 - (9A) Extension of Measure
- Lecture 18 - (9B) Extension of Measure
- Lecture 19 - (10A) Outer Measure and its Properties
- Lecture 20 - (10B) Outer Measure and its Properties
- Lecture 21 - (11A) Measurable Sets
- Lecture 22 - (11B) Measurable Sets
- Lecture 23 - (12A) Lebesgue Measure and its Properties
- Lecture 24 - (12B) Lebesgue Measure and its Properties
- Lecture 25 - (13A) Characterization of Lebesgue Measurable Sets
- Lecture 26 - (13B) Characterization of Lebesgue Measurable Sets
- Lecture 27 - (14A) Measurable Functions
- Lecture 28 - (14B) Measurable Functions
- Lecture 29 - (15A) Properties of Measurable Functions

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - (15B) Properties of Measurable Functions
- Lecture 31 - (16A) Measurable Functions on Measure Spaces
- Lecture 32 - (16B) Measurable Functions on Measure Spaces
- Lecture 33 - (17A) Integral of Nonnegative Simple Measurable Functions
- Lecture 34 - (17B) Integral of Nonnegative Simple Measurable Functions
- Lecture 35 - (18A) Properties of Nonnegative Simple Measurable Functions
- Lecture 36 - (18B) Properties of Nonnegative Simple Measurable Functions
- Lecture 37 - (19A) Monotone Convergence Theorem and Fatou's Lemma
- Lecture 38 - (19B) Monotone Convergence Theorem and Fatou's Lemma
- Lecture 39 - (20A) Properties of Integrable Functions and Dominated Convergence Theorem
- Lecture 40 - (20B) Properties of Integrable Functions and Dominated Convergence Theorem
- Lecture 41 - (21A) Dominated Convergence Theorem and Applications
- Lecture 42 - (21B) Dominated Convergence Theorem and Applications
- Lecture 43 - (22A) Lebesgue Integral and its Properties
- Lecture 44 - (22B) Lebesgue Integral and its Properties
- Lecture 45 - (23A) Product Measure, an Introduction
- Lecture 46 - (23B) Product Measure, an Introduction
- Lecture 47 - (24A) Construction of Product Measures
- Lecture 48 - (24B) Construction of Product Measures
- Lecture 49 - (25A) Computation of Product Measure - I
- Lecture 50 - (25B) Computation of Product Measure - I
- Lecture 51 - (26A) Computation of Product Measure - II
- Lecture 52 - (26B) Computation of Product Measure - II
- Lecture 53 - (27A) Integration on Product Spaces
- Lecture 54 - (27B) Integration on Product Spaces
- Lecture 55 - (28A) Fubini's Theorems
- Lecture 56 - (28B) Fubini's Theorems
- Lecture 57 - (29A) Lebesgue Measure and Integral on  $\mathbb{R}^2$
- Lecture 58 - (29B) Lebesgue Measure and Integral on  $\mathbb{R}^2$
- Lecture 59 - (30A) Properties of Lebesgue Measure on  $\mathbb{R}^2$
- Lecture 60 - (30B) Properties of Lebesgue Measure on  $\mathbb{R}^2$
- Lecture 61 - (31A) Lebesgue Integral on  $\mathbb{R}^2$
- Lecture 62 - (31B) Lebesgue Integral on  $\mathbb{R}^2$

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Calculus for Economics, Commerce and Management

Subject Co-ordinator - Prof.Inder Kumar Rana

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Monopoly Market, Revenue and Elasticity
- Lecture 31 - Property of Marginals, Monopoly Market, Publisher v/s Author Problem
- Lecture 32 - Convex and Concave Functions
- Lecture 33 - Derivative Tests for Convexity, Concavity and Points of Inflection, Higher Order Derivative Conc
- Lecture 34 - Convex and Concave Functions, Asymptotes
- Lecture 35 - Asymptotes, Curve Sketching
- Lecture 36 - Functions of Two Variables, Visualizing Graph, Level Curves, Contour Lines
- Lecture 37 - Partial Derivatives and Application to Marginal Analysis
- Lecture 38 - Marginals in Cobb-Douglas model, partial derivatives and elasticity, chain rules
- Lecture 39 - Chain Rules, Higher Order Partial Derivatives, Local Maxima and Minima, Critical Points
- Lecture 40 - Saddle Points, Derivative Tests, Absolute Maxima and Minima
- Lecture 41 - Some Examples, Constrained Maxima and Minima

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Basic Linear Algebra

Subject Co-ordinator - Prof.Inder Kumar Rana

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction - I
- Lecture 2 - Introduction - II
- Lecture 3 - Introduction - III
- Lecture 4 - Systems of Linear Equations - I
- Lecture 5 - Systems of Linear Equations - II
- Lecture 6 - Systems of Linear Equations - III
- Lecture 7 - Reduced Row Echelon Form and Rank - I
- Lecture 8 - Reduced Row Echelon Form and Rank - II
- Lecture 9 - Reduced Row Echelon Form and Rank - III
- Lecture 10 - Solvability of a Linear System, Linear Span, Basis - I
- Lecture 11 - Solvability of a Linear System, Linear Span, Basis - II
- Lecture 12 - Solvability of a Linear System, Linear Span, Basis - III
- Lecture 13 - Linear Span, Linear Independence and Basis - I
- Lecture 14 - Linear Span, Linear Independence and Basis - II
- Lecture 15 - Linear Span, Linear Independence and Basis - III
- Lecture 16 - Row Space, Column Space, Rank-Nullity Theorem - I
- Lecture 17 - Row Space, Column Space, Rank-Nullity Theorem - II
- Lecture 18 - Row Space, Column Space, Rank-Nullity Theorem - III
- Lecture 19 - Determinants and their Properties - I
- Lecture 20 - Determinants and their Properties - II
- Lecture 21 - Determinants and their Properties - III
- Lecture 22 - Linear Transformations - I
- Lecture 23 - Linear Transformations - II
- Lecture 24 - Linear Transformations - III
- Lecture 25 - Orthonormal Basis, Geometry in  $\mathbb{R}^2$  - I
- Lecture 26 - Orthonormal Basis, Geometry in  $\mathbb{R}^2$  - II
- Lecture 27 - Orthonormal Basis, Geometry in  $\mathbb{R}^2$  - III
- Lecture 28 - Isometries, Eigenvalues and Eigenvectors - I
- Lecture 29 - Isometries, Eigenvalues and Eigenvectors - II

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Isometries, Eigenvalues and Eigenvectors - III
- Lecture 31 - Diagonalization and Real Symmetric Matrices - I
- Lecture 32 - Diagonalization and Real Symmetric Matrices - II
- Lecture 33 - Diagonalization and Real Symmetric Matrices - III
- Lecture 34 - Diagonalization and its Applications - I
- Lecture 35 - Diagonalization and its Applications - II
- Lecture 36 - Diagonalization and its Applications - III
- Lecture 37 - Abstract Vector Spaces - I
- Lecture 38 - Abstract Vector Spaces - II
- Lecture 39 - Abstract Vector Spaces - III
- Lecture 40 - Inner Product Spaces - I
- Lecture 41 - Inner Product Spaces - II

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Commutative Algebra

Subject Co-ordinator - Prof. Dilip P. Patil

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Zariski Topology and K-Spectrum

Lecture 2 - Algebraic Varieties and Classical Nullstellensatz

Lecture 3 - Motivation for Krull's Dimension

Lecture 4 - Chevalley's dimension

Lecture 5 - Associated Prime Ideals of a Module

Lecture 6 - Support of a Module

Lecture 7 - Primary Decomposition

Lecture 8 - Primary Decomposition (Continued...)

Lecture 9 - Uniqueness of Primary Decomposition

Lecture 10 - Modules of Finite Length

Lecture 11 - Modules of Finite Length (Continued...)

Lecture 12 - Introduction to Krull's Dimension

Lecture 13 - Noether Normalization Lemma (Classical Version)

Lecture 14 - Consequences of Noether Normalization Lemma

Lecture 15 - Nil Radical and Jacobson Radical of Finite type Algebras over a Field and digression of Integral

Lecture 16 - Nagata's version of NNL

Lecture 17 - Dimensions of Polynomial ring over Noetherian rings

Lecture 18 - Dimension of Polynomial Algebra over arbitrary Rings

Lecture 19 - Dimension Inequalities

Lecture 20 - Hilbert's Nullstellensatz

Lecture 21 - Computational rules for Poincaré Series

Lecture 22 - Graded Rings, Modules and Poincaré Series

Lecture 23 - Hilbert-Samuel Polynomials

Lecture 24 - Hilbert-Samuel Polynomials (Continued...)

Lecture 25 - Numerical Function of polynomial type

Lecture 26 - Hilbert-Samuel Polynomial of a Local ring

Lecture 27 - Filtration on a Module

Lecture 28 - Artin-Rees Lemma

Lecture 29 - Dimension Theorem

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Dimension Theorem (Continued...)
- Lecture 31 - Consequences of Dimension Theorem
- Lecture 32 - Generalized Krull's Principal Ideal Theorem
- Lecture 33 - Second proof of Krull's Principal Ideal Theorem
- Lecture 34 - The Spec Functor
- Lecture 35 - Prime ideals in Polynomial rings
- Lecture 36 - Characterization of Equidimensional Affine Algebra
- Lecture 37 - Connection between Regular local rings and associated graded rings
- Lecture 38 - Statement of the Jacobian Criterion for Regularity
- Lecture 39 - Hilbert function for Affine Algebra
- Lecture 40 - Hilbert Serre Theorem
- Lecture 41 - Jacobian Matrix and its Rank
- Lecture 42 - Jacobian Matrix and its Rank (Continued...)
- Lecture 43 - Proof of Jacobian Criterion
- Lecture 44 - Proof of Jacobian Criterion (Continued...)
- Lecture 45 - Preparation for Homological Dimension
- Lecture 46 - Complexes of Modules and Homology
- Lecture 47 - Projective Modules
- Lecture 48 - Homological Dimension and Projective module
- Lecture 49 - Global Dimension
- Lecture 50 - Homological characterization of Regular Local Rings (RLR)
- Lecture 51 - Homological characterization of Regular Local Rings (Continued...)
- Lecture 52 - Homological Characterization of Regular Local Rings (Continued...)
- Lecture 53 - Regular Local Rings are UFD
- Lecture 54 - RLR-Prime ideals of height 1
- Lecture 55 - Discrete Valuation Ring
- Lecture 56 - Discrete Valuation Ring (Continued...)
- Lecture 57 - Dedekind Domains
- Lecture 58 - Fractionary Ideals and Dedekind Domains
- Lecture 59 - Characterization of Dedekind Domain
- Lecture 60 - Dedekind Domains and prime factorization of ideals

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Galois Theory

Subject Co-ordinator - Prof. Dilip P. Patil

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Historical Perspectives

Lecture 2 - Examples of Fields

Lecture 3 - Polynomials and Basic properties

Lecture 4 - Polynomial Rings

Lecture 5 - Unit and Unit Groups

Lecture 6 - Division with remainder and prime factorization

Lecture 7 - Zeroes of Polynomials

Lecture 8 - Polynomial functions

Lecture 9 - Algebraically closed Fields and statement of FTA

Lecture 10 - Gauss's Theorem (Uniqueness of factorization)

Lecture 11 - Digression on Rings homomorphism, Algebras

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

Lecture 13 - Algebraic elements

Lecture 14 - Examples

Lecture 15 - Minimal Polynomials

Lecture 16 - Characterization of Algebraic elements

Lecture 17 - Theorem of Kronecker

Lecture 18 - Examples

Lecture 19 - Digression on Groups

Lecture 20 - Some examples and Characteristic of a Ring

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

Lecture 22 - Construction of Finite Fields

Lecture 23 - Digression on Group action - I

Lecture 24 - Automorphism Groups of a Field Extension

Lecture 25 - Dedekind-Artin Theorem

Lecture 26 - Galois Extension

Lecture 27 - Examples of Galois extension

Lecture 28 - Examples of Automorphism Groups

Lecture 29 - Digression on Linear Algebra

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- Lecture 30 - Minimal and Characteristic Polynomials, Norms, Trace of elements
- Lecture 31 - Primitive Element Theorem for Galois Extension
- Lecture 32 - Fundamental Theorem of Galois Theory
- Lecture 33 - Fundamental Theorem of Galois Theory (Continued...)
- Lecture 34 - Cyclotomic extensions
- Lecture 35 - Cyclotomic Polynomials
- Lecture 36 - Irreducibility of Cyclotomic Polynomials over  $\mathbb{Q}$
- Lecture 37 - Reducibility of Cyclotomic Polynomials over Finite Fields
- Lecture 38 - Galois Group of Cyclotomic Polynomials
- Lecture 39 - Extension over a fixed Field of a finite subGroup is Galois Extension
- Lecture 40 - Digression on Group action - II
- Lecture 41 - Correspondence of Normal SubGroups and Galois sub-extensions
- Lecture 42 - Correspondence of Normal SubGroups and Galois sub-extensions (Continued...)
- Lecture 43 - Inverse Galois problem for Abelian Groups
- Lecture 44 - Elementary Symmetric Polynomials
- Lecture 45 - Fundamental Theorem on Symmetric Polynomials
- Lecture 46 -  $\text{Gal}(K[X_1, X_2, \dots, X_n]/K[S_1, S_2, \dots, S_n])$
- Lecture 47 - Digression on Symmetric and Alternating Group
- Lecture 48 - Discriminant of a Polynomial
- Lecture 49 - Zeroes and Embeddings
- Lecture 50 - Normal Extensions
- Lecture 51 - Existence of Algebraic Closure
- Lecture 52 - Uniqueness of Algebraic Closure
- Lecture 53 - Proof of The Fundamental Theorem of Algebra
- Lecture 54 - Galois Group of a Polynomial
- Lecture 55 - Perfect Fields
- Lecture 56 - Embeddings
- Lecture 57 - Characterization of finite Separable extension
- Lecture 58 - Primitive Element Theorem
- Lecture 59 - Equivalence of Galois extensions and Normal-Separable extensions
- Lecture 60 - Operation of Galois Group of Polynomial on the set of zeroes
- Lecture 61 - Discriminants
- Lecture 62 - Examples for further study

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Basic Real Analysis

Subject Co-ordinator - Prof. I. K. Rana

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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  
Lecture 11 - Topology of Real Numbers  
Lecture 12 - Topology of Real Numbers  
Lecture 13 - Topology of Real Numbers  
Lecture 14 - Topology of Real Numbers  
Lecture 15 - Topology of Real Numbers  
Lecture 16 - Topology of Real Numbers  
Lecture 17 - Topology of Real Numbers  
Lecture 18 - Topology of Real Numbers  
Lecture 19 - Topology of Real Numbers  
Lecture 20 - Topology of Real Numbers  
Lecture 21 - Topology of Real Numbers  
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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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
- Lecture 65 - Pointwise and Uniform convergence - Part IV
- Lecture 66 - Series of Numbers - Part I
- Lecture 67 - Series of Numbers - Part II
- Lecture 68 - Series of Numbers - Part III

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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Lecture 69 - Alternating Series and Power Series

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:A Basic Course in Number Theory

Subject Co-ordinator - Prof. Shripad Garge

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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 Euclid'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  $\mathbb{Z}/n\mathbb{Z}$
- Lecture 21 - Wilson's theorem
- Lecture 22 - Roots of polynomials over  $\mathbb{Z}/p\mathbb{Z}$
- Lecture 23 - Euler  $\phi$ -function - I
- Lecture 24 - Euler  $\phi$ -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  $U_n$  - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Structure of  $U_n$  - II
- Lecture 31 - Quadratic residues
- Lecture 32 - The Legendre symbol
- Lecture 33 - Quadratic reciprocity law - I
- Lecture 34 - Quadratic reciprocity law - II
- Lecture 35 - Quadratic reciprocity law - III
- Lecture 36 - Quadratic reciprocity law - IV
- Lecture 37 - The Jacobi symbol
- Lecture 38 - Binary quadratic forms
- Lecture 39 - Equivalence of binary quadratic forms
- Lecture 40 - Discriminant of a binary quadratic form
- Lecture 41 - Reduction theory of integral binary quadratic forms
- Lecture 42 - Reduced forms up to equivalence - I
- Lecture 43 - Reduced forms up to equivalence - II
- Lecture 44 - Reduced forms up to equivalence - III
- Lecture 45 - Sums of squares - I
- Lecture 46 - Sums of squares - II
- Lecture 47 - Sums of squares - III
- Lecture 48 - Beyond sums of squares - I
- Lecture 49 - Beyond sums of squares - II
- Lecture 50 - Continued fractions - basic results
- Lecture 51 - Dirichlet's approximation theorem
- Lecture 52 - Good rational approximations
- Lecture 53 - Continued fraction expansion for real numbers - I
- Lecture 54 - Continued fraction expansion for real numbers - II
- Lecture 55 - Convergents give better approximations
- Lecture 56 - Convergents are the best approximations - I
- Lecture 57 - Convergents are the best approximations - II
- Lecture 58 - Quadratic irrationals as continued fractions
- Lecture 59 - Some basics of algebraic number theory
- Lecture 60 - Units in quadratic fields
- Lecture 61 - Units in quadratic fields
- Lecture 62 - Brahmagupta-Pell equations
- Lecture 63 - Tying some loose ends

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Algebraic Topology - Part I

Subject Co-ordinator - Prof. Anant R. Shastri

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Basic Problem in Topology
- Lecture 2 - Concept of homotopy
- Lecture 3 - Bird's eye-view of the course
- Lecture 4 - Path Homotopy
- Lecture 5 - Composition of paths
- Lecture 6 - Fundamental group  $\pi_1$
- Lecture 7 - Computation of Fund. Group of a circle
- Lecture 8 - Computation (Continued...)
- Lecture 9 - Computation concluded
- Lecture 10 - Van-Kampen's Theorem
- Lecture 11 - Function Spaces
- Lecture 12 - Quotient Maps
- Lecture 13 - Group Actions
- Lecture 14 - Examples of Group Actions
- Lecture 15 - Assorted Results on Quotient Spaces
- Lecture 16 - Quotient Constructions Typical to Alg. Top
- Lecture 17 - Quotient Constructions (Continued...)
- Lecture 18 - Relative Homotopy
- Lecture 19 - Construction of a typical SDR
- Lecture 20 - Generalized construction of SDRs
- Lecture 21 - A theoretical application
- Lecture 22 - The Harvest
- Lecture 23 - NDR pairs
- Lecture 24 - General Remarks
- Lecture 25 - Basics of Geometric Realization
- Lecture 26 - Abstract Simplicial Complex
- Lecture 27 - Geometric Realization
- Lecture 28 - Topology on  $|K|$
- Lecture 29 - Simplicial maps

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Polyhedrons
- Lecture 31 - Point Set topological Aspects
- Lecture 32 - Barycentric Subdivision
- Lecture 33 - Finer Subdivisions
- Lecture 34 - Simplicial Approximation
- Lecture 35 - Sperner Lemma
- Lecture 36 - Invariance of domain
- Lecture 37 - Proof of controlled homotopy
- Lecture 38 - Links and Stars
- Lecture 39 - Homotopical Aspects of Simplicial Complexes
- Lecture 40 - Homotopical Aspects
- Lecture 41 - Covering Spaces and Fund. Groups
- Lecture 42 - Lifting Properties
- Lecture 43 - Homotopy Lifting
- Lecture 44 - Relation with the fund. Group
- Lecture 45 - Regular covering
- Lecture 46 - Lifting Problem
- Lecture 47 - Classification of Coverings
- Lecture 48 - Classification
- Lecture 49 - Existence of Simply connected coverings
- Lecture 50 - Construction of Simply connected covering
- Lecture 51 - Properties Shared by total space and base
- Lecture 52 - Examples
- Lecture 53 - G-coverings
- Lecture 54 - Pull-backs
- Lecture 55 - Classification of G-coverings
- Lecture 56 - Proof of classification
- Lecture 57 - Pushouts and Free products
- Lecture 58 - Existence of Free Products, pushouts
- Lecture 59 - Free Products and free groups
- Lecture 60 - Seifert-Van Kampen Theorems
- Lecture 61 - Applications
- Lecture 62 - Applications (Continued...)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Algebraic Topology - Part II

Subject Co-ordinator - Prof. Anant R. Shastri

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Attaching cells
- Lecture 3 - Subcomplexes and Examples
- Lecture 4 - More examples
- Lecture 5 - More Examples
- Lecture 6 - Topological Properties
- Lecture 7 - Coinduced Topology
- Lecture 8 - Compactly generated topology on Products
- Lecture 9 - Product of Cell complexes
- Lecture 10 - Product of Cell complexes (Continued...)
- Lecture 11 - Partition of Unity on CW-complexes
- Lecture 12 - Partition of Unity (Continued...)
- Lecture 13 - Homotopical Aspects
- Lecture 14 - Homotopical Aspects (Continued...)
- Lecture 15 - Cellular Maps
- Lecture 16 - Cellular Maps (Continued...)
- Lecture 17 - Homotopy exact sequence of a pair
- Lecture 18 - Homotopy exact sequence of a fibration
- Lecture 19 - Categories-Definitions and Examples
- Lecture 20 - More Examples
- Lecture 21 - Functors
- Lecture 22 - Equivalence of Functors (Continued...)
- Lecture 23 - Universal Objects
- Lecture 24 - Basic Homological Algebra
- Lecture 25 - Diagram-Chasing
- Lecture 26 - Homology of Chain Complexes
- Lecture 27 - Euler Characteristics
- Lecture 28 - Singular Homology Groups
- Lecture 29 - Basic Properties of Singular Homology

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- Lecture 30 - Excision
- Lecture 31 - Examples of Excision-Mayer Vietoris
- 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  $H_1$  and  $H_1$
- 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 Poincaré 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Partial Differential Equations

Subject Co-ordinator - Prof. Sivaji Ganesh

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Partial Differential Equations - Basic concepts and Nomenclature
- Lecture 2 - First Order Partial Differential Equations- How they arise? Cauchy Problems, IVPs, IBVPs
- Lecture 3 - First order Partial Differential Equations - Geometry of Quasilinear equations
- Lecture 4 - FOPDE's - General Solutions to Linear and Semilinear equations
- Lecture 5 - First order Partial Differential Equations- Lagrange's method for Quasilinear equations
- Lecture 6 - Relation between Characteristic curves and Integral surfaces for Quasilinear equations
- Lecture 7 - Relation between Characteristic curves and Integral surfaces for Quasilinear equations
- Lecture 8 - FOPDE's - Method of characteristics for Quasilinear equations - 1
- Lecture 9 - First order Partial Differential Equations - Failure of transversality condition
- Lecture 10 - First order Partial Differential Equations - Tutorial of Quasilinear equations
- Lecture 11 - FOPDE's - General nonlinear equations 1 - Search for a characteristic direction
- Lecture 12 - FOPDE's - General nonlinear equations 2 - Characteristic direction and characteristic strip
- Lecture 13 - FOPDE's - General nonlinear equations 3 - Finding an initial strip
- Lecture 14 - FOPDE's - General nonlinear equations 4 - Local existence and uniqueness theorem
- Lecture 15 - First order Partial Differential Equations - Tutorial on General nonlinear equations
- Lecture 16 - First order Partial Differential Equations - Initial value problems for Burgers equation
- Lecture 17 - FOPDE's - Conservation laws with a view towards global solutions to Burgers equation
- Lecture 18 - Second Order Partial Differential Equations - Special Curves associated to a PDE
- Lecture 19 - Second Order Partial Differential Equations - Curves of discontinuity
- Lecture 20 - Second Order Partial Differential Equations - Classification
- Lecture 21 - SOPDE's - Canonical form for an equation of Hyperbolic type
- Lecture 22 - SOPDE's - Canonical form for an equation of Parabolic type
- Lecture 23 - SOPDE's - Canonical form for an equation of Elliptic type
- Lecture 24 - Second Order Partial Differential Equations - Characteristic Surfaces
- Lecture 25 - SOPDE's - Canonical forms for constant coefficient PDEs
- Lecture 26 - Wave Equation - A mathematical model for vibrating strings
- Lecture 27 - Wave Equation in one space dimension - d'Alembert formula
- Lecture 28 - Tutorial on One dimensional wave equation
- Lecture 29 - Wave Equation in d space dimensions - Equivalent Cauchy problems via Spherical means

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- Lecture 30 - Cauchy problem for Wave Equation in 3 space dimensions - Poisson-Kirchhoff formulae
- Lecture 31 - Cauchy problem for Wave Equation in 2 space dimensions - Hadamard's method of descent
- Lecture 32 - Nonhomogeneous Wave Equation - Duhamel principle
- Lecture 33 - Wellposedness of Cauchy problem for Wave Equation
- Lecture 34 - Wave Equation on an interval in? - Solution to an IBVP from first principles
- Lecture 35 - Tutorial on IBVPs for wave equation
- Lecture 36 - IBVP for Wave Equation - Separation of Variables Method
- Lecture 37 - Tutorial on Separation of variables method for wave equation
- Lecture 38 - Qualitative analysis of Wave equation - Parallelogram identity
- Lecture 39 - Qualitative analysis of Wave equation - Domain of dependence, domain of influence
- Lecture 40 - Qualitative analysis of Wave equation - Causality Principle, Finite speed of propagation
- Lecture 41 - Qualitative analysis of Wave equation - Uniqueness by Energy method
- Lecture 42 - Qualitative analysis of Wave equation - Huygens Principle
- Lecture 43 - Qualitative analysis of Wave equation - Generalized solutions to Wave equation
- Lecture 44 - Qualitative analysis of Wave equation - Propagation of waves
- Lecture 45 - Laplace equation - Associated Boundary value problems
- Lecture 46 - Laplace equation - Fundamental solution
- Lecture 47 - Dirichlet BVP for Laplace equation - Green's function and Poisson's formula
- Lecture 48 - Laplace equation - Weak maximum principle and its applications
- Lecture 49 - Laplace equation - Dirichlet BVP on a disk in  $R^2$  for Laplace equations
- Lecture 50 - Tutorial 1 on Laplace equation
- Lecture 51 - Laplace equation - Mean value property
- Lecture 52 - Laplace equation - More qualitative properties
- Lecture 53 - Laplace equation - Strong Maximum Principle and Dirichlet Principle
- Lecture 54 - Tutorial 2 on Laplace equation
- Lecture 55 - Cauchy Problem for Heat Equation - 1
- Lecture 56 - Cauchy Problem for Heat Equation - 2
- Lecture 57 - IBVP for Heat equation Subtitle: Method of Separation of Variables
- Lecture 58 - Maximum principle for heat equation
- Lecture 59 - Tutorial on heat equation
- Lecture 60 - Heat equation Subheading : Infinite speed of propagation, Energy, Backward Problem

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:An Introduction to Point-Set-Topology - Part I

Subject Co-ordinator - Prof. Anant R Shastri

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction  
Lecture 2 - Introduction  
Lecture 3 - Introduction  
Lecture 4 - Introduction  
Lecture 5 - Introduction  
Lecture 6 - Introduction  
Lecture 7 - Introduction  
Lecture 8 - Introduction  
Lecture 9 - Introduction  
Lecture 10 - Introduction  
Lecture 11 - Introduction  
Lecture 12 - Introduction  
Lecture 13 - Introduction  
Lecture 14 - Introduction  
Lecture 15 - Introduction  
Lecture 16 - Introduction  
Lecture 17 - Introduction  
Lecture 18 - Introduction  
Lecture 19 - Introduction  
Lecture 20 - Introduction  
Lecture 21 - Introduction  
Lecture 22 - Creating New Spaces  
Lecture 23 - Creating New Spaces  
Lecture 24 - Creating New Spaces  
Lecture 25 - Creating New Spaces  
Lecture 26 - Creating New Spaces  
Lecture 27 - Creating New Spaces  
Lecture 28 - Creating New Spaces  
Lecture 29 - Creating New Spaces

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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Lecture 30 - Creating New Spaces  
Lecture 31 - Creating New Spaces  
Lecture 32  
Lecture 33  
Lecture 34  
Lecture 35  
Lecture 36  
Lecture 37  
Lecture 38 - Smallness Properties of Topological Spaces  
Lecture 39 - Smallness Properties of Topological Spaces  
Lecture 40 - Smallness Properties of Topological Spaces  
Lecture 41 - Smallness Properties of Topological Spaces  
Lecture 42 - Smallness Properties of Topological Spaces  
Lecture 43 - Smallness Properties of Topological Spaces  
Lecture 44 - Smallness Properties of Topological Spaces  
Lecture 45 - Smallness Properties of Topological Spaces  
Lecture 46 - Smallness Properties of Topological Spaces  
Lecture 47 - Largeness properties  
Lecture 48 - Largeness properties  
Lecture 49 - Largeness properties  
Lecture 50 - Largeness properties  
Lecture 51 - Largeness properties  
Lecture 52 - Largeness properties  
Lecture 53 - Largeness properties  
Lecture 54 - Largeness properties  
Lecture 55 - Largeness properties  
Lecture 56  
Lecture 57  
Lecture 58  
Lecture 59  
Lecture 60  
Lecture 61

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:An Introduction to Point-Set-Topology - Part II

Subject Co-ordinator - Prof. Anant R Shastri

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Welcome Speech
- Lecture 2 - Preliminaries from Banach spaces
- Lecture 3 - Differentiation on Banach spaces
- Lecture 4 - Preliminaries from one-variable real analysis
- Lecture 5 - Implicit and Inverse function theorems
- Lecture 6 - Compact Hausdorff spaces
- Lecture 7 - Local Compactness
- Lecture 8 - Local Compactness (Continued...)
- Lecture 9 - The retraction functor  $k(X)$
- Lecture 10 - Compactly generated spaces
- Lecture 11 - Paracompactness
- Lecture 12 - Partition of Unity
- Lecture 13 - Paracompactness (Continued...)
- Lecture 14 - Paracompactness (Continued...)
- Lecture 15 - Various Notions of Compactness
- Lecture 16 - Total Boundedness
- Lecture 17 - Arzel`a- Ascoli Theorem
- Lecture 18 - Generalities on Compactification
- Lecture 19 - Alexandroff's compactification
- Lecture 20 - Proper maps
- Lecture 21 - Stone-Cech compactification
- Lecture 22 - Stone-Weierstrass's Theorems
- Lecture 23 - Real Stone-Weierstrass Theorem
- Lecture 24 - Complex and extended Stone-Weierstrass theorem
- Lecture 25 - (Missing)
- Lecture 26 - Urysohn's Metrization theorem
- Lecture 27 - Nagata Smyrnov Metrization theorem
- Lecture 28 - Nets
- Lecture 29 - Cofinal families subnets

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- Lecture 30 - Basics of Filters
- Lecture 31 - Convergence Properties of Filters
- Lecture 32 - Ultrafilters and Tychonoff'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 Brouwer'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 Homeomorphisms
- Lecture 55 - Definition and Examples 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Fourier Analysis and its Applications

Subject Co-ordinator - Prof. G. K Srinivasan

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Genesis and a little history
- Lecture 2 - Basic convergence theorem
- Lecture 3 - Riemann Lebesgue Lemma
- Lecture 4 - The ubiquitous Gaussian
- Lecture 5 - Jacobi theta function identity
- Lecture 6 - The Riemann zeta function
- Lecture 7 - Bessel's functions of the first kind
- Lecture 8 - Least square approximation
- Lecture 9 - Parseval formula. Isoperimetric theorem
- Lecture 10 - Dirichlet problem for a disc
- Lecture 11 - The Poisson kernel
- Lecture 12 - Cesaro summability and Fejer's theorem
- Lecture 13 - Fejer's theorem (Continued...)
- Lecture 14 - Kronecker's theorem
- Lecture 15 - Weyl's equidistribution theorem
- Lecture 16 - Borel's theorem and beyond
- Lecture 17 - Fourier transform and Schwartz space
- Lecture 18 - Hermite's differential equation
- Lecture 19 - Fourier inversion theorem Riemann Lebesgue lemma
- Lecture 20 - Plancherel's Theorem
- Lecture 21 - Heat equation. The heat kernel
- Lecture 22 - The Airy's function
- Lecture 23 - Exercises on Fourier Transform
- Lecture 24 - Principle of equipartitioning of energy
- Lecture 25 - A formula of Srinivasa Ramanujan
- Lecture 26 - Sturm Liouville problems. Orthogonal systems
- Lecture 27 - Vibrations of a circular membrane
- Lecture 28 - Fourier Bessel Series
- Lecture 29 - Properties of Legendre Polynomials

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Properties of Legendre polynomials (Continued...)
- Lecture 31 - Legendre polynomials - interlacing of zeros
- Lecture 32 - Laplace's integrals for Legendre polynomials
- Lecture 33 - Regular Sturm-Liouville problems
- Lecture 34 - Variational properties of eigen-values
- Lecture 35 - The Dirichlet principle
- Lecture 36 - Regular Sturm-Liouville problems - Existence of eigen-values
- Lecture 37 - The Bergman space
- Lecture 38 - The Banach Steinhaus' Theorem
- Lecture 39 - Hilbert space basics
- Lecture 40 - Completeness of Hermite functions
- Lecture 41 - Hermite, Laguerre and Tchebycheff's polynomials
- Lecture 42 - Orthonormal bases in Hilbert spaces
- Lecture 43 - Non-separable Hilbert-spaces. Almost periodic functions
- Lecture 44 - Hilbert-Schmidt operators. Green's functions
- Lecture 45 - Spectrum of a bounded linear operator
- Lecture 46 - Weak (sequential) compactness of the closed unit ball
- Lecture 47 - Compact self-adjoint operators. Existence of eigen values
- Lecture 48 - Compact self-adjoint operators. Existence of eigen values (Continued...)
- Lecture 49 - Celestial Mechanics
- Lecture 50 - Inverting the Kepler equation using Fourier series
- Lecture 51 - Odds and Ends
- Lecture 52 - Dirichlet's Theorem on Fourier Series
- Lecture 53 - Dirichlet's Theorem on Fourier Series (Continued...)
- Lecture 54 - Topology on the Schwartz space
- Lecture 55 - Examples of tempered distributions
- Lecture 56 - Operations on distributions
- Lecture 57 - Fourier Transform of tempered distribution
- Lecture 58 - Support of a Distribution. Distributions with point support
- Lecture 59 - Distributional solutions of ODEs. Continuity of the Fourier transform and differentiation
- Lecture 60 - The Poisson summation formula

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Numerical Analysis (2023)

Subject Co-ordinator - Prof. S. Baskar

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Mathematical Preliminaries: Taylor Approximation
- Lecture 3 - Mathematical Preliminaries: Order of Convergence
- Lecture 4 - Arithmetic Error: Floating-point Approximation
- Lecture 5 - Arithmetic Error: Significant Digits
- Lecture 6 - Arithmetic Error: Condition Number and Stable Computation
- Lecture 7 - Tutorial Session-1: Problem Solving
- Lecture 8 - Python Coding: Introduction
- Lecture 9 - Linear Systems: Gaussian Elimination Method
- Lecture 10 - Linear Systems: LU-Factorization (Doolittle and Crout)
- Lecture 11 - Linear Systems: LU-Factorization (Cholesky)
- Lecture 12 - Linear Systems: Operation Count for Direct Methods
- Lecture 13 - Tutorial Session-2: Python Coding for Naive Gaussian Elimination Method
- Lecture 14 - Tutorial Session-3: Python Coding for Thomas Algorithm
- Lecture 15 - Matrix Norms: Subordinate Matrix Norms
- Lecture 16 - Matrix Norms: Condition Number of a Matrix
- Lecture 17 - Iterative Methods: Jacobi Method
- Lecture 18 - Iterative Methods: Convergence of Jacobi Method
- Lecture 19 - Iterative Methods: Gauss-Seidel Method
- Lecture 20 - Iterative Methods: Convergence Analysis of Iterative Methods
- Lecture 21 - Iterative Methods: Successive Over Relaxation Method
- Lecture 22 - Tutorial Session-4: Python implementation of Jacobi Method
- Lecture 23 - Eigenvalues and Eigenvectors: Power Method (Construction)
- Lecture 24 - Eigenvalues and Eigenvectors: Power Method (Convergence Theorem)
- Lecture 25 - Eigenvalues and Eigenvectors: Gerschgorin's Theorem and Applications
- Lecture 26 - Eigenvalues and Eigenvectors: Power Method (Inverse and Shifted Methods)
- Lecture 27 - Nonlinear Equations: Overview
- Lecture 28 - Nonlinear Equations: Bisection Method
- Lecture 29 - Tutorial Session-5: Implementation of Bisection Method

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Nonlinear Equations: Regula-falsi and Secant Methods
- Lecture 31 - Nonlinear Equations: Convergence Theorem of Secant Method
- Lecture 32 - Nonlinear Equations: Newton-Raphson's method
- Lecture 33 - Nonlinear Equations: Newton-Raphson's method (Convergence Theorem)
- Lecture 34 - Nonlinear Equations: Fixed-point Iteration Methods
- Lecture 35 - Nonlinear Equations: Fixed-point Iteration Methods (Convergence) and Modified Newton's Method
- Lecture 36 - Nonlinear Equations: System of Nonlinear Equations
- Lecture 37 - Nonlinear Equations: Implementation of Newton-Raphson's Method as Python Code
- Lecture 38 - Polynomial Interpolation: Existence and Uniqueness
- Lecture 39 - Polynomial Interpolation: Lagrange and Newton Forms
- Lecture 40 - Polynomial Interpolation: Newton's Divided Difference Formula
- Lecture 41 - Polynomial Interpolation: Mathematical Error in Interpolating Polynomial
- Lecture 42 - Polynomial Interpolation: Arithmetic Error in Interpolating Polynomials
- Lecture 43 - Polynomial Interpolation: Implementation of Lagrange Form as Python Code
- Lecture 44 - Polynomial Interpolation: Runge Phenomenon and Piecewise Polynomial Interpolation
- Lecture 45 - Polynomial Interpolation: Hermite Interpolation
- Lecture 46 - Polynomial Interpolation: Cubic Spline Interpolation
- Lecture 47 - Polynomial Interpolation: Tutorial Session
- Lecture 48 - Numerical Integration: Rectangle Rule
- Lecture 49 - Numerical Integration: Trapezoidal Rule
- Lecture 50 - Numerical Integration: Simpson's Rule
- Lecture 51 - Numerical Integration: Gaussian Quadrature Rule
- Lecture 52 - Numerical Integration: Tutorial Session
- Lecture 53 - Numerical Differentiation: Primitive Finite Difference Formulae
- Lecture 54 - Numerical Differentiation: Method of Undetermined Coefficients and Arithmetic Error
- Lecture 55 - Numerical ODEs: Euler Methods
- Lecture 56 - Numerical ODEs: Euler Methods (Error Analysis)
- Lecture 57 - Numerical ODEs: Runge-Kutta Methods
- Lecture 58 - Numerical ODEs: Modified Euler's Methods
- Lecture 59 - Numerical ODEs: Multistep Methods
- Lecture 60 - Numerical ODEs: Stability Analysis
- Lecture 61 - Numerical ODEs: Two-point Boundary Value Problems

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Point Set Topology

Subject Co-ordinator - Prof. Ronnie Sebastian

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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  $GL(n, \mathbb{R})^+$  (math symbol)

Lecture 22 - Connectedness of  $GL(n, \mathbb{C})$ ,  $SL(n, \mathbb{C})$ ,  $SL(n, \mathbb{R})$

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Locally compact spaces
- Lecture 31 - One point compactification
- Lecture 32 - One point compactification (Continued...)
- Lecture 33 - Uniqueness of one point compactification
- Lecture 34 - Part 1 : Quotient topology
- Lecture 35 - Part 2 : Quotient topology on  $G/H$
- Lecture 36 - Part 3 : Grassmannian
- Lecture 37 - Normal topological spaces
- Lecture 38 - Urysohn's Lemma
- Lecture 39 - Tietze Extension Theorem
- Lecture 40 - Regular and Second Countable spaces
- Lecture 41 - Product Topology on  $\mathbb{R}^{\mathbb{N}}$
- Lecture 42 - Urysohn's Metrization Theorem

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:High Performance Scientific Computing

Subject Co-ordinator - Prof. Shivasubramanian Gopalakrishnan

Co-ordinating Institute - IIT - Bombay

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 0 - Introduction to High Performance Scientific Computing
- Lecture 1 - Introduction to Operating System
- Lecture 2 - Linux Kernel Explained
- Lecture 3 - Mastering Linux Directory and File Management
- Lecture 4 - Understanding File Permissions and Ownership in Linux
- Lecture 5 - Mastering Linux Text Processing and File Management
- Lecture 6 - Linux Memory and Networking Commands
- Lecture 7 - Understanding Shell Scripting: Parent-Child Processes and User Input Handling
- Lecture 8 - Shell Scripting Tutorial for Beginners
- Lecture 9 - Introduction to High-Performance Computing (HPC) and Its Key Components
- Lecture 10 - Exploring Computing Platform Architecture and CPU Optimization Techniques
- Lecture 11 - Hierarchical Memory Systems and Scalable Architectures in Large-Scale Computing
- Lecture 12 - Concurrency and Synchronization in Parallel Programming: Techniques and Frameworks
- Lecture 13 - Need for Parallel Computing
- Lecture 14 - Role of Numerical Models in Solving complex problems on Computers
- Lecture 15 - Common Challenges with Memory in Computer Architecture
- Lecture 16 - Organization of hardware in Large HPC systems
- Lecture 17 - Architecture of Nvidias Grace Hopper Superchip
- Lecture 18 - Introduction to Shared Memory Programming using OpenMP
- Lecture 19 - Distribution of work using multiple OpenMP Threads
- Lecture 20 - Synchronization and Parallel Loops in OpenMP
- Lecture 21 - Storage attributes of different variables in OpenMP
- Lecture 22 - OpenMP Memory Model, Irregular Parallelism, and Tasks
- Lecture 23 - Parallelization of example codes using OpenMP - Part 1
- Lecture 24 - Parallelization of example codes using OpenMP - Part 2
- Lecture 25 - Introduction to Message Passing Interface (MPI)
- Lecture 26 - Sending and Receiving the messages using MPI
- Lecture 27 - Collective Communication in MPI
- Lecture 28 - Domain Decomposition

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 29 - Parallelization of example code using MPI
- Lecture 30 - Performance Analysis Frameworks for Parallel Programming
- Lecture 31 - Examples of Collective Communication in MPI - Part 1
- Lecture 32 - Examples of Collective Communication in MPI - Part 2
- Lecture 33 - Introduction to GPU Computing
- Lecture 34 - A Dive into Software Stack and Nvidia Architecture
- Lecture 35 - Comparative Analysis of NVIDIA and Intel GPU Architectures
- Lecture 36 - Understanding FLOPS and Memory Bandwidth Calculations for NVIDIA GPUs
- Lecture 37 - SIMD vs. SIMT: Thread Mapping, Scheduling, and Pipelining in NVIDIA GPUs
- Lecture 38 - Understanding 1D, 2D, and 3D Grid Arrangements - Part 1
- Lecture 39 - Understanding 1D, 2D, and 3D Grid Arrangements - Part 2
- Lecture 40 - Thread Block Mapping and Warp Scheduling in GPU
- Lecture 41 - Exploring Warp Scheduling and Latency Management in NVIDIA GPUs
- Lecture 42 - An Introduction to GPU Programming: Tools, Techniques, and CUDA - Part 1
- Lecture 43 - An Introduction to GPU Programming: Tools, Techniques, and CUDA - Part 2
- Lecture 44 - Understanding NVIDIA GPU Memory Types and Efficient Memory Management - Part 1
- Lecture 45 - Understanding NVIDIA GPU Memory Types and Efficient Memory Management - Part 2
- Lecture 46 - Understanding Third Divergence in Parallel Computing and Its Impact on GPU Performance
- Lecture 47 - Memory Layouts and Their Role in Optimizing Computing Performance
- Lecture 48 - CUDA Program Compilation and Execution: A Step-by-Step Guide - Part 1
- Lecture 49 - CUDA Program Compilation and Execution: A Step-by-Step Guide - Part 2
- Lecture 50 - Introduction to OpenACC
- Lecture 51 - Parallelization of loops using OpenACC
- Lecture 52 - OpenACC Data Management
- Lecture 53 - OpenACC Loop Optimizations
- Lecture 54 - Implementing Asynchronous behavior in OpenACC
- Lecture 55 - Programming for multiple-device architecture using OpenACC
- Lecture 56 - Profiling and Parallelizing the serial code using OpenACC
- Lecture 57 - Programming for multiple-device architecture using MPI and CUDA
- Lecture 58 - Programming for multiple-device architecture using MPI and OpenACC
- Lecture 59 - Profiling Serial codes using GNU gprof
- Lecture 60 - Profiling and Debugging of the codes using Valgrind
- Lecture 61 - Code Debugging using GDB
- Lecture 62 - Performance Analysis of MPI codes
- Lecture 63 - Parallel Debugging of MPI Programs using Open Source Tools
- Lecture 64 - Role of Numerical Methods in High Performance Scientific Computing
- Lecture 65 - Libraries used in High Performance Scientific Computing
- Lecture 66 - Introduction to HPC Schedulers using SLURM and PBS
- Lecture 67 - Scientific Visualization

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 68 - Revision and challenges in the future
- Lecture 69 - OpenMP Revision
- Lecture 70 - CUDA Revision
- Lecture 71 - MPI Revision
- Lecture 72 - OpenACC Revision
- Lecture 73 - Heterogeneous Computing
- Lecture 74 - Trends in Microprocessor Architectures

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Stochastic Processes

Subject Co-ordinator - Dr. S. Dharmaraja

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Stochastic Processes
- Lecture 2 - Introduction to Stochastic Processes (Continued.)
- Lecture 3 - Problems in Random Variables and Distributions
- Lecture 4 - Problems in Sequences of Random Variables
- Lecture 5 - Definition, Classification and Examples
- Lecture 6 - Simple Stochastic Processes
- Lecture 7 - Stationary Processes
- Lecture 8 - Autoregressive Processes
- Lecture 9 - Introduction, Definition and Transition Probability Matrix
- Lecture 10 - Chapman-Kolmogorov Equations
- Lecture 11 - Classification of States and Limiting Distributions
- Lecture 12 - Limiting and Stationary Distributions
- Lecture 13 - Limiting Distributions, Ergodicity and Stationary Distributions
- Lecture 14 - Time Reversible Markov Chain, Application of Irreducible Markov Chain in Queueing Models
- Lecture 15 - Reducible Markov Chains
- Lecture 16 - Definition, Kolmogorov Differential Equations and Infinitesimal Generator Matrix
- Lecture 17 - Limiting and Stationary Distributions, Birth Death Processes
- Lecture 18 - Poisson Processes
- Lecture 19 - M/M/1 Queueing Model
- Lecture 20 - Simple Markovian Queueing Models
- Lecture 21 - Queueing Networks
- Lecture 22 - Communication Systems
- Lecture 23 - Stochastic Petri Nets
- Lecture 24 - Conditional Expectation and Filtration
- Lecture 25 - Definition and Simple Examples
- Lecture 26 - Definition and Properties
- Lecture 27 - Processes Derived from Brownian Motion
- Lecture 28 - Stochastic Differential Equations
- Lecture 29 - Ito Integrals

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Ito Formula and its Variants
- Lecture 31 - Some Important SDE`s and Their Solutions
- Lecture 32 - Renewal Function and Renewal Equation
- Lecture 33 - Generalized Renewal Processes and Renewal Limit Theorems
- Lecture 34 - Markov Renewal and Markov Regenerative Processes
- Lecture 35 - Non Markovian Queues
- Lecture 36 - Non Markovian Queues Cont,,
- Lecture 37 - Application of Markov Regenerative Processes
- Lecture 38 - Galton-Watson Process
- Lecture 39 - Markovian Branching Process

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Stochastic Processes - 1

Subject Co-ordinator - Dr. S. Dharmaraja

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

---

- 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
- Lecture 64 - Burke's Theorem and Simulation of M/M/1 queueing Model
- Lecture 65 - M/M/c Queueing Model
- Lecture 66 - M/M/1/N Queueing Model
- Lecture 67 - M/M/c/K Model, M/M/c/c Loss System, M/M/? Self Service System
- Lecture 68 - Transient Solution of Finite Birth Death Process and Finite Source Markovian Queueing Model

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Queueing Networks Characteristics and Types of Queueing Networks
- Lecture 70 - Tandem Queueing Networks
- Lecture 71 - Stationary Distribution and Open Queueing Network
- Lecture 72 - Jackson's Theorem, Closed Queueing Networks, Gordon and Newell Results
- Lecture 73 - Wireless Handoff Performance Model and System Description
- Lecture 74 - Description of 3G Cellular Networks and Queueing Model
- Lecture 75 - Simulation of Queueing Systems
- Lecture 76 - Definition and Basic Components of Petri Net and Reachability Analysis
- Lecture 77 - Arc Extensions in Petri Net, Stochastic Petri Nets and examples

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Stochastic Processes

Subject Co-ordinator - Dr. S. Dharmaraja

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

---

- 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
- Lecture 64 - Burke's Theorem and Simulation of M/M/1 queueing Model
- Lecture 65 - M/M/c Queueing Model
- Lecture 66 - M/M/1/N Queueing Model
- Lecture 67 - M/M/c/K Model, M/M/c/c Loss System, M/M/? Self Service System
- Lecture 68 - Transient Solution of Finite Birth Death Process and Finite Source Markovian Queueing Model

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Queueing Networks Characteristics and Types of Queueing Networks
- Lecture 70 - Tandem Queueing Networks
- Lecture 71 - Stationary Distribution and Open Queueing Network
- Lecture 72 - Jackson's Theorem, Closed Queueing Networks, Gordon and Newell Results
- Lecture 73 - Wireless Handoff Performance Model and System Description
- Lecture 74 - Description of 3G Cellular Networks and Queueing Model
- Lecture 75 - Simulation of Queueing Systems
- Lecture 76 - Definition and Basic Components of Petri Net and Reachability Analysis
- Lecture 77 - Arc Extensions in Petri Net, Stochastic Petri Nets and examples
- Lecture 78 - Generalized Stochastic Petri Net
- Lecture 79 - Generalized Stochastic Petri Net (Continued...)
- Lecture 80 - Conditional Expectation and Examples
- Lecture 81 - Filtration in Discrete time
- Lecture 82 - Remarks of Conditional Expectation and Adaptability
- Lecture 83 - Definition and Examples of Martingale
- Lecture 84 - Examples of Martingale (Continued...)
- Lecture 85 - Examples of Martingale (Continued...)
- Lecture 86 - Doob's Martingale Process, Sub martingale and Super Martingale
- Lecture 87 - Definition of Brownian Motion
- Lecture 88 - Definition of Brownian Motion (Continued...)
- Lecture 89 - Properties of Brownian Motion
- Lecture 90 - Processes Derived from Brownian Motion
- Lecture 91 - Processes Derived from Brownian Motion (Continued...)
- Lecture 92 - Processes Derived from Brownian Motion (Continued...)
- Lecture 93 - Stochastic Differential Equations
- Lecture 94 - Stochastic Differential Equations (Continued...)
- Lecture 95 - Stochastic Differential Equations (Continued...)
- Lecture 96 - Ito Integrals
- Lecture 97 - Ito Integrals (Continued...)
- Lecture 98 - Ito Integrals (Continued...)
- Lecture 99 - Renewal Function and Renewal Equation
- Lecture 100 - Renewal Function and Renewal Equation (Continued...)
- Lecture 101 - Renewal Function and Renewal Equation (Continued...)
- Lecture 102 - Generalized Renewal Processes and Renewal Limit Theorems
- Lecture 103 - Generalized Renewal Processes and Renewal Limit Theorems (Continued...)
- Lecture 104 - Generalized Renewal Processes and Renewal Limit Theorems (Continued...)
- Lecture 105 - Markov Renewal and Markov Regenerative Processes
- Lecture 106 - Markov Renewal and Markov Regenerative Processes (Continued...)
- Lecture 107 - Markov Renewal and Markov Regenerative Processes (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 108 - Markov Renewal and Markov Regenerative Processes (Continued...)
- Lecture 109 - Non Markovian Queues
- Lecture 110 - Non Markovian Queues (Continued...)
- Lecture 111 - Non Markovian Queues (Continued...)
- Lecture 112 - Stationary Processes
- Lecture 113 - Stationary Processes (Continued...)
- Lecture 114 - Stationary Processes (Continued...)
- Lecture 115 - Stationary Processes (Continued...) and Ergodicity
- Lecture 116 - G1/M/1 queue
- Lecture 117 - G1/M/1 queue (Continued...)
- Lecture 118 - G1/M/1/N queue and examples
- Lecture 119 - Galton-Watson Process
- Lecture 120 - Examples and Theorems
- Lecture 121 - Theorems and Examples (Continued...)
- Lecture 122 - Markov Branching Process
- Lecture 123 - Markov Branching Process Theorems and Properties
- Lecture 124 - Markov Branching Process Theorems and Properties (Continued...)

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Chaotic Dynamical Systems

Subject Co-ordinator - Dr. Anima Nagar

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - The beginning
- Lecture 2 - Elementary Concepts
- Lecture 3 - Elementary Concepts (Continued...)
- Lecture 4 - More on orbits
- Lecture 5 - Periods of Periodic Points
- Lecture 6 - Scrambled Sets
- Lecture 7 - Sensitive Dependence on Initial Conditions
- Lecture 8 - A Population Dynamics Model
- Lecture 9 - Bifurcations
- Lecture 10 - Nonlinear Systems
- Lecture 11 - Horseshoe Attractor
- Lecture 12 - Dynamics of the Horseshoe Attractor
- Lecture 13 - Recurrence
- Lecture 14 - Recurrence (Continued...)
- Lecture 15 - Transitivity
- Lecture 16 - Devaney's Chaos
- Lecture 17 - Transitivity = Chaos on Intervals
- Lecture 18 - Stronger forms of Transitivity
- Lecture 19 - Chaotic Properties of Mixing Systems
- Lecture 20 - Weakly Mixing and Chaos
- Lecture 21 - Strongly Transitive Systems
- Lecture 22 - Strongly Transitive Systems (Continued...)
- Lecture 23 - Introduction to Symbolic Dynamics
- Lecture 24 - Shift Spaces
- Lecture 25 - Subshifts of Finite Type
- Lecture 26 - Subshifts of Finite Type (Continued...), Chaotic Dynamical Systems
- Lecture 27 - Measuring Chaos - Topological Entropy
- Lecture 28 - Topological Entropy - Adler's Version
- Lecture 29 - Bowen's Definition of Topological Entropy

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Equivalence of the two definitions of Topological Entropy
- Lecture 31 - Linear Systems in Two Dimensions
- Lecture 32 - Asymptotic Properties of Orbits of Linear Transformation in  $\mathbb{R}^2$
- Lecture 33 - Hyperbolic Toral Automorphisms
- Lecture 34 - Chaos in Toral Automorphisms
- Lecture 35 - Chaotic Attractors of Henon Maps

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Probability Theory and Stochastic Processes

Subject Co-ordinator - Dr. S. Dharmaraja

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Random experiment, sample space, axioms of probability, probability space
- Lecture 2 - Random experiment, sample space, axioms of probability, probability space (Continued...)
- Lecture 3 - Random experiment, sample space, axioms of probability, probability space (Continued...)
- Lecture 4 - Conditional probability, independence of events.
- Lecture 5 - Multiplication rule, total probability rule, Bayes's theorem.
- Lecture 6 - Definition of Random Variable, Cumulative Distribution Function
- Lecture 7 - Definition of Random Variable, Cumulative Distribution Function (Continued...)
- Lecture 8 - Definition of Random Variable, Cumulative Distribution Function (Continued...)
- Lecture 9 - Type of Random Variables, Probability Mass Function, Probability Density Function
- Lecture 10 - Type of Random Variables, Probability Mass Function, Probability Density Function (Continued...)
- Lecture 11 - Distribution of Function of Random Variables
- Lecture 12 - Mean and Variance
- Lecture 13 - Mean and Variance (Continued...)
- Lecture 14 - Higher Order Moments and Moments Inequalities
- Lecture 15 - Higher Order Moments and Moments Inequalities (Continued...)
- Lecture 16 - Generating Functions
- Lecture 17 - Generating Functions (Continued...)
- Lecture 18 - Common Discrete Distributions
- Lecture 19 - Common Discrete Distributions (Continued...)
- Lecture 20 - Common Continuous Distributions
- Lecture 21 - Common Continuous Distributions (Continued...)
- Lecture 22 - Applications of Random Variable
- Lecture 23 - Applications of Random Variable (Continued...)
- Lecture 24 - Random vector and joint distribution
- Lecture 25 - Joint probability mass function
- Lecture 26 - Joint probability density function
- Lecture 27 - Independent random variables
- Lecture 28 - Independent random variables (Continued...)
- Lecture 29 - Functions of several random variables

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Functions of several random variables (Continued...)
- Lecture 31 - Some important results
- 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 - Modes 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 - Motivation for Stochastic Processes
- Lecture 48 - Definition of a Stochastic Process
- Lecture 49 - Classification of Stochastic Processes
- Lecture 50 - Examples of Stochastic Process
- Lecture 51 - Examples Of Stochastic Process (Continued...)
- Lecture 52 - Bernoulli Process
- Lecture 53 - Poisson Process
- Lecture 54 - Poisson Process (Continued...)
- Lecture 55 - Simple Random Walk
- Lecture 56 - Time Series and Related Definitions
- Lecture 57 - Strict Sense Stationary Process
- Lecture 58 - Wide Sense Stationary Process and Examples
- Lecture 59 - Examples of Stationary Processes (Continued...)
- Lecture 60 - Discrete Time Markov Chain (DTMC)
- Lecture 61 - DTMC (Continued...)
- Lecture 62 - Examples of DTMC
- Lecture 63 - Examples of DTMC (Continued...)
- Lecture 64 - Chapman-Kolmogorov equations and N-step transition matrix
- Lecture 65 - Examples based on N-step transition matrix
- Lecture 66 - Examples (Continued...)
- Lecture 67 - Classification of states
- Lecture 68 - Classification of states (Continued...)

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## NPTTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Statistical Inference

Subject Co-ordinator - Prof. Nilladri Chatterjee

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Statistical Inference - 1  
Lecture 2 - Statistical Inference - 2  
Lecture 3 - Statistical Inference - 3  
Lecture 4 - Statistical Inference - 4  
Lecture 5 - Statistical Inference - 5  
Lecture 6 - Statistical Inference - 6  
Lecture 7 - Statistical Inference - 7  
Lecture 8 - Statistical Inference - 8  
Lecture 9 - Statistical Inference - 9  
Lecture 10 - Statistical Inference - 10  
Lecture 11 - Statistical Inference - 11  
Lecture 12 - Statistical Inference - 12  
Lecture 13 - Statistical Inference - 13  
Lecture 14 - Statistical Inference - 14  
Lecture 15 - Statistical Inference - 15  
Lecture 16 - Stasistical Inference - 16  
Lecture 17 - Stasistical Inference - 17  
Lecture 18 - Statistical Inference - 18  
Lecture 19 - Stasistical Inference - 19  
Lecture 20 - Stasistical Inference - 20  
Lecture 21 - Stasistical Inference - 21

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC: Integral Transforms and their Applications

Subject Co-ordinator - Prof. Sarthok Sircar

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Fourier Transforms - Part 1  
Lecture 2 - Introduction to Fourier Transforms - Part 2  
Lecture 3 - Introduction to Fourier Transforms - Part 3  
Lecture 4 - Properties of Fourier transforms, Shannon Sampling Theorem, Gibb's Phenomena - Part 1  
Lecture 5 - Properties of Fourier transforms, Shannon Sampling Theorem, Gibb's Phenomena - Part 2  
Lecture 6 - Properties of Fourier transforms, Shannon Sampling Theorem, Gibb's Phenomena - Part 3  
Lecture 7 - Applications of Fourier Transforms - Part 1  
Lecture 8 - Applications of Fourier Transforms - Part 2  
Lecture 9 - Applications of Fourier Transforms - Part 3  
Lecture 10 - Introduction to Laplace Transforms - Part 1  
Lecture 11 - Introduction to Laplace Transforms - Part 2  
Lecture 12 - Introduction to Laplace Transforms - Part 3  
Lecture 13 - Inverse Laplace Transform, Initial and Final Value Theorems - Part 1  
Lecture 14 - Inverse Laplace Transform, Initial and Final Value Theorems - Part 2  
Lecture 15 - Inverse Laplace Transform, Initial and Final Value Theorems - Part 3  
Lecture 16 - Applications of Laplace Transforms - Part 1  
Lecture 17 - Applications of Laplace Transforms - Part 2  
Lecture 18 - Applications of Laplace Transforms - Part 3  
Lecture 19 - Applications of Laplace Transforms (Continued) - Part 1  
Lecture 20 - Applications of Laplace Transforms (Continued) - Part 2  
Lecture 21 - Applications of Laplace Transforms (Continued) - Part 3  
Lecture 22 - Applications of Fourier-Laplace Transforms - Part 1  
Lecture 23 - Applications of Fourier-Laplace Transforms - Part 2  
Lecture 24 - Applications of Fourier-Laplace Transforms - Part 3  
Lecture 25 - Introduction to Hankel Transforms - Part 1  
Lecture 26 - Introduction to Hankel Transforms - Part 2  
Lecture 27 - Introduction to Hankel Transforms - Part 3  
Lecture 28 - Introduction to Mellin Transforms - Part 1  
Lecture 29 - Introduction to Mellin Transforms - Part 2

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Introduction to Mellin Transforms - Part 3
- Lecture 31 - Introduction to Hilbert Transforms - Part 1
- Lecture 32 - Introduction to Hilbert Transforms - Part 2
- Lecture 33 - Introduction to Hilbert Transforms - Part 3
- Lecture 34 - Applications of Hilbert Transforms, Introduction to Stieltjes Transform - Part 1
- Lecture 35 - Applications of Hilbert Transforms, Introduction to Stieltjes Transform - Part 2
- Lecture 36 - Applications of Hilbert Transforms, 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-transform, Applications of Z-Transform - Part 1
- Lecture 47 - Inverse Z-transform, Applications of Z-Transform - Part 2
- Lecture 48 - Inverse Z-transform, Applications 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
- Lecture 65 - Fractional ODEs and PDEs (Continued) - Part 2
- Lecture 66 - Fractional ODEs and PDEs (Continued) - Part 3
- Lecture 67 - Introduction to Wavelet Transform - Part 1
- Lecture 68 - Introduction to Wavelet Transform - Part 2

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Introduction to Wavelet Transform - Part 3
- Lecture 70 - Discrete Haar, Shanon and Debauchies Wavelet - Part 1
- Lecture 71 - Discrete Haar, Shanon and Debauchies Wavelet - Part 2
- Lecture 72 - Discrete Haar, Shanon and Debauchies Wavelet - Part 3

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Fuzzy Set Theory, Arithmetic and Logic

Subject Co-ordinator - Prof. Nilladri Chatterjee

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Fuzzy Sets Arithmetic and Logic - 1  
Lecture 2 - Fuzzy Sets Arithmetic and Logic - 2  
Lecture 3 - Fuzzy Sets Arithmetic and Logic - 3  
Lecture 4 - Fuzzy Sets Arithmetic and Logic - 4  
Lecture 5 - Fuzzy Sets Arithmetic and Logic - 5  
Lecture 6 - Fuzzy Sets Arithmetic and Logic - 6  
Lecture 7 - Fuzzy Sets Arithmetic and Logic - 7  
Lecture 8 - Fuzzy Sets Arithmetic and Logic - 8  
Lecture 9 - Fuzzy Sets Arithmetic and Logic - 9  
Lecture 10 - Fuzzy Sets Arithmetic and Logic - 10  
Lecture 11 - Fuzzy Sets Arithmetic and Logic - 11  
Lecture 12 - Fuzzy Sets Arithmetic and Logic - 12  
Lecture 13 - Fuzzy Sets Arithmetic and Logic - 13  
Lecture 14 - Fuzzy Sets Arithmetic and Logic - 14  
Lecture 15 - Fuzzy Sets Arithmetic and Logic - 15  
Lecture 16 - Fuzzy Sets Arithmetic and Logic - 16  
Lecture 17 - Fuzzy Sets Arithmetic and Logic - 17  
Lecture 18 - Fuzzy Sets Arithmetic and Logic - 18  
Lecture 19 - Fuzzy Sets Arithmetic and Logic - 19  
Lecture 20 - Fuzzy Sets Arithmetic and Logic - 20  
Lecture 21 - Fuzzy Sets Arithmetic and Logic - 21  
Lecture 22 - Fuzzy Sets Arithmetic and Logic - 22  
Lecture 23 - Fuzzy Sets Arithmetic and Logic - 23  
Lecture 24 - Fuzzy Sets Arithmetic and Logic - 24  
Lecture 25 - Fuzzy Sets Arithmetic and Logic - 25  
Lecture 26 - Fuzzy Sets Arithmetic and Logic - 26  
Lecture 27 - Fuzzy Sets Arithmetic and Logic - 27  
Lecture 28 - Fuzzy Sets Arithmetic and Logic - 28  
Lecture 29 - Fuzzy Sets Arithmetic and Logic - 29

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Lecture 30 - Fuzzy Sets Arithmetic and Logic - 30

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Methods of Applied Mathematics

Subject Co-ordinator - Prof. Vivek Kumar Aggarwal

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to First Order Differential Equations
- Lecture 2 - Introduction to First Order Differential Equations (Continued...)
- Lecture 3 - Introduction to Second Order Linear Differential Equations
- Lecture 4 - Second Order Linear Differential Equations With Constant Coefficients
- Lecture 5 - Second Order Linear Differential Equations With Constant Coefficients (Continued...)
- Lecture 6 - Second Order Linear Differential Equations With Variable Coefficients
- Lecture 7 - Factorization of Second order Differential Operator and Euler Cauchy Equation
- Lecture 8 - Power Series Solution of General Differential Equation
- Lecture 9 - Green's function
- Lecture 10 - Method of Green's Function for Solving Initial Value and Boundary Value Problems
- Lecture 11 - Adjoint Linear Differential Operator
- Lecture 12 - Adjoint Linear Differential Operator (Continued...)
- Lecture 13 - Sturm-Liouville Problems
- Lecture 14 - Laplace transformation
- Lecture 15 - Laplace transformation (Continued...)
- Lecture 16 - Laplace Transform Method for Solving Ordinary Differential Equations
- Lecture 17 - Laplace Transform Applied to Differential Equations and Convolution
- Lecture 18 - Fourier Series
- Lecture 19 - Fourier Series (Continued...)
- Lecture 20 - Gibbs Phenomenon and Parseval's Identity
- Lecture 21 - Fourier Integral and Fourier Transform
- Lecture 22 - Fourier Integral and Fourier Transform (Continued...)
- Lecture 23 - Fourier Transform Method for Solving Ordinary Differential Equations
- Lecture 24 - Frames, Riesz Bases and Orthonormal Bases
- Lecture 25 - Frames, Riesz Bases and Orthonormal Bases (Continued...)
- Lecture 26 - Fourier Series and Fourier Transform
- Lecture 27 - Time-Frequency Analysis and Gabor Transform
- Lecture 28 - Window Fourier Transform and Multiresolution Analysis
- Lecture 29 - Construction of Scaling Functions and Wavelets Using Multiresolution Analysis

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Daubechies Wavelet
- Lecture 31 - Daubechies Wavelet (Continued...)
- Lecture 32 - Wavelet Transform and Shannon Wavelet

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Probability Theory

Subject Co-ordinator - Prof. Niladri Chatterjee

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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Lecture 30 - Advanced Probability Theory

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Scientific Computing using Matlab

Subject Co-ordinator - Prof. Vivek Kumar Aggarwal, Prof. Mani Mehra

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Matlab
- Lecture 2 - Plotting of Functions in Matlab
- Lecture 3 - Symbolic Computation in Matlab
- Lecture 4 - Functions definition in Matlab
- Lecture 5 - In continuation of basics of Matlab
- Lecture 6 - In continuation of basics of Matlab (Continued...)
- Lecture 7 - Floating point representation of a number
- Lecture 8 - Errors arithmetic
- Lecture 9 - Iterative method for solving nonlinear equations
- Lecture 10 - Bisection method for solving nonlinear equations
- Lecture 11 - Order of Convergence of an Iterative Method
- Lecture 12 - Regula-Falsi and Secant Method for Solving Nonlinear Equations
- Lecture 13 - Raphson method for solving nonlinear equations
- Lecture 14 - Newton-Raphson Method for Solving Nonlinear System of Equations
- Lecture 15 - Matlab Code for Fixed Point Iteration Method
- Lecture 16 - Matlab Code for Newton-Raphson and Regula-Falsi Method
- Lecture 17 - Matlab Code for Newton Method for Solving System of Equations
- Lecture 18 - Linear System of Equations
- Lecture 19 - Linear System of Equations (Continued...)
- Lecture 20 - Gauss Elimination Method for solving Linear System of Equation
- Lecture 21 - Matlab Code for Gauss Elimination Method
- Lecture 22 - LU Decomposition Method for Solving Linear System of Equations
- Lecture 23 - LU Decomposition Method for Solving Linear System of Equations (Continued...)
- Lecture 24 - Iterative Method for Solving Linear System of Equations
- Lecture 25 - Iterative Method for Solving Linear System of Equations (Continued...)
- Lecture 26 - Matlab Code for Gauss Jacobi Method
- Lecture 27 - Matlab Code for Gauss Seidel Method
- Lecture 28 - Matlab Code for Gauss Seidel Method
- Lecture 29 - Power Method for Solving Eigenvalues of a Matrix

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## NPTTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Power Method for Solving Eigenvalues of a Matrix (Continued...)
- Lecture 31 - Gershgorin Circle Theorem for Estimating Eigenvalues of a Matrix
- Lecture 32 - Gershgorin Circle Theorem for Estimating Eigenvalues of a Matrix
- Lecture 33 - Matlab Code for Power Method/ Shifted Inverse Power Method
- Lecture 34 - Interpolation
- Lecture 35 - Interpolation (Continued...)
- Lecture 36 - Interpolation (Continued...)
- Lecture 37 - Interpolating Polynomial Using Newton's Forward Difference Formula
- Lecture 38 - Error Estimates in Polynomial Approximation
- Lecture 39 - Interpolating Polynomial Using Newton's Backward Difference Formula
- Lecture 40 - Stirling's Formula and Lagrange's Interpolating Polynomial
- Lecture 41 - In Continuation of Lagrange's Interpolating Formula
- Lecture 42 - Interpolating Polynomial Using Newton's Divided Difference Formula
- Lecture 43 - Examples Based on Lagrange's and Newton's Divided Difference Interpolation
- Lecture 44 - Spline Interpolation
- Lecture 45 - Cubic Spline
- Lecture 46 - Cubic Spline (Continued...)
- Lecture 47 - Curve Fitting
- Lecture 48 - Quadratic Polynomial Fitting and Code for Lagrange's Interpolating Polynomial using Octave
- Lecture 49 - Matlab Code for Newton's Divided Difference and Least Square Approximation
- Lecture 50 - Matlab Code for Cubic Spline
- Lecture 51 - Numerical Differentiation
- Lecture 52 - Various Numerical Differentiation Formulas
- Lecture 53 - Higher Order Accurate Numerical Differentiation Formula For First Order Derivative
- Lecture 54 - Higher Order Accurate Numerical Differentiation Formula For Second Order Derivative
- Lecture 55 - Numerical Integration
- Lecture 56 - Trapezoidal Rule for Numerical Integration
- Lecture 57 - Simpson's 1/3 rule for Numerical Integration
- Lecture 58 - Simpson's 3/8 Rule for Numerical Integration
- Lecture 59 - Method of Undetermined Coefficients
- Lecture 60 - Octave Code for Trapezoidal and Simpson's Rule
- Lecture 61 - Taylor Series Method for Ordinary Differential Equations
- Lecture 62 - Linear Multistep Method (LMM) for Ordinary Differential Equations
- Lecture 63 - Convergence and Zero Stability for LMM
- Lecture 64 - Matlab/Octave Code for Initial Value Problems
- Lecture 65 - Advantage of Implicit and Explicit Methods Over Each other via Matlab/Octave Codes for Initial v

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Non-parametric Statistical Inference

Subject Co-ordinator - Prof. Niladri Chatterjee

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1  
Lecture 2  
Lecture 3  
Lecture 4  
Lecture 5  
Lecture 6  
Lecture 7  
Lecture 8  
Lecture 9  
Lecture 10

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Matrix Computation and its applications

Subject Co-ordinator - Prof. Vivek K. Aggarwal

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Binary Operation and Groups

Lecture 2 - Vector Spaces

Lecture 3 - Some Examples of Vector Spaces

Lecture 4 - Some Examples of Vector Spaces (Continued...)

Lecture 5 - Subspace of a Vector Space

Lecture 6 - Spanning Set

Lecture 7 - Properties of Subspaces

Lecture 8 - Properties of Subspaces (Continued...)

Lecture 9 - Linearly Independent and Dependent Vectors

Lecture 10 - Linearly Independent and Dependent Vectors (Continued...)

Lecture 11 - Properties of Linearly Independent and Dependent Vectors

Lecture 12 - Properties of Linearly Independent and Dependent Vectors (Continued...)

Lecture 13 - Basis and Dimension of a Vector Space

Lecture 14 - Example of Basis and Standard Basis of a Vector Space

Lecture 15 - Linear Functions

Lecture 16 - Range Space of a Matrix and Row Reduced Echelon Form

Lecture 17 - Row Equivalent Matrices

Lecture 18 - Row Equivalent Matrices (Continued...)

Lecture 19 - Null Space of a Matrix

Lecture 20 - Four Subspaces Associated with a Given Matrix

Lecture 21 - Four Subspaces Associated with a Given Matrix (Continued...)

Lecture 22 - Linear Independence of the rows and columns of a Matrix

Lecture 23 - Application of Diagonal Dominant Matrices

Lecture 24 - Application of Zero Null Space: Interpolating Polynomial and Wronskian Matrix

Lecture 25 - Characterization of basis of a Vector Space and its Subspaces

Lecture 26 - Coordinate of a Vector with respect to Ordered Basis

Lecture 27 - Examples of different subspaces of a vector space of polynomials having degree less than or equal to

Lecture 28 - Linear Transformation

Lecture 29 - Properties of Linear Transformation

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Determining Linear Transformation on a Vector Space by its value on the basis element
- Lecture 31 - Range space and null space of a Linear Transformation
- Lecture 32 - Rank and Nullity of a Linear Transformation
- Lecture 33 - Rank Nullity Theorem
- Lecture 34 - Application of Rank Nullity Theorem and Inverse of a Linear Transformation
- Lecture 35 - Matrix Associated with Linear Transformation
- Lecture 36 - Matrix Representation of a Linear Transformation Relative to Ordered Bases
- Lecture 37 - Matrix Representation of a Linear Transformation Relative to Ordered Bases (Continued...)
- Lecture 38 - Linear Map Associated with a Matrix
- Lecture 39 - Similar Matrices and Diagonalisation of Matrix
- Lecture 40 - Orthonormal bases of a Vector Space
- Lecture 41 - Gram-Schmidt Orthogonalisation Process
- Lecture 42 - QR Factorisation
- Lecture 43 - Inner Product Spaces
- Lecture 44 - Inner Product of different real vector spaces and basics of complex vector space
- Lecture 45 - Inner Product on complex vector spaces and Cauchy-Schwarz inequality
- Lecture 46 - Norm of a Vector
- Lecture 47 - Matrix Norm
- Lecture 48 - Sensitivity Analysis of a System of Linear Equations
- Lecture 49 - Orthogonality of the four subspaces associated with a matrix
- Lecture 50 - Best Approximation: Least Square Method
- Lecture 51 - Best Approximation: Least Square Method (Continued...)
- Lecture 52 - Jordan-Canonical Form
- Lecture 53 - Some examples on the Jordan form of a given matrix and generalised eigen vectors
- Lecture 54 - Singular value decomposition (SVD) theorem
- Lecture 55 - Matlab/Octave code for Solving SVD
- Lecture 56 - Pseudo-Inverse/Moore-Penrose Inverse
- Lecture 57 - Householder Transformation
- Lecture 58 - Matlab/Octave code for Householder Transformation

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Probability Theory and Statistics

Subject Co-ordinator - Prof. S Dharmaraja

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Random experiment, sample space, axioms of probability, probability space
- Lecture 2 - Random experiment, sample space, axioms of probability, probability space (Continued...)
- Lecture 3 - Random experiment, sample space, axioms of probability, probability space (Continued...)
- Lecture 4 - Conditional probability, independence of events
- Lecture 5 - Multiplication rule, total probability rule, Bayes's theorem
- Lecture 6 - Definition of Random Variable, Cumulative Distribution Function
- Lecture 7 - Definition of Random Variable, Cumulative Distribution Function (Continued...)
- Lecture 8 - Definition of Random Variable, Cumulative Distribution Function (Continued...)
- Lecture 9 - Type of Random Variables, Probability Mass Function, Probability Density Function
- Lecture 10 - Type of Random Variables, Probability Mass Function, Probability Density Function (Continued...)
- Lecture 11 - Distribution of Function of Random Variables
- Lecture 12 - Mean and Variance
- Lecture 13 - Mean and Variance (Continued...)
- Lecture 14 - Higher Order Moments and Moments Inequalities
- Lecture 15 - Higher Order Moments and Moments Inequalities (Continued...)
- Lecture 16 - Generating Functions
- Lecture 17 - Generating Functions (Continued...)
- Lecture 18 - Common Discrete Distributions
- Lecture 19 - Common Discrete Distributions (Continued...)
- Lecture 20 - Common Continuous Distributions
- Lecture 21 - Common Continuous Distributions (Continued...)
- Lecture 22 - Applications of Random Variable
- Lecture 23 - Applications of Random Variable (Continued...)
- Lecture 24 - Random vector and joint distribution
- Lecture 25 - Joint probability mass function
- Lecture 26 - Joint probability density function
- Lecture 27 - Independent random variables
- Lecture 28 - Independent random variables (Continued...)
- Lecture 29 - Functions of several random variables

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Functions of several random variables (Continued...)
- Lecture 31 - Some important results
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Probability Theory and Stochastic Processes (Tamil)

Subject Co-ordinator - Prof. S Dharmaraja

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Random Experiment, Sample Space and Sigma Field
- Lecture 2 - Axiomatic Definition of Probability
- Lecture 3 - Properties of Axiomatic Definition of Probability and Classical Definition of Probability
- Lecture 4 - Conditional Probability, Independent Events and Baye's Rule
- Lecture 5 - Definition of Random Variable
- Lecture 6 - Cumulative Distribution Function
- Lecture 7 - Discrete and Continuous Type Random Variables
- Lecture 8 - Mixed Type Random Variable
- Lecture 9 - Function of a Random Variable
- Lecture 10 - Mean
- Lecture 11 - Variance and Higher Order Moments
- Lecture 12 - Inequalities of Markov and Chebyshev
- Lecture 13 - Generating Functions
- Lecture 14 - Standard Discrete Distributions
- Lecture 15 - Standard Discrete Distributions (Continued...)
- Lecture 16 - Standard Continuous Distributions
- Lecture 17 - Standard Continuous Distributions (Continued...)
- Lecture 18 - Definition and Joint Distribution of a Random Vector
- Lecture 19 - Joint Probability Mass Function
- Lecture 20 - Joint Probability Density Function
- Lecture 21 - Independent Random Vector
- Lecture 22 - Distribution of Functions of Random Variables (Discrete Type)
- Lecture 23 - Distribution of Functions of Random Variables (Continuous Type)
- Lecture 24 - Conditional Distribution of Random Variables (Discrete Type)
- Lecture 25 - Conditional Distribution of Random Variables (Continuous Type)
- Lecture 26 - Expectation for Several Random Variables
- Lecture 27 - Covariance and Correlation Coefficient
- Lecture 28 - Generating Functions for Several Random Variables
- Lecture 29 - Conditional Expectation

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Modes of Convergence
- Lecture 31 - Modes of Convergence (Continued...)
- Lecture 32 - Law of Large Numbers
- Lecture 33 - Central Limit Theorem
- Lecture 34 - Definition and Classification of Stochastic Processes
- Lecture 35 - Properties of Stochastic Processes
- Lecture 36 - Properties of Stochastic Processes (Continued...)
- Lecture 37 - Standard Simple Stochastic Processes
- Lecture 38 - Definition of Discrete Time Markov Chain (DTMC)
- Lecture 39 - Chapman-Kolmogorov Equation
- Lecture 40 - Classification of States
- Lecture 41 - Classification of States (Continued...)
- Lecture 42 - Limiting Distribution
- Lecture 43 - Stationary Distribution
- Lecture 44 - Reducible Markov Chains
- Lecture 45 - Definition of Continuous Time Markov Chain (CTMC)
- Lecture 46 - Infinitesimal Generator Matrix
- Lecture 47 - Kolmogorov Differential Equations
- Lecture 48 - Limiting Distribution and Steady-State Distribution
- Lecture 49 - Birth Death Processes
- Lecture 50 - Introduction to Queueing Models and Kendall Notation
- Lecture 51 - Single-Server Queueing Models
- Lecture 52 - Single-Server Queueing Models (Continued...)
- Lecture 53 - Multi-Server Queueing Models

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Scientific Computing using Python (Hindi)

Subject Co-ordinator - Prof. Mani Mehra, Prof. Vivek K. Aggarwal

Co-ordinating Institute - IIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Python  
Lecture 2 - Introduction to Python (Continued...)  
Lecture 3 - Introduction to Python (Continued...)  
Lecture 4 - Introduction to Python (Continued...)  
Lecture 5 - Introduction to Python (Continued...)  
Lecture 6 - Introduction to Python (Continued...)  
Lecture 7 - Errors in Computation  
Lecture 8 - Errors in Computation (Continued...)  
Lecture 9 - Solution of Non-Linear Equation  
Lecture 10 - Solution of Non-Linear Equation (Continued...)  
Lecture 11 - Solution of Non-Linear Equation (Continued...)  
Lecture 12 - Vector and Matrix Norms  
Lecture 13 - Solution of System of Linear Equations  
Lecture 14 - Solution of System of Linear Equations (Continued...)  
Lecture 15 - Positive Definite Matrices  
Lecture 16 - Jacobi and Gauss-Seidal Iterative Methods  
Lecture 17 - Matrix Eigenvalue Computation: Power Method  
Lecture 18 - Gershgorin Theorem  
Lecture 19 - Polynomial Interpolation  
Lecture 20 - Polynomial Interpolation (Continued...)  
Lecture 21 - Polynomial Interpolation (Continued...)  
Lecture 22 - Polynomial Interpolation (Continued...)  
Lecture 23 - Polynomial Interpolation (Continued...)  
Lecture 24 - Polynomial Interpolation (Continued...)  
Lecture 25 - Polynomial Interpolation (Continued...) (Spline Method)  
Lecture 26 - Least Square Approximation  
Lecture 27 - Least Square Approximation (Continued...)  
Lecture 28 - Numerical Differentiation  
Lecture 29 - Numerical Differentiation (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Numerical Integration
- Lecture 31 - Numerical Integration (Continued...)
- Lecture 32 - Numerical Integration (Continued...)
- Lecture 33 - Numerical Solution of Initial Value Problems
- Lecture 34 - Numerical Solution of Initial Value Problems (Continued...)
- Lecture 35 - Numerical Solution of Initial Value Problems (Continued...)
- Lecture 36 - Numerical Solution of Boundary Value Problems

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Formal Languages and Automata Theory

Subject Co-ordinator - Dr. K.V. Krishna, Dr. Diganta Goswami

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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  $\Leftrightarrow$  DFA
- Lecture 10 - Myhill-Nerode Theorem
- Lecture 11 - Minimization
- Lecture 12 - RE  $\Rightarrow$  FA
- Lecture 13 - FA  $\Rightarrow$  RE
- Lecture 14 - FA  $\Leftrightarrow$  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  $\Leftrightarrow$  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 - Variants of Turing Machines

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Structured Grammars
- Lecture 31 - Decidability
- Lecture 32 - Undecidability 1
- Lecture 33 - Undecidability 2
- Lecture 34 - Undecidability 3
- Lecture 35 - Time Bounded Turing Machines
- Lecture 36 - P and NP
- Lecture 37 - NP-Completeness
- Lecture 38 - NP-Complete Problems 1
- Lecture 39 - NP-Complete Problems 2
- Lecture 40 - NP-Complete Problems 3
- Lecture 41 - Chomsky Hierarchy

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Complex Analysis

Subject Co-ordinator - Prof. P.A.S. Sree Krishna

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Introduction to Complex Numbers
- Lecture 3 - de Moivre's Formula and Stereographic Projection
- Lecture 4 - Topology of the Complex Plane - Part-I
- Lecture 5 - Topology of the Complex Plane - Part-II
- Lecture 6 - Topology of the Complex Plane - Part-III
- Lecture 7 - Introduction to Complex Functions
- Lecture 8 - Limits and Continuity
- Lecture 9 - Differentiation
- Lecture 10 - Cauchy-Riemann Equations and Differentiability
- Lecture 11 - Analytic functions; the exponential function
- Lecture 12 - Sine, Cosine and Harmonic functions
- Lecture 13 - Branches of Multifunctions; Hyperbolic Functions
- Lecture 14 - Problem Solving Session I
- Lecture 15 - Integration and Contours
- Lecture 16 - Contour Integration
- Lecture 17 - Introduction to Cauchy's Theorem
- Lecture 18 - Cauchy's Theorem for a Rectangle
- Lecture 19 - Cauchy's theorem - Part-II
- Lecture 20 - Cauchy's Theorem - Part-III
- Lecture 21 - Cauchy's Integral Formula and its Consequences
- Lecture 22 - The First and Second Derivatives of Analytic Functions
- Lecture 23 - Morera's Theorem and Higher Order Derivatives of Analytic Functions
- Lecture 24 - Problem Solving Session II
- Lecture 25 - Introduction to Complex Power Series
- Lecture 26 - Analyticity of Power Series
- Lecture 27 - Taylor's Theorem
- Lecture 28 - Zeroes of Analytic Functions
- Lecture 29 - Counting the Zeroes of Analytic Functions

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Open mapping theorem - Part-I
- Lecture 31 - Open mapping theorem - Part-II
- Lecture 32 - Properties of Mobius Transformations - Part-I
- Lecture 33 - Properties of Mobius Transformations - Part-II
- Lecture 34 - Problem Solving Session III
- Lecture 35 - Removable Singularities
- Lecture 36 - Poles Classification of Isolated Singularities
- Lecture 37 - Essential Singularity & Introduction to Laurent Series
- Lecture 38 - Laurent's Theorem
- Lecture 39 - Residue Theorem and Applications
- Lecture 40 - Problem Solving Session IV

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Finance

Subject Co-ordinator - Prof. Siddhartha Pratim Chakrabarty

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Financial Markets and Bonds
- Lecture 2 - Introduction to Stocks, Futures and Forwards and Swaps
- Lecture 3 - Introduction to Options
- Lecture 4 - Interest Rates and Present Value
- Lecture 5 - Present and Future Values, Annuities, Amortization and Bond Yield
- Lecture 6 - Price Yield Curve and Term Structure of Interest Rates
- Lecture 7 - Markowitz Theory, Return and Risk and Two Asset Portfolio
- Lecture 8 - Minimum Variance Portfolio and Feasible Set
- Lecture 9 - Multi Asset Portfolio, Minimum Variance Portfolio, Efficient Frontier and Minimum Variance Line
- Lecture 10 - Minimum Variance Line (Continued), Market Portfolio
- Lecture 11 - Capital Market Line, Capital Asset Pricing Model
- Lecture 12 - Performance Analysis
- Lecture 13 - No-Arbitrage Principle and Pricing of Forward Contracts
- Lecture 14 - Futures, Options and Put-Call-Parity
- Lecture 15 - Bounds on Options
- Lecture 16 - Derivative Pricing in a Single Period Binomial Model
- Lecture 17 - Derivative Pricing in Multiperiod Binomial Model
- Lecture 18 - Derivative Pricing in Binomial Model and Path Dependent Options
- Lecture 19 - Discrete Probability Spaces
- Lecture 20 - Filtrations and Conditional Expectations
- Lecture 21 - Properties of Conditional Expectations
- Lecture 22 - Examples of Conditional Expectations, Martingales
- Lecture 23 - Risk-Neutral Pricing of European Derivatives in Binomial Model
- Lecture 24 - Actual and Risk-Neutral Probabilities, Markov Process, American Options
- Lecture 25 - General Probability Spaces, Expectations, Change of Measure
- Lecture 26 - Filtrations, Independence, Conditional Expectations
- Lecture 27 - Brownian Motion and its Properties
- Lecture 28 - Itô Integral and its Properties
- Lecture 29 - Itô Formula, Itô Processes

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Multivariable Stochastic Calculus, Stochastic Differential Equations
- Lecture 31 - Black-Scholes-Merton (BSM) Model, BSM Equation, BSM Formula
- Lecture 32 - Greeks, Put-Call Parity, Change of Measure
- Lecture 33 - Girsanov Theorem, Risk-Neutral Pricing of Derivatives, BSM Formula
- Lecture 34 - MRT and Hedging, Multidimensional Girsanov and MRT
- Lecture 35 - Multidimensional BSM Model, Fundamental Theorems of Asset Pricing
- Lecture 36 - BSM Model with Dividend-Paying Stocks

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Portfolio Theory

Subject Co-ordinator - Prof. Siddhartha Pratim Chakrabarty

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Probability space and their properties, Random variables

Lecture 2 - Mean, variance, covariance and their properties

Lecture 3 - Linear regression; Binomial and normal distribution; Central Limit Theorem

Lecture 4 - Financial markets

Lecture 5 - Bonds and stocks

Lecture 6 - Binomial and geometric Brownian motion (gBm) asset pricing models

Lecture 7 - Expected return, risk and covariance of returns

Lecture 8 - Expected return and risk of a portfolio; Minimum variance portfolio

Lecture 9 - Multi-asset portfolio and Efficient frontier

Lecture 10 - Capital Market Line and Derivation of efficient frontier

Lecture 11 - Capital Asset Pricing Model and Single index model

Lecture 12 - Portfolio performance analysis

Lecture 13 - Utility functions and expected utility

Lecture 14 - Risk preferences of investors

Lecture 15 - Absolute Risk Aversion and Relative Risk Aversion

Lecture 16 - Portfolio theory with utility functions

Lecture 17 - Geometric Mean Return and Roy's Safety-First Criterion

Lecture 18 - Kataoka's Safety-First Criterion and Telser's Safety-First Criterion

Lecture 19 - Semi-variance framework

Lecture 20 - Stochastic dominance; First order stochastic dominance

Lecture 21 - Second order stochastic dominance and Third order stochastic dominance

Lecture 22 - Discrete time model and utility function

Lecture 23 - Optimal portfolio for single-period discrete time model

Lecture 24 - Optimal portfolio for multi-period discrete time model; Discrete Dynamic Programming

Lecture 25 - Continuous time model; Hamilton-Jacobi-Bellman PDE

Lecture 26 - Hamilton-Jacobi-Bellman PDE; Duality/Martingale Approach

Lecture 27 - Duality/Martingale Approach in Discrete and Continuous Time

Lecture 28 - Interest rates and bonds; Duration

Lecture 29 - Duration; Immunization

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Convexity; Hedging and Immunization
- Lecture 31 - Quantiles and their properties
- Lecture 32 - Value-at-Risk and its properties
- Lecture 33 - Average Value-at-Risk and its properties
- Lecture 34 - Asset allocation
- Lecture 35 - Portfolio optimization
- Lecture 36 - Portfolio optimization with constraints, Value-at-Risk

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Discrete-time Markov Chains and Poission Processes

Subject Co-ordinator - Prof. Ayon Ganguly, Prof. Subhamay Saha

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Review of Basic Probability - I
- Lecture 2 - Review of Basic Probability - II
- Lecture 3 - Review of Basic Probability - III
- Lecture 4 - Stochastic Processes
- Lecture 5 - Definition of Markov Chain and Transition Probabilities
- Lecture 6 - Markov Property and Chapman-Kolmogorov Equations
- Lecture 7 - Chapman-Kolmogorov Equations: Examples
- Lecture 8 - Accessibility and Communication of States
- Lecture 9 - Hitting Time - I
- Lecture 10 - Hitting Time - II
- Lecture 11 - Hitting Time - III
- Lecture 12 - Strong Markov Property
- Lecture 13 - Passage Time and Excursion
- Lecture 14 - Number of Visits
- Lecture 15 - Class Property
- Lecture 16 - Transience and Recurrence of Random Walks
- Lecture 17 - Stationary Distribution - I
- Lecture 18 - Stationary Distribution - II
- Lecture 19 - Stationary Distribution - III
- Lecture 20 - Limit Theorems - I
- Lecture 21 - Limit Theorems - II
- Lecture 22 - Some Problems - I
- Lecture 23 - Some Problems - II
- Lecture 24 - Time Reversibility
- Lecture 25 - Properties of Exponential Distribution
- Lecture 26 - Some Problems
- Lecture 27 - Order Statistics
- Lecture 28 - Poisson Processes
- Lecture 29 - Poisson Thinning - I

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- Lecture 30 - Poisson Thinning - II
- Lecture 31 - Conditional Arrival Times
- Lecture 32 - Independent Poisson Processes
- Lecture 33 - Some Problems
- Lecture 34 - Compound Poisson Processes

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Queueing Theory

Subject Co-ordinator - Prof. N. Selvaraju

Co-ordinating Institute - IIT - Guwahati

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Queueing Systems, System Performance Measures
- Lecture 2 - Characteristics of Queueing Systems, Kendall's Notation
- Lecture 3 - Little's Law, General Relationships
- Lecture 4 - Laplace and Laplace-Stieltjes Transforms, Probability Generating Functions
- Lecture 5 - An Overview of Stochastic Processes
- Lecture 6 - Markov Chains: Definition, Transition Probabilities
- Lecture 7 - Classification Properties of Markov Chains
- Lecture 8 - Long-Term Behaviour of Markov Chains
- Lecture 9 - Exponential Distribution and its Properties, Poisson Process
- Lecture 10 - Poisson Process and its Properties, Generalizations
- Lecture 11 - Continuous-Time Markov Chains, Generator Matrix, Kolmogorov Equations
- Lecture 12 - Stationary and Limiting Distributions of CTMC, Balance Equations, Birth-Death Processes
- Lecture 13 - Birth-Death Queues: General Theory, M/M/1 Queues and their Steady State Solution
- Lecture 14 - M/M/1 Queues: Performance Measures, PASTA Property, Waiting Time Distributions
- Lecture 15 - M/M/c Queues, Erlang Delay Formula
- Lecture 16 - M/M/c/K Queues
- Lecture 17 - Erlang's Loss System, Erlang Loss Formula, Infinite-Server Queues
- Lecture 18 - Finite-Source Queues, Engset Loss System, State-Dependent Queues, Queues with Impatience
- Lecture 19 - Transient Solutions: M/M/1/1, Infinite-Server and M/M/1 Queues, Busy Period Analysis
- Lecture 20 - Queues with Bulk Arrivals
- Lecture 21 - Queues with Bulk Service
- Lecture 22 - Erlang and Phase-Type Distributions
- Lecture 23 - Erlangian Queues: Erlangian Arrivals, Erlangian Service Times
- Lecture 24 - Nonpreemptive Priority Queues
- Lecture 25 - Nonpreemptive and Preemptive Priority Queues
- Lecture 26 - M/M/1 Retrial Queues
- Lecture 27 - Discrete-Time Queues: Geo/Geo/1 (EAS), Geo/Geo/1 (LAS)
- Lecture 28 - Introduction to Queueing Networks, Two-Node Network
- Lecture 29 - Burke's Theorem, General Setup, Tandem Networks

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Queueing Networks with Blocking, Open Jackson Networks
- 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/∞ 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Applied Multivariate Analysis

Subject Co-ordinator - Dr. Sharmishtha Mitra

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Prologue
- Lecture 2 - Basic concepts on multivariate distribution
- Lecture 3 - Basic concepts on multivariate distribution
- Lecture 4 - Multivariate normal distribution - I
- Lecture 5 - Multivariate normal distribution - II
- Lecture 6 - Multivariate normal distribution - III
- Lecture 7 - Some problems on multivariate distributions - I
- Lecture 8 - Some problems on multivariate distributions - II
- Lecture 9 - Random sampling from multivariate normal distribution and Wishart distribution - I
- Lecture 10 - Random sampling from multivariate normal distribution and Wishart distribution - II
- Lecture 11 - Random sampling from multivariate normal distribution and Wishart distribution - III
- Lecture 12 - Wishart distribution and its properties - I
- Lecture 13 - Wishart distribution and its properties - II
- Lecture 14 - Hotelling's  $T^2$  distribution and its applications
- Lecture 15 - Hotelling's  $T^2$  distribution and various confidence intervals and regions
- Lecture 16 - Hotelling's  $T^2$  distribution and Profile analysis
- Lecture 17 - Profile analysis - I
- Lecture 18 - Profile analysis - II
- Lecture 19 - MANOVA - I
- Lecture 20 - MANOVA - II
- Lecture 21 - MANOVA - III
- Lecture 22 - MANOVA & Multiple Correlation Coefficient
- Lecture 23 - Multiple Correlation Coefficient
- Lecture 24 - Principal Component Analysis
- Lecture 25 - Principal Component Analysis
- Lecture 26 - Principal Component Analysis
- Lecture 27 - Cluster Analysis
- Lecture 28 - Cluster Analysis
- Lecture 29 - Cluster Analysis

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Cluster Analysis
- Lecture 31 - Discriminant Analysis and Classification
- 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 - Canonical Correlation Analysis
- Lecture 42 - Canonical Correlation Analysis
- Lecture 43 - Canonical Correlation Analysis
- Lecture 44 - Canonical Correlation Analysis

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Calculus of Variations and Integral Equations

Subject Co-ordinator - Dr. Malay Banerjee, Prof. D. Bahuguna

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Calculus of Variations and Integral Equations  
Lecture 2 - Calculus of Variations and Integral Equations  
Lecture 3 - Calculus of Variations and Integral Equations  
Lecture 4 - Calculus of Variations and Integral Equations  
Lecture 5 - Calculus of Variations and Integral Equations  
Lecture 6 - Calculus of Variations and Integral Equations  
Lecture 7 - Calculus of Variations and Integral Equations  
Lecture 8 - Calculus of Variations and Integral Equations  
Lecture 9 - Calculus of Variations and Integral Equations  
Lecture 10 - Calculus of Variations and Integral Equations  
Lecture 11 - Calculus of Variations and Integral Equations  
Lecture 12 - Calculus of Variations and Integral Equations  
Lecture 13 - Calculus of Variations and Integral Equations  
Lecture 14 - Calculus of Variations and Integral Equations  
Lecture 15 - Calculus of Variations and Integral Equations  
Lecture 16 - Calculus of Variations and Integral Equations  
Lecture 17 - Calculus of Variations and Integral Equations  
Lecture 18 - Calculus of Variations and Integral Equations  
Lecture 19 - Calculus of Variations and Integral Equations  
Lecture 20 - Calculus of Variations and Integral Equations  
Lecture 21 - Calculus of Variations and Integral Equations  
Lecture 22 - Calculus of Variations and Integral Equations  
Lecture 23 - Calculus of Variations and Integral Equations  
Lecture 24 - Calculus of Variations and Integral Equations  
Lecture 25 - Calculus of Variations and Integral Equations  
Lecture 26 - Calculus of Variations and Integral Equations  
Lecture 27 - Calculus of Variations and Integral Equations  
Lecture 28 - Calculus of Variations and Integral Equations  
Lecture 29 - Calculus of Variations and Integral Equations

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Calculus of Variations and Integral Equations
- Lecture 31 - Calculus of Variations and Integral Equations
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Linear programming and Extensions

Subject Co-ordinator - Prof. Prabha Sharma

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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, Bland'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  $\{a_{ij}\}$

Lecture 20 - Assignment 4, postoptimality analysis, changes in  $b$ , adding a new constraint, changes in  $\{a_{ij}\}$

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 cycle
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Convex Optimization

Subject Co-ordinator - Dr. Joydeep Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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  
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Lecture 27 - Convex Optimization  
Lecture 28 - Convex Optimization  
Lecture 29 - Convex Optimization

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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Lecture 30 - Convex Optimization  
Lecture 31 - Convex Optimization  
Lecture 32 - Convex Optimization  
Lecture 33 - Convex Optimization  
Lecture 34 - Convex Optimization  
Lecture 35 - Convex Optimization  
Lecture 36 - Convex Optimization  
Lecture 37 - Convex Optimization  
Lecture 38 - Convex Optimization  
Lecture 39 - Convex Optimization  
Lecture 40 - Convex Optimization  
Lecture 41 - Convex Optimization  
Lecture 42 - Convex Optimization

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Foundations of Optimization

Subject Co-ordinator - Dr. Joydeep Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Optimization  
Lecture 2 - Optimization  
Lecture 3 - Optimization  
Lecture 4 - Optimization  
Lecture 5 - Optimization  
Lecture 6 - Optimization  
Lecture 7 - Optimization  
Lecture 8 - Optimization  
Lecture 9 - Optimization  
Lecture 10 - Optimization  
Lecture 11 - Optimization  
Lecture 12 - Optimization  
Lecture 13 - Optimization  
Lecture 14 - Optimization  
Lecture 15 - Optimization  
Lecture 16 - Optimization  
Lecture 17 - Optimization  
Lecture 18 - Optimization  
Lecture 19 - Optimization  
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Lecture 24 - Optimization  
Lecture 25 - Optimization  
Lecture 26 - Optimization  
Lecture 27 - Optimization  
Lecture 28 - Optimization  
Lecture 29 - Optimization

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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Lecture 30 - Optimization  
Lecture 31 - Optimization  
Lecture 32 - Optimization  
Lecture 33 - Optimization  
Lecture 34 - Optimization  
Lecture 35 - Optimization  
Lecture 36 - Optimization  
Lecture 37 - Optimization  
Lecture 38 - Optimization

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Probability Theory and Applications

Subject Co-ordinator - Prof. Prabha Sharma

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Basic principles of counting
- Lecture 2 - Sample space, events, axioms of probability
- Lecture 3 - Conditional probability, Independence of events
- Lecture 4 - Random variables, cumulative density function, expected value
- Lecture 5 - Discrete random variables and their distributions
- Lecture 6 - Discrete random variables and their distributions
- Lecture 7 - Discrete random variables and their distributions
- Lecture 8 - Continuous random variables and their distributions
- Lecture 9 - Continuous random variables and their distributions
- Lecture 10 - Continuous random variables and their distributions
- Lecture 11 - Function of random variables, Moment generating function
- Lecture 12 - Jointly distributed random variables, Independent r. v. and their sums
- Lecture 13 - Independent r. v. and their sums
- Lecture 14 - Chi square r. v., sums of independent normal r. v., Conditional distr
- Lecture 15 - Conditional distri, Joint distr. of functions of r. v., Order statistics
- Lecture 16 - Order statistics, Covariance and correlation
- Lecture 17 - Covariance, Correlation, Cauchy-Schwarz inequalities, Conditional expectation
- Lecture 18 - Conditional expectation, Best linear predictor
- Lecture 19 - Inequalities and bounds
- Lecture 20 - Convergence and limit theorems
- Lecture 21 - Central limit theorem
- Lecture 22 - Applications of central limit theorem
- Lecture 23 - Strong law of large numbers, Joint mgf
- Lecture 24 - Convolutions
- Lecture 25 - Stochastic processes
- Lecture 26 - Transition and state probabilities
- Lecture 27 - State prob., First passage and First return prob
- Lecture 28 - First passage and First return prob. Classification of states
- Lecture 29 - Random walk, periodic and null states

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- Lecture 30 - Reducible Markov chains
- Lecture 31 - Time reversible Markov chains
- Lecture 32 - Poisson Processes
- Lecture 33 - Inter-arrival times, Properties of Poisson processes
- Lecture 34 - Queuing Models
- Lecture 35 - Analysis of  $L$ ,  $L_q$ ,  $W$  and  $W_q$ , M/M/S model
- Lecture 36 - M/M/S, M/M/I/K models
- Lecture 37 - M/M/I/K and M/M/S/K models
- Lecture 38 - Application to reliability theory failure law
- Lecture 39 - Exponential failure law, Weibull law
- Lecture 40 - Reliability of systems

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Basic Calculus for Engineers, Scientists and Economists

Subject Co-ordinator - Dr. Joydeep Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Numbers  
Lecture 2 - Functions-1  
Lecture 3 - Sequence-1  
Lecture 4 - Sequence-2  
Lecture 5 - Limits and Continuity-1  
Lecture 6 - Limits and Continuity-2  
Lecture 7 - Limits And Continuity-3  
Lecture 8 - Derivative-1  
Lecture 9 - Derivative-2  
Lecture 10 - Maxima And Minima  
Lecture 11 - Mean-Value Theorem And Taylors Expansion-1  
Lecture 12 - Mean-Value Theorem And Taylors Expansion-2  
Lecture 13 - Integration-1  
Lecture 14 - Integration-2  
Lecture 15 - Integration By Parts  
Lecture 16 - Definite Integral  
Lecture 17 - Riemann Integration-1  
Lecture 18 - Riemann Integration-2  
Lecture 19 - Functions Of Two Or More Variables  
Lecture 20 - Limits And Continuity Of Functions Of Two Variable  
Lecture 21 - Differentiation Of Functions Of Two Variables-1  
Lecture 22 - Differentiation Of Functions Of Two Variables-2  
Lecture 23 - Unconstrained Minimization Of Funtions Of Two Variables  
Lecture 24 - Constrained Minimization And Lagrange Multiplier Rules  
Lecture 25 - Infinite Series-1  
Lecture 26 - Infinite Series-2  
Lecture 27 - Infinite Series-3  
Lecture 28 - Multiple Integrals-1  
Lecture 29 - Multiple Integrals-2

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Lecture 30 - Multiple Integrals-3

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Probability and Stochastics for finance

Subject Co-ordinator - Dr. Joydeep Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Differential Calculus in Several Variables

Subject Co-ordinator - Prof. Sudipta Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Several Variables and Notion Of distance in  $R^n$
- Lecture 2 - Countinuity And Compactness
- Lecture 3 - Countinuity And Connectdness
- Lecture 4 - Derivatives
- Lecture 5 - Matrix Of Linear Transformation
- Lecture 6 - Examples for Differentiable function
- Lecture 7 - Sufficient condition of differentiability
- Lecture 8 - Chain Rule
- Lecture 9 - Mean Value Theorem
- Lecture 10 - Higher Order Derivatives
- Lecture 11 - Taylor's Formula
- Lecture 12 - Maximum And Minimum
- Lecture 13 - Second derivative test for maximum, minimum and saddle point
- Lecture 14 - We formalise the second derivative test discussed in Lecture 2 and do examples
- Lecture 15 - Specialisation to functions of two variables
- Lecture 16 - Implicit Function Theorem
- Lecture 17 - Implicit Function Theorem -a
- Lecture 18 - Application of IFT
- Lecture 19 - Application of IFT
- Lecture 20 - Application of IFT
- Lecture 21 - Application of IFT

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Curves and Surfaces

Subject Co-ordinator - Prof. Sudipta Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Level curves and locus, definition of parametric curves, tangent, arc length, arc length parameter
- Lecture 2 - How much a curve is  $\hat{A}$  curved $\hat{A}$ , signed unit normal and signed curvature, rigid motions, constant
- 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, t
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Linear Regression Analysis and Forecasting

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Basic Fundamental Concepts Of Modelling

Lecture 2 - Regression Model - A Statistical Tool

Lecture 3 - Simple Linear Regression Analysis

Lecture 4 - Estimation Of Parameters In Simple Linear Regression Model

Lecture 5 - Estimation Of Parameters In Simple Linear Regression Model (Continued...)

Lecture 6 - Estimation Of Parameters In Simple Linear Regression Model (Continued...)

Lecture 7 - Maximum Likelihood Estimation of Parameters in Simple Linear Regression Model

Lecture 8 - Testing of Hypothesis and Confidence Interval Estimation in Simple Linear Regression Model

Lecture 9 - Testing of Hypothesis and Confidence Interval Estimation in Simple Linear Regression Model (Continued...)

Lecture 10 - Software Implementation in Simple Linear Regression Model using MINITAB

Lecture 11 - Multiple Linear Regression Model

Lecture 12 - Estimation of Model Parameters in Multiple Linear Regression Model

Lecture 13 - Estimation of Model Parameters in Multiple Linear Regression Model (Continued...)

Lecture 14 - Standardized Regression Coefficients and Testing of Hypothesis

Lecture 15 - Testing of Hypothesis (Continued...) and Goodness of Fit of the Model

Lecture 16 - Diagnostics in Multiple Linear Regression Model

Lecture 17 - Diagnostics in Multiple Linear Regression Model (Continued...)

Lecture 18 - Diagnostics in Multiple Linear Regression Model (Continued...)

Lecture 19 - Software Implementation of Multiple Linear Regression Model using MINITAB

Lecture 20 - Software Implementation of Multiple Linear Regression Model using MINITAB (Continued...)

Lecture 21 - Forecasting in Multiple Linear Regression Model

Lecture 22 - Within Sample Forecasting

Lecture 23 - Outside Sample Forecasting

Lecture 24 - Software Implementation of Forecasting using MINITAB

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to R Software

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - How to Learn and Follow the Course

Lecture 2 - Why R and Installation Procedure

Lecture 3 - Introduction \_Help\_ Demo examples\_ packages\_ libraries

Lecture 4 - Introduction \_Command line\_ Data editor \_ Rstudio

Lecture 5 - Basics in Calculations

Lecture 6 - Basics of Calculations \_ Calculator \_Built in Functions Assignments

Lecture 7 - Basics of Calculations \_Functions \_Matrices

Lecture 8 - Basics Calculations

Lecture 9 - Basics Calculations

Lecture 10 - Basics Calculations

Lecture 11 - Basics Calculations

Lecture 12 - Basics Calculations

Lecture 13 - Basics Calculations

Lecture 14 - Basics Calculations

Lecture 15 - Data management - Sequences

Lecture 16 - Data management - sequences

Lecture 17 - Data management - Repeats

Lecture 18 - Data management - Sorting and Ordering

Lecture 19 - Data management - Lists

Lecture 20 - Data management - Lists (Continued...)

Lecture 21 - Data management - Vector indexing

Lecture 22 - Data management - Vector Indexing (Continued...)

Lecture 23 - Data management - Factors

Lecture 24 - Data management - factors (Continued...)

Lecture 25 - Strings - Display and Formatting, Print and Format Functions

Lecture 26 - Strings - Display and Formatting, Print and Format with Concatenate

Lecture 27 - Strings - Display and Formatting, Paste Function

Lecture 28 - Strings - Display and Formatting, Splitting

Lecture 29 - Strings - Display and Formatting, Replacement\_ Manipulations \_Alphabets

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Strings - Display and Formatting, Replacement and Evaluation of Strings
- Lecture 31 - Data frames
- Lecture 32 - Data frames (Continued...)
- Lecture 33 - Data frames (Continued...)
- Lecture 34 - Data Handling - Importing CSV and Tabular Data Files
- Lecture 35 - Data Handling - Importing Data Files from Other Software
- Lecture 36 - Statistical Functions - Frequency and Partition values
- Lecture 37 - Statistical Functions - Graphics and Plots
- Lecture 38 - Statistical Functions - Central Tendency and Variation
- Lecture 39 - Statistical Functions - Boxplots, Skewness and Kurtosis
- Lecture 40 - Statistical Functions - Bivariate three dimensional plot
- Lecture 41 - Statistical Functions - Correlation and Examples of Programming
- Lecture 42 - Examples of Programming
- Lecture 43 - Examples of More Programming

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Descriptive Statistics with R Software

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to R Software  
Lecture 2 - Basics and R as a Calculator  
Lecture 3 - Calculations with Data Vectors  
Lecture 4 - Built-in Commands and Missing Data Handling  
Lecture 5 - Operations with Matrices  
Lecture 6 - Objectives, Steps and Basic Definitions  
Lecture 7 - Variables and Types of Data  
Lecture 8 - Absolute Frequency, Relative Frequency and Frequency Distribution  
Lecture 9 - Frequency Distribution and Cumulative Distribution Function  
Lecture 10 - Bar Diagrams  
Lecture 11 - Subdivided Bar Plots and Pie Diagrams  
Lecture 12 - 3D Pie Diagram and Histogram  
Lecture 13 - Kernel Density and Stem - Leaf Plots  
Lecture 14 - Arithmetic Mean  
Lecture 15 - Median  
Lecture 16 - Quantiles  
Lecture 17 - Mode, Geometric Mean and Harmonic Mean  
Lecture 18 - Range, Interquartile Range and Quartile Deviation  
Lecture 19 - Absolute Deviation and Absolute Mean Deviation  
Lecture 20 - Mean Squared Error, Variance and Standard Deviation  
Lecture 21 - Coefficient of Variation and Boxplots  
Lecture 22 - Raw and Central Moments  
Lecture 23 - Sheppard's Correction, Absolute Moments and Computation of Moments  
Lecture 24 - Skewness and Kurtosis  
Lecture 25 - Univariate and Bivariate Scatter Plots  
Lecture 26 - Smooth Scatter Plots  
Lecture 27 - Quantile-Quantile and Three Dimensional Plots  
Lecture 28 - Correlation Coefficient  
Lecture 29 - Correlation Coefficient Using R Software

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Rank Correlation Coefficient
- Lecture 31 - Measures of Association for Discrete and Counting Variables - Part 1
- Lecture 32 - Measures of Association for Discrete and Counting Variables - Part 2
- Lecture 33 - Least Squares Method - One Variable
- Lecture 34 - Least Squares Method - R Commands and More than One Variables

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Calculus of Several Real Variables

Subject Co-ordinator - Dr. Joydeep Dutta

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Vectors in plane and space
- Lecture 2 - Inner product and distance
- Lecture 3 - Application to real world problems
- Lecture 4 - Matrices and determinants
- Lecture 5 - Cross product of two vectors
- Lecture 6 - Higher dimensional Euclidean space
- Lecture 7 - Functions of more than one real-variable
- Lecture 8 - Partial derivatives and Continuity
- Lecture 9 - Vector-valued maps and Jacobian matrix
- Lecture 10 - Chain rule for partial derivatives
- Lecture 11 - The Gradient Vector and Directional Derivative
- Lecture 12 - The Implicit Function Theorem
- Lecture 13 - Higher Order Partial Derivatives
- Lecture 14 - Taylor's Theorem in Higher Dimension
- Lecture 15 - Maxima and Minima for Several Variables
- Lecture 16 - Second Derivative Test for Maximum and Minimum
- Lecture 17 - Constrained Optimization and The Lagrange Multiplier Rule
- Lecture 18 - Vector Valued Function and Classical Mechanics
- Lecture 19 - Arc Length
- Lecture 20 - Vector Fields
- Lecture 21 - Multiple Integral - I
- Lecture 22 - Multiple Integral - II
- Lecture 23 - Multiple Integral - III
- Lecture 24 - Multiple Integral - IV
- Lecture 25 - Cylindrical and Spherical Coordinates
- Lecture 26 - Multiple Integrals and Mechanics
- Lecture 27 - Line Integral - I
- Lecture 28 - Line Integral - II
- Lecture 29 - Parametrized Surfaces

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- Lecture 30 - Area of a surface Integral
- Lecture 31 - Area of parametrized surface
- Lecture 32 - Surface Integrals
- Lecture 33 - Green's Theorem
- Lecture 34 - Stoke's Theorem
- Lecture 35 - Examples of Stoke's Theorem
- Lecture 36 - Gauss Divergence Theorem
- Lecture 37 - Facts about vector fields

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. A.K. Lal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Notations, Motivation and Definition
- Lecture 2 - Matrix: Examples, Transpose and Addition
- Lecture 3 - Matrix Multiplication
- Lecture 4 - Matrix Product Recalled
- Lecture 5 - Matrix Product (Continued...)
- Lecture 6 - Inverse of a Matrix
- Lecture 7 - Introduction to System of Linear Equations
- Lecture 8 - Some Initial Results on Linear Systems
- Lecture 9 - Row Echelon Form (REF)
- Lecture 10 - LU Decomposition - Simplest Form
- Lecture 11 - Elementary Matrices
- Lecture 12 - Row Reduced Echelon Form (RREF)
- Lecture 13 - Row Reduced Echelon Form (RREF) (Continued...)
- Lecture 14 - RREF and Inverse
- Lecture 15 - Rank of a matrix
- Lecture 16 - Solution Set of a System of Linear Equations
- Lecture 17 - System of n Linear Equations in n Unknowns
- Lecture 18 - Determinant
- Lecture 19 - Permutations and the Inverse of a Matrix
- Lecture 20 - Inverse and the Cramer's Rule
- Lecture 21 - Vector Spaces
- Lecture 22 - Vector Subspaces and Linear Span
- Lecture 23 - Linear Combination, Linear Independence and Dependence
- Lecture 24 - Basic Results on Linear Independence
- Lecture 25 - Results on Linear Independence (Continued...)
- Lecture 26 - Basis of a Finite Dimensional Vector Space
- Lecture 27 - Fundamental Spaces associated with a Matrix
- Lecture 28 - Rank - Nullity Theorem
- Lecture 29 - Fundamental Theorem of Linear Algebra

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Definition and Examples of Linear Transformations
- Lecture 31 - Results on Linear Transformations
- Lecture 32 - Rank-Nullity Theorem and Applications
- Lecture 33 - Isomorphism of Vector Spaces
- Lecture 34 - Ordered Basis of a Finite Dimensional Vector Space
- Lecture 35 - Ordered Basis (Continued...)
- Lecture 36 - Matrix of a Linear Transformation
- Lecture 37 - Matrix of a Linear Transformation (Continued...)
- Lecture 38 - Matrix of a Linear Transformation (Continued...)
- Lecture 39 - Similarity of Matrices
- Lecture 40 - Inner Product Space
- Lecture 41 - Inner Product (Continued...)
- Lecture 42 - Cauchy Schwartz Inequality
- Lecture 43 - Projection on a Vector
- Lecture 44 - Results on Orthogonality
- Lecture 45 - Results on Orthogonality (Continued...)
- Lecture 46 - Gram-Schmidt Orthonormalization Process
- Lecture 47 - Orthogonal Projections
- Lecture 48 - Gram-Schmidt Process: Applications
- Lecture 49 - Examples and Applications on QR-decomposition
- Lecture 50 - Recapitulate ideas on Inner Product Spaces
- Lecture 51 - Motivation on Eigenvalues and Eigenvectors
- Lecture 52 - Examples and Introduction to Eigenvalues and Eigenvectors
- Lecture 53 - Results on Eigenvalues and Eigenvectors
- Lecture 54 - Results on Eigenvalues and Eigenvectors (Continued...)
- Lecture 55 - Results on Eigenvalues and Eigenvectors (Continued...)
- Lecture 56 - Diagonalizability
- Lecture 57 - Diagonalizability (Continued...)
- Lecture 58 - Schur's Unitary Triangularization (SUT)
- Lecture 59 - Applications of Schur's Unitary Triangularization
- Lecture 60 - Spectral Theorem for Hermitian Matrices
- Lecture 61 - Cayley Hamilton Theorem
- Lecture 62 - Quadratic Forms
- Lecture 63 - Sylvester's Law of Inertia
- Lecture 64 - Applications of Quadratic Forms to Analytic Geometry
- Lecture 65 - Examples of Conics and Quartics
- Lecture 66 - Singular Value Decomposition (SVD)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Computational Number Theory and Algebra

Subject Co-ordinator - Prof. Nitin Saxena

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Background
- Lecture 3 - GCD algorithm and Chinese Remainder Theorem
- Lecture 4 - Fast polynomial multiplication
- Lecture 5 - Fast polynomial multiplication (Continued...)
- Lecture 6 - Fast integer multiplication and division
- Lecture 7 - Fast integer arithmetic and matrix multiplication
- Lecture 8 - Matrix Multiplication Tensor
- Lecture 9 - Polynomial factoring over finite fields
- Lecture 10 - Equi-degree factorization and idea of Berlekamp's algorithm
- Lecture 11 - Berlekamp's algorithm as a reduction method
- Lecture 12 - Factoring over finite fields
- Lecture 13 - Reed Solomon Error Correcting Codes
- Lecture 14 - List Decoding
- Lecture 15 - Bivariate Factorization - Hensel Lifting
- Lecture 16 - Bivariate polynomial factoring (Continued...)
- Lecture 17 - Multivariate Polynomial Factorization
- Lecture 18 - Multivariate Factoring - Hilbert's Irreducibility Theorem
- Lecture 19 - Multivariate factoring (Continued...)
- Lecture 20 - Analysis of LLL algorithm
- Lecture 21 - Analysis of LLL algorithm (Continued...)
- Lecture 22 - Analysis of LLL-reduced basis algorithm and Introduction to NTRU cryptosystem
- Lecture 23 - NTRU cryptosystem (Continued...) and Introduction to Primality testing
- Lecture 24 - Randomized Primality testing
- Lecture 25 - Deterministic primality test (AKS) and RSA cryptosystem
- Lecture 26 - Integer factoring
- Lecture 27 - Pollard's  $p-1$ , Fermat, Morrison-Brillhart, Quadratic and Number field sieve methods

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Basic Calculus 1 and 2

Subject Co-ordinator - Prof. Parasar Mohanty

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Real numbers and Archimedean property
- Lecture 2 - Supremum and Decimal representation of Reals
- Lecture 3 - Functions
- Lecture 4 - Functions continued and Limits
- Lecture 5 - Limits (Continued...)
- Lecture 6 - Limits (Continued...) and Continuity
- Lecture 7 - Continuity and Intermediate Value Property
- Lecture 8 - Differentiation
- Lecture 9 - Chain Rule
- Lecture 10 - Nth derivative of a function
- Lecture 11 - Local extrema and Rolle's theorem
- Lecture 12 - Mean value theorem and Monotone functions
- Lecture 13 - Local extremum tests
- Lecture 14 - Concavity and points of inflection
- Lecture 15 - Asymptotes and plotting graph of functions
- Lecture 16 - Optimization and L'Hospital Rule
- Lecture 17 - L'Hospital Rule continued and Cauchy Mean value theorem
- Lecture 18 - Approximation of Roots
- Lecture 19 - Antiderivative and Riemann Integration
- Lecture 20 - Riemann's criterion for Integrability
- Lecture 21 - Integration and its properties
- Lecture 22 - Area and Mean value theorem for integrals
- Lecture 23 - Fundamental theorem of Calculus
- Lecture 24 - Integration by parts and Trapezoidal rule
- Lecture 25 - Simpson's rule and Substitution in integrals
- Lecture 26 - Area between curves
- Lecture 27 - Arc Length and Parametric curves
- Lecture 28 - Polar Co-ordinates
- Lecture 29 - Area of curves in polar coordinates

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Volume of solids
- Lecture 31 - Improper Integrals
- Lecture 32 - Sequences
- Lecture 33 - Algebra of sequences and Sandwich theorem
- Lecture 34 - Subsequences
- Lecture 35 - Series
- Lecture 36 - Comparison tests for Series
- Lecture 37 - Ratio and Root test for series
- Lecture 38 - Integral test and Leibniz test for series
- Lecture 39 - Revision - I
- Lecture 40 - Revision - II

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Partial Differential Equations

Subject Co-ordinator - Prof. Kaushik Bal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Essentials of Data Science With R Software 1: Probability and Statistics

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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 Tschebyschev's Inequality

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Degenerate and Discrete Uniform Distributions
- Lecture 31 - Discrete Uniform Distribution in R
- Lecture 32 - Bernoulli and Binomial Distribution
- Lecture 33 - Binomial Distribution in R
- Lecture 34 - Poisson Distribution
- Lecture 35 - Poisson Distribution in R
- Lecture 36 - Geometric Distribution
- Lecture 37 - Geometric Distribution in R
- Lecture 38 - Continuous Random Variables and Uniform Distribution
- Lecture 39 - Normal Distribution
- Lecture 40 - Normal Distribution in R
- Lecture 41 - Normal Distribution - More Results
- Lecture 42 - Exponential Distribution
- Lecture 43 - Bivariate Probability Distribution for Discrete Random Variables
- Lecture 44 - Bivariate Probability Distribution in R Software
- Lecture 45 - Bivariate Probability Distribution for Continuous Random Variables
- Lecture 46 - Examples in Bivariate Probability Distribution Functions
- Lecture 47 - Covariance and Correlation
- Lecture 48 - Covariance and Correlation  $\hat{a}$  • Examples and R Software
- Lecture 49 - Bivariate Normal Distribution
- Lecture 50 - Chi square Distribution
- Lecture 51 - t-Distribution
- Lecture 52 - F-Distribution
- Lecture 53 - Distribution of Sample Mean, Convergence in Probability and Weak Law of Large Numbers
- Lecture 54 - Central Limit Theorem
- Lecture 55 - Needs for Drawing Statistical Inferences
- Lecture 56 - Unbiased Estimators
- Lecture 57 - Efficiency of Estimators
- Lecture 58 - Cram r Rao Lower Bound and Efficiency of Estimators
- Lecture 59 - Consistency and Sufficiency of Estimators
- Lecture 60 - Method of Moments
- Lecture 61 - Method of Maximum Likelihood and Rao Blackwell Theorem
- Lecture 62 - Basic Concepts of Confidence Interval Estimation
- Lecture 63 - Confidence Interval for Mean in One Sample with Known Variance
- Lecture 64 - Confidence Interval for Mean and Variance
- Lecture 65 - Basics of Tests of Hypothesis and Decision Rules
- Lecture 66 - Test Procedures for One Sample Test for Mean with Known Variance
- Lecture 67 - One Sample Test for Mean with Unknown Variance
- Lecture 68 - Two Sample Test for Mean with Known and Unknown Variances

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Essentials of Data Science With R Software 2: Sampling Theory and Line

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - What is Data Science ?

Lecture 2 - Installation and Working with R

Lecture 3 - Calculations with R as a Calculator

Lecture 4 - Calculations with Data Vectors

Lecture 5 - Built-in Commands and Missing Data Handling

Lecture 6 - Operations with Matrices

Lecture 7 - Data Handling

Lecture 8 - Graphics and Plots

Lecture 9 - Sampling, Sampling Unit, Population and Sample

Lecture 10 - Terminologies and Concepts

Lecture 11 - Ensuring Representativeness and Type of Surveys

Lecture 12 - Conducting Surveys and Ensuring Representativeness

Lecture 13 - SRSWOR, SRSWR, and Selection of Unit - 1

Lecture 14 - SRSWOR, SRSWR, and Selection of Unit - 2

Lecture 15 - Probabilities of Selection of Samples

Lecture 16 - SRSWOR and SRSWR with R with sample Package

Lecture 17 - Examples of SRS with R using sample Package

Lecture 18 - Simple Random Sampling : SRS with R using sampling and sample Packages

Lecture 19 - Simple Random Sampling : Estimation of Population Mean

Lecture 20 - Simple Random Sampling : Estimation of Population Variance

Lecture 21 - Simple Random Sampling : Estimation of Population Variance

Lecture 22 - SRS: Confidence Interval Estimation of Population Mean

Lecture 23 - SRS: Estimation of Mean, Variance and Confidence Interval in SRSWOR using R

Lecture 24 - SRS: Estimation of Mean, Variance and Confidence Interval in SRSWR using R

Lecture 25 - Sampling for Proportions and Percentages : Basic Concepts

Lecture 26 - Sampling for Proportions and Percentages : Mean and Variance of Sample Proportion

Lecture 27 - Sampling for Proportions and Percentages : Sampling for Proportions with R

Lecture 28 - Stratified Random Sampling : Drawing the Sample and Sampling Procedure

Lecture 29 - Stratified Random Sampling : Estimation of Population Mean, Population Variance and Confidence Interval

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Stratified Random Sampling : Sample Allocation and Variances Under Allocation
- Lecture 31 - Stratified Random Sampling : Drawing of Sample Using sampling and strata Packages in R
- Lecture 32 - Stratified Random Sampling : Drawing of Sample Using survey Package in R
- Lecture 33 - Bootstrap Methodology : What is Bootstrap and Methodology
- Lecture 34 - Bootstrap Methodology : EDF, Bootstrap Bias and Bootstrap Standard Errors
- Lecture 35 - Bootstrap Methodology : Bootstrap Analysis Using boot Package in R
- Lecture 36 - Bootstrap Methodology : Bootstrap Confidence Interval
- Lecture 37 - Bootstrap Methodology : Bootstrap Confidence Interval Using boot and bootstrap Packages in R
- Lecture 38 - Bootstrap Methodology : Example of Bootstrap Analysis Using boot Package
- Lecture 39 - Introduction to Linear Models and Regression : Introduction and Basic Concepts
- Lecture 40 - Simple Linear Regression Analysis : Basic Concepts and Least Squares Estimation
- Lecture 41 - Simple Linear Regression Analysis : Fitting Linear Model With R Software
- Lecture 42 - Simple Linear Regression Analysis : Properties of Least Squares Estimators
- Lecture 43 - Simple Linear Regression Analysis : Maximum Likelihood and Confidence Interval Estimation
- Lecture 44 - Simple Linear Regression Analysis : Test of Hypothesis and Confidence Interval Estimation With R
- Lecture 45 - Multiple Linear Regression Analysis : Basic Concepts
- Lecture 46 - Multiple Linear Regression Analysis : OLSE, Fitted Model and Residuals
- Lecture 47 - Multiple Linear Regression Analysis : Model Fitting With R Software
- Lecture 48 - Multiple Linear Regression Analysis : Properties of OLSE and Maximum Likelihood Estimation
- Lecture 49 - Multiple Linear Regression Analysis : Test of Hypothesis and Confidence Interval Estimation on I
- Lecture 50 - Analysis of Variance and Implementation in R Software
- Lecture 51 - Goodness of Fit and Implementation in R Software
- Lecture 52 - Variable Selection using LASSO Regression : Introduction and Basic Concepts
- Lecture 53 - Variable Selection using LASSO Regression : LASSO with R

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Measure Theoretic Probability 1

Subject Co-ordinator - Prof. Suprio Bhar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to the course Measure Theoretic Probability 1

Lecture 2 - Sigma-fields and Measurable spaces

Lecture 3 - Fields and Generating sets for Sigma-fields

Lecture 4 - Borel Sigma-field on  $\mathbb{R}$  and other sets

Lecture 5 - Limits of sequences of sets and Monotone classes

Lecture 6 - Measures and Measure spaces

Lecture 7 - Probability Measures

Lecture 8 - Properties of Measures - I

Lecture 9 - Properties of Measures - II

Lecture 10 - Properties of Measures - III

Lecture 11 - Measurable functions

Lecture 12 - Borel Measurable functions

Lecture 13 - Algebraic properties of Measurable functions

Lecture 14 - Limiting behaviour of measurable functions

Lecture 15 - Random Variables and Random Vectors

Lecture 16 - Law or Distribution of an RV

Lecture 17 - Distribution Function of an RV

Lecture 18 - Decomposition of Distribution functions

Lecture 19 - Construction of RVs with a specified law

Lecture 20 - Caratheodery Extension Theorem

Lecture 21 - From Distribution Functions to Probability Measures - I

Lecture 22 - From Distribution Functions to Probability Measures - II

Lecture 23 - Lebesgue-Stieltjes Measures

Lecture 24 - Properties of Lebesgue Measure on  $\mathbb{R}$

Lecture 25 - Distribution Functions and Probability Measures in higher dimensions

Lecture 26 - Integration of measurable functions

Lecture 27 - Properties of Measure Theoretic Integration - I

Lecture 28 - Properties of Measure Theoretic Integration - II

Lecture 29 - Monotone Convergence Theorem

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Computation of Expectation for Discrete RVs
- Lecture 31 - MCT and the Linearity of Measure Theoretic Integration
- Lecture 32 - Sets of measure zero and Measure Theoretic Integration
- Lecture 33 - Fatou's Lemma and Dominated Convergence Theorem
- Lecture 34 - Riemann and Lebesgue integration
- Lecture 35 - Computations involving Lebesgue Integration
- Lecture 36 - Decomposition of Measures
- Lecture 37 - Absolutely Continuous RVs
- Lecture 38 - Expectation of Absolutely Continuous RVs
- Lecture 39 - Inequalities involving moments of RVs
- Lecture 40 - Conclusion to the course Measure Theoretic Probability 1

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Foundations of R Software

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:An Introduction to Hyperbolic Geometry

Subject Co-ordinator - Prof. Abhijit Pal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:A Primer to Mathematical Optimization

Subject Co-ordinator - Prof. Debdas Ghosh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction and History of Optimization
- Lecture 2 - Basics of Linear Algebra
- Lecture 3 - Definiteness of Matrices
- Lecture 4 - Sets in  $\mathbb{R}^n$
- Lecture 5 - Limit Superior and Limit Inferior
- Lecture 6 - Order of Convergence
- Lecture 7 - Lipschitz and Uniform Continuity
- Lecture 8 - Partial and Directional Derivatives and Differentiability (8,9)
- Lecture 9 - Taylor's Theorem
- Lecture 10 - Convex Sets and Convexity Preserving Operations
- Lecture 11 - Separation Results
- Lecture 12 - Theorems of Alternatives (13 and 14)
- Lecture 13 - Convex Functions
- Lecture 14 - Properties and Zeroth Order Characterization of Convex Function
- Lecture 15 - First-Order and Second-Order Characterization of Convex Functions
- Lecture 16 - Convexity Preserving Operations
- Lecture 17 - Optimality and Coerciveness
- Lecture 18 - First-Order Optimality Condition (20 Part 1)
- Lecture 19 - Second-Order Optimality Condition (20 Part 2)
- Lecture 20 - General Structure of Unconstrained Optimization Algorithms
- Lecture 21 - Inexact Line Search
- Lecture 22 - Global Convergence of Descent Methods (23,24)
- Lecture 23 - Where Do Descent Methods Converge?
- Lecture 24 - Scaling of Variables
- Lecture 25 - Practical Stopping Criteria
- Lecture 26 - Steepest Descent Method (28,29)
- Lecture 27 - Newton's Method (30,31,32)
- Lecture 28 - Quasi Newton Methods (33,34,35)
- Lecture 29 - Conjugate Direction Methods (36,37)

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- Lecture 30 - Trust Region Methods - Part I
- Lecture 31 - Trust Region Methods - Part II
- Lecture 32 - A Revisit to Lagrange Multipliers Method
- Lecture 33 - Special Cones for Constrained Optimization
- Lecture 34 - Tangent Cone
- Lecture 35 - First-Order KKT Optimality Conditions (42,43)
- Lecture 36 - Second-Order KKT Optimality Conditions
- Lecture 37 - Constraint Qualifications
- Lecture 38 - Lagrangian Duality Theory (46 to 50)
- Lecture 39 - Methods for Linearly Constrained Problems (51,52,53)
- Lecture 40 - Interior-Point Method for QPP
- Lecture 41 - Penalty Methods
- Lecture 42 - Sequential Quadratic Programming Method

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Measure Theoretic Probability 2

Subject Co-ordinator - Prof. Suprio Bhar

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Set Theory and Mathematical Logic

Subject Co-ordinator - Prof. Amit Kuber

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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 - Equivalentents 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

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Fourier Analysis

Subject Co-ordinator - Prof. Parasar Mohanty

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Origin of Fourier series
- Lecture 2 - Convergence of a series and Riemann integration
- Lecture 3 - Riemann integration and periodic functions
- Lecture 4 - Fourier coefficients and series
- Lecture 5 - Complex Fourier series
- Lecture 6 - Riemann Lebesgue lemma and Dirichlet kernel
- Lecture 7 - Convolution of two Riemann integrable functions
- Lecture 8 - Properties of convolution
- Lecture 9 - Cesaro summability and summation by parts
- Lecture 10 - Fejer kernel
- Lecture 11 - Fejer theorem and applications
- Lecture 12 - Good kernels and Poisson kernel
- Lecture 13 - Abel summability
- Lecture 14 - Dirichlet problem
- Lecture 15 - Convergence at jump discontinuity
- Lecture 16 - Orthonormal families
- Lecture 17 - Pythagoras theorem and Parseval identity
- Lecture 18 - Pointwise convergence
- Lecture 19 - Parseval identity applications
- Lecture 20 - Divergent Fourier series
- Lecture 21 - Pointwise convergence of  $S_N(f)$
- Lecture 22 - Isoperimetric problem
- Lecture 23 - Weyl's equidistribution theorem
- Lecture 24 - on Equidistributed sequences
- Lecture 25 - Proof of Weyl's criterion
- Lecture 26 - Fourier analysis on finite groups
- Lecture 27 - Fourier transform on  $Z(N)$
- Lecture 28 - Inversion theorem and Parseval identity
- Lecture 29 - Results on Fourier coefficients of two functions

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Fast Fourier transform
- Lecture 31 - Fourier analysis on finite abelian group
- 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  $\mathbb{R}$
- Lecture 37 - Properties of Fourier transform
- Lecture 38 - Inversion formula and convolution
- Lecture 39 - Fejer kernel on  $\mathbb{R}$
- 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 kernel and mean value theorem for harmonic functions
- Lecture 50 - Wave equation
- Lecture 51 - Eigenvalues of Fourier transform
- Lecture 52 - Fourier transform on  $\mathbb{R}^n$
- Lecture 53 - Properties of Fourier transform on  $\mathbb{R}^n$
- 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 - Poisson summation formula
- Lecture 58 - Application of Poisson summation formula
- Lecture 59 - Radon transform
- Lecture 60 - Reconstruction formula

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Ordinary Differential Equations

Subject Co-ordinator - Prof. Kaushik Bal

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Vector Spaces  
Lecture 2 - Linear Transformation  
Lecture 3 - Matrices  
Lecture 4 - Calculus in Several Variable  
Lecture 5 - Lipchitz Continuity  
Lecture 6 - Cauchy-Schwartz and Gronwall Inequality  
Lecture 7 - Ordinary Differential Equations: Introduction  
Lecture 8 - Differential Inequalities  
Lecture 9 - 2nd Order Constant coefficient linear equations  
Lecture 10 - Picard Existence and Uniqueness Theorem  
Lecture 11 - Linear System  
Lecture 12 - Well-Posedness of a ODE  
Lecture 13 - Linear System - 1  
Lecture 14 - Linear System - 2  
Lecture 15 - Fundamental Matrix  
Lecture 16 - Exponential of a Linear Operator  
Lecture 17 - Fundamental theorem of linear Systems  
Lecture 18 - Higher Dimensional Matrix Exponential - 1  
Lecture 19 - Higher Dimensional Matrix Exponential - 2  
Lecture 20 - Method of Eigenvalue  
Lecture 21 - Method of Eigenvalue (Continued...)  
Lecture 22 - Maximal Interval of Existence  
Lecture 23 - Maximal Interval of Existence: Worked out examples  
Lecture 24 - Periodic Linear System  
Lecture 25 - Asymptotic behavior of solution to linear system - I  
Lecture 26 - Asymptotic behavior of solution to linear system - II  
Lecture 27 - Asymptotic Behavior of Linear Systems - III  
Lecture 28 - Exact and Adjoint equations  
Lecture 29 - Sturm Comparison Theory

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Oscillation Theory - 2
- Lecture 31 - Linear Boundary Value Problem
- Lecture 32 - Maximum Principle
- Lecture 33 - Sturm Liouville Theory - 1
- Lecture 34 - Sturm Liouville Theory - 2
- Lecture 35 - Periodic Sturm Liouville Problem
- Lecture 36 - Eigenfunction Expansion
- Lecture 37 - Stability in the sense of Lyapunov - I
- Lecture 38 - Stability in the sense of Lyapunov - II
- Lecture 39 - Lyapunov Direct method
- Lecture 40 - Linear two-dimensional phase space dynamics (Continued...)
- Lecture 41 - Phase Portrait for Planar Systems

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Category Theory

Subject Co-ordinator - Prof. Amit Kuber

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Category Theory

Lecture 2 - Examples of Categories

Lecture 3 - Functors

Lecture 4 - Natural Transformations and Equivalences of Categories

Lecture 5 - Equivalence of Categories and some properties of morphisms

Lecture 6 - The Yoneda lemma and Representable functors

Lecture 7 - Limits and colimits - Part 1

Lecture 8 - Limits and colimits - Part 2

Lecture 9 - Limits and colimits - Part 3 - Interaction with functors - Adjunctions - I Definitions

Lecture 10 - Adjunctions - II Examples

Lecture 11 - Adjunctions - III Triangular identities

Lecture 12 - Adjunctions - IV General adjoint functor theorem

Lecture 13 - Adjunctions - V Special adjoint functor theorem Filtered colimits-I Basics

Lecture 14 - Filtered colimits - II Locally finitely presentable (LFP) categories

Lecture 15 - Monads - I Eilenberg-Moore and Kleisli categories

Lecture 16 - Monads - II Monadcity theorem

Lecture 17 - Monoidal categories and enriched categories

Lecture 18 - Abelian categories

Lecture 19 - Grothendieck categories and localization

Lecture 20 - Freyd-Mitchell embedding theorem Homological algebra I Diagram chasing

Lecture 21 - Homological algebra II Chain homotopy, projective resolutions and the derived category

Lecture 22 - Model categories

Lecture 23 - Topos Theory - I Elementary toposes

Lecture 24 - Topos Theory - II Grothendieck toposes

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Multivariate Procedures with R (Hindi)

Subject Co-ordinator - Prof. Shalabh

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 0 - How to Learn and Follow the Course

Lecture 1 - R Software and its Installation

Lecture 2 - Help, Demonstration, Examples, Packages and Libraries

Lecture 3 - Command line and Data Editor

Lecture 4 - Introduction to R Studio

Lecture 5 - R as a Calculator

Lecture 6 - Calculations with Data Vectors and Built-in Functions

Lecture 7 - Matrix Operations

Lecture 8 - Matrix Operations

Lecture 9 - Univariate Data - Central Tendency and Variability

Lecture 10 - Bivariate Data

Lecture 11 - Missing Data Handling

Lecture 12 - Measuring Central Tendency with Missing Data

Lecture 13 - Measuring Variation with Missing Data

Lecture 14 - Coefficient of Variation and Summary

Lecture 15 - Boxplots and Grouped Boxplots

Lecture 16 - Bar Diagram, Subdivided and Multiple Bar Diagrams

Lecture 17 - Pie Diagram, Histogram and Multiple Histogram

Lecture 18 - Scatter Plots, Smooth Scatter Plots and Matrix Plots

Lecture 19 - Three Dimensional Plots, Star Plots and Chernoff Faces

Lecture 20 - Continuous and Discrete

Lecture 21 - Probability Functions

Lecture 22 - Probability Functions for Continuous Bivariate and Multivariate Random Variables

Lecture 23 - Theoretical Properties

Lecture 24 - Application in R Software

Lecture 25 - Bivariate Normal and Multivariate Normal Distributions in R

Lecture 26 - Chi square ( $\chi^2$ ), t and F Distribution

Lecture 27 - Point and Interval Estimation

Lecture 28 - Maximum Likelihood Estimation

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 29 - Basics of Tests of Hypothesis
- Lecture 30 - Test and Confidence Interval for Mean in One Sample with Known Variance in Univariate Data
- Lecture 31 - Test and Confidence Interval for Mean in One Sample with Unknown Variance in Univariate Data
- Lecture 32 - Tests for Mean in Two Samples with Univariate Data
- Lecture 33 - Analysis of Variance and Homogeneity of Variances with Univariate Data
- Lecture 34 - Tests for Mean Vector with Multivariate Data in One Sample
- Lecture 35 - Tests for Mean Vector with Multivariate Data in Two Samples
- Lecture 36 - Centering, Scaling and Z-Scores
- Lecture 37 - Introduction and Basic Concepts
- Lecture 38 - Estimation of Parameters
- Lecture 39 - Model Fitting With R Software
- Lecture 40 - Test of Hypothesis and Confidence Interval Estimation on Individual Regression Coefficients
- Lecture 41 - Analysis of Variance and Implementation in R Software
- Lecture 42 - Goodness of Fit and Testing of Normality
- Lecture 43 - Logistic Regression Model
- Lecture 44 - Introduction to Classification
- Lecture 45 - Bayes Procedure for Classification
- Lecture 46 - Classification Procedure for Multivariate Normal Distributions
- Lecture 47 - Classification Procedure and Analysis in R
- Lecture 48 - Basic Concepts and Definitions
- Lecture 49 - Hierarchical Classification
- Lecture 50 - Hierarchical Classification and Analysis with R
- Lecture 51 - Hierarchical Classification with Example in R
- Lecture 52 - Concepts and Theoretical Setup
- Lecture 53 - Principle Component and Its Graphical Analysis in R
- Lecture 54 - Canonical Variables and Concepts
- Lecture 55 - Statistical Analysis of Canonical Variables
- Lecture 56 - Canonical Variables Analysis in R

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Optimization Algorithms: Theory and Software Implementation

Subject Co-ordinator - Prof. Thirumulanathan D

Co-ordinating Institute - IIT - Kanpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Optimization  
Lecture 2 - Introduction to Optimization (Continued...)  
Lecture 3 - Introduction to Optimization (Continued...)  
Lecture 4 - Introduction to Optimization (Continued...)  
Lecture 5 - Introduction to Optimization (Continued...)  
Lecture 6 - Introduction to Python  
Lecture 7 - Introduction to Python (Continued...)  
Lecture 8 - Introduction to Python (Continued...)  
Lecture 9 - Introduction to Python (Continued...)  
Lecture 10 - Introduction to Python (Continued...)  
Lecture 11 - Optimization Algorithms  
Lecture 12 - Optimization Algorithms (Continued...)  
Lecture 13 - Optimization Algorithms (Continued...)  
Lecture 14 - Optimization Algorithms (Continued...)  
Lecture 15 - Optimization Algorithms (Continued...)  
Lecture 16 - Gradient Descent/Conjugate Gradient Algorithms  
Lecture 17 - Gradient Descent/Conjugate Gradient Algorithms (Continued...)  
Lecture 18 - Gradient Descent/Conjugate Gradient Algorithms (Continued...)  
Lecture 19 - Gradient Descent/Conjugate Gradient Algorithms (Continued...)  
Lecture 20 - Gradient Descent/Conjugate Gradient Algorithms (Continued...)  
Lecture 21 - Newton's Method  
Lecture 22 - Newton's Method (Continued...)  
Lecture 23 - Newton's Method (Continued...)  
Lecture 24 - Newton's Method (Continued...)  
Lecture 25 - Newton's Method (Continued...)  
Lecture 26 - Quasi-Newton Methods  
Lecture 27 - Quasi-Newton Methods (Continued...)  
Lecture 28 - Quasi-Newton Methods (Continued...)  
Lecture 29 - Quasi-Newton Methods (Continued...)

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- Lecture 30 - Quasi-Newton Methods (Continued...)
- Lecture 31 - Quadratic Penalty Method
- Lecture 32 - Quadratic Penalty Method (Continued...)
- Lecture 33 - Quadratic Penalty Method (Continued...)
- Lecture 34 - Quadratic Penalty Method (Continued...)
- Lecture 35 - Quadratic Penalty Method (Continued...)
- Lecture 36 - Augmented Lagrangian Method
- Lecture 37 - Augmented Lagrangian Method (Continued...)
- Lecture 38 - Augmented Lagrangian Method (Continued...)
- Lecture 39 - Augmented Lagrangian Method (Continued...)
- Lecture 40 - Augmented Lagrangian Method (Continued...)
- Lecture 41 - Simplex Method
- Lecture 42 - Simplex Method (Continued...)
- Lecture 43 - Simplex Method (Continued...)
- Lecture 44 - Simplex Method (Continued...)
- Lecture 45 - Simplex Method (Continued...)
- Lecture 46 - Affine Scaling Method
- Lecture 47 - Affine Scaling Method (Continued...)
- Lecture 48 - Affine Scaling Method (Continued...)
- Lecture 49 - Affine Scaling Method (Continued...)
- Lecture 50 - Affine Scaling Method (Continued...)
- Lecture 51 - Affine Scaling Method (Continued...)
- Lecture 52 - Affine Scaling Method (Continued...)
- Lecture 53 - Affine Scaling Method (Continued...)
- Lecture 54 - Affine Scaling Method (Continued...)
- Lecture 55 - Affine Scaling Method (Continued...)
- Lecture 56 - An application from machine learning
- Lecture 57 - An application from machine learning (Continued...)
- Lecture 58 - An application from machine learning (Continued...)
- Lecture 59 - An application from machine learning (Continued...)
- Lecture 60 - An application from machine learning (Continued...)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Advanced Engineering Mathematics

Subject Co-ordinator - Dr. P. Panigrahi, Prof. J. Kumar, Prof. P.D. Srivastava, Prof. Somesh Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Review Groups, Fields and Matrices
- Lecture 2 - Vector Spaces, Subspaces, Linearly Dependent/Independent of Vectors
- Lecture 3 - Basis, Dimension, Rank and Matrix Inverse
- Lecture 4 - Linear Transformation, Isomorphism and Matrix Representation
- Lecture 5 - System of Linear Equations, Eigenvalues and Eigenvectors
- Lecture 6 - Method to Find Eigenvalues and Eigenvectors, Diagonalization of Matrices
- Lecture 7 - Jordan Canonical Form, Cayley Hamilton Theorem
- Lecture 8 - Inner Product Spaces, Cauchy-Schwarz Inequality
- Lecture 9 - Orthogonality, Gram-Schmidt Orthogonalization Process
- Lecture 10 - Spectrum of special matrices, positive/negative definite matrices
- Lecture 11 - Concept of Domain, Limit, Continuity and Differentiability
- Lecture 12 - Analytic Functions, C-R Equations
- Lecture 13 - Harmonic Functions
- Lecture 14 - Line Integral in the Complex
- Lecture 15 - Cauchy Integral Theorem
- Lecture 16 - Cauchy Integral Theorem (Continued.)
- Lecture 17 - Cauchy Integral Formula
- Lecture 18 - Power and Taylor's Series of Complex Numbers
- Lecture 19 - Power and Taylor's Series of Complex Numbers (Continued.)
- Lecture 20 - Taylor's, Laurent Series of  $f(z)$  and Singularities
- Lecture 21 - Classification of Singularities, Residue and Residue Theorem
- Lecture 22 - Laplace Transform and its Existence
- Lecture 23 - Properties of Laplace Transform
- Lecture 24 - Evaluation of Laplace and Inverse Laplace Transform
- Lecture 25 - Applications of Laplace Transform to Integral Equations and ODEs
- Lecture 26 - Applications of Laplace Transform to PDEs
- Lecture 27 - Fourier Series
- Lecture 28 - Fourier Series (Continued.)
- Lecture 29 - Fourier Integral Representation of a Function

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- Lecture 30 - Introduction to Fourier Transform
- Lecture 31 - Applications of Fourier Transform to PDEs
- Lecture 32 - Laws of Probability - I
- Lecture 33 - Laws of Probability - II
- Lecture 34 - Problems in Probability
- Lecture 35 - Random Variables
- Lecture 36 - Special Discrete Distributions
- Lecture 37 - Special Continuous Distributions
- Lecture 38 - Joint Distributions and Sampling Distributions
- Lecture 39 - Point Estimation
- Lecture 40 - Interval Estimation
- Lecture 41 - Basic Concepts of Testing of Hypothesis
- Lecture 42 - Tests for Normal Populations

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Functional Analysis

Subject Co-ordinator - Prof. P.D. Srivastava

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Metric Spaces with Examples
- Lecture 2 - Holder Inequality and Minkowski Inequality
- Lecture 3 - Various Concepts in a Metric Space
- Lecture 4 - Separable Metrics Spaces with Examples
- Lecture 5 - Convergence, Cauchy Sequence, Completeness
- Lecture 6 - Examples of Complete and Incomplete Metric Spaces
- Lecture 7 - Completion of Metric Spaces + Tutorial
- Lecture 8 - Vector Spaces with Examples
- Lecture 9 - Normed Spaces with Examples
- Lecture 10 - Banach Spaces and Schauder Basis
- Lecture 11 - Finite Dimensional Normed Spaces and Subspaces
- Lecture 12 - Compactness of Metric/Normed Spaces
- Lecture 13 - Linear Operators-definition and Examples
- Lecture 14 - Bounded Linear Operators in a Normed Space
- Lecture 15 - Bounded Linear Functionals in a Normed Space
- Lecture 16 - Concept of Algebraic Dual and Reflexive Space
- Lecture 17 - Dual Basis & Algebraic Reflexive Space
- Lecture 18 - Dual Spaces with Examples
- Lecture 19 - Tutorial - I
- Lecture 20 - Tutorial - II
- Lecture 21 - Inner Product & Hilbert Space
- Lecture 22 - Further Properties of Inner Product Spaces
- Lecture 23 - Projection Theorem, Orthonormal Sets and Sequences
- Lecture 24 - Representation of Functionals on a Hilbert Spaces
- Lecture 25 - Hilbert Adjoint Operator
- Lecture 26 - Self Adjoint, Unitary & Normal Operators
- Lecture 27 - Tutorial - III
- Lecture 28 - Annihilator in an IPS
- Lecture 29 - Total Orthonormal Sets And Sequences

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- Lecture 30 - Partially Ordered Set and Zorns Lemma
- Lecture 31 - Hahn Banach Theorem for Real Vector Spaces
- Lecture 32 - Hahn Banach Theorem for Complex V.S. & Normed Spaces
- Lecture 33 - Baires Category & Uniform Boundedness Theorems
- Lecture 34 - Open Mapping Theorem
- Lecture 35 - Closed Graph Theorem
- Lecture 36 - Adjoint Operator
- Lecture 37 - Strong and Weak Convergence
- Lecture 38 - Convergence of Sequence of Operators and Functionals
- Lecture 39 - LP - Space
- Lecture 40 - LP - Space (Continued.)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Numerical methods of Ordinary and Partial Differential Equations

Subject Co-ordinator - Dr. G.P. Raja Sekhar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 characteristics for Hyperbolic PDEs - II
- Lecture 39 - Finite Difference Approximations to 1st order Hyperbolic PDEs
- Lecture 40 - Summary, Appendices, Remarks

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Optimization

Subject Co-ordinator - Prof. A. Goswami, Dr. Debjani Chakraborty

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Optimization - Introduction
- Lecture 2 - Formulation of LPP
- Lecture 3 - Geometry of LPP and Graphical Solution of LPP
- Lecture 4 - Solution of LPP
- 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 Optimality 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
- Lecture 22 - Unconstrained multivariable optimization
- Lecture 23 - Nonlinear programming with equality constraint
- Lecture 24 - Nonlinear programming KKT conditions
- Lecture 25 - Numerical optimization
- Lecture 26 - Numerical optimization
- Lecture 27 - Fibonacci Method
- Lecture 28 - Golden Section Methods
- Lecture 29 - Interpolation Methods

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- Lecture 30 - Unconstrained optimization techniques
- Lecture 31 - Unconstrained optimization techniques
- Lecture 32 - Nonlinear programming
- Lecture 33 - Interior and Exterior penalty 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Probability and Statistics

Subject Co-ordinator - Prof. Somesh Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Algebra of Sets - I  
Lecture 2 - Algebra of Sets - II  
Lecture 3 - Introduction to Probability  
Lecture 4 - Laws of Probability - I  
Lecture 5 - Laws of Probability - II  
Lecture 6 - Problems in Probability  
Lecture 7 - Random Variables  
Lecture 8 - Probability Distributions  
Lecture 9 - Characteristics of Distribution  
Lecture 10 - Special Distributions - I  
Lecture 11 - Special Distributions - II  
Lecture 12 - Special Distributions - III  
Lecture 13 - Special Distributions - IV  
Lecture 14 - Special Distributions - V  
Lecture 15 - Special Distributions - VI  
Lecture 16 - Special Distributions - VII  
Lecture 17 - Functions of a Random Variable  
Lecture 18 - Joint Distributions - I  
Lecture 19 - Joint Distributions - II  
Lecture 20 - Joint Distributions - III  
Lecture 21 - Joint Distributions - IV  
Lecture 22 - Transformations of Random Vectors  
Lecture 23 - Sampling Distributions - I  
Lecture 24 - Sampling Distributions - II  
Lecture 25 - Descriptive Statistics - I  
Lecture 26 - Descriptive Statistics - II  
Lecture 27 - Estimation - I  
Lecture 28 - Estimation - II  
Lecture 29 - Estimation - III

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Estimation - IV
- Lecture 31 - Estimation - V
- Lecture 32 - Estimation - VI
- Lecture 33 - Testing of Hypothesis - I
- Lecture 34 - Testing of Hypothesis - II
- Lecture 35 - Testing of Hypothesis - III
- Lecture 36 - Testing of Hypothesis - IV
- Lecture 37 - Testing of Hypothesis - V
- Lecture 38 - Testing of Hypothesis - VI
- Lecture 39 - Testing of Hypothesis - VII
- Lecture 40 - Testing of Hypothesis - VIII

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Regression Analysis

Subject Co-ordinator - Dr. Soumen Maity

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Simple Linear Regression
- Lecture 2 - Simple Linear Regression (Continued...1)
- Lecture 3 - Simple Linear Regression (Continued...2)
- Lecture 4 - Simple Linear Regression (Continued...3)
- Lecture 5 - Simple Linear Regression (Continued...4)
- Lecture 6 - Multiple Linear Regression
- Lecture 7 - Multiple Linear Regression (Continued...1)
- Lecture 8 - Multiple Linear Regression (Continued...2)
- Lecture 9 - Multiple Linear Regression (Continued...3)
- Lecture 10 - Selecting the BEST Regression model
- Lecture 11 - Selecting the BEST Regression model (Continued...1)
- Lecture 12 - Selecting the BEST Regression model (Continued...2)
- Lecture 13 - Selecting the BEST Regression model (Continued...3)
- Lecture 14 - Multicollinearity
- Lecture 15 - Multicollinearity (Continued...1)
- Lecture 16 - Multicollinearity (Continued...2)
- Lecture 17 - Model Adequacy Checking
- Lecture 18 - Model Adequacy Checking (Continued...1)
- Lecture 19 - Model Adequacy Checking (Continued...2)
- Lecture 20 - Test for Influential Observations
- Lecture 21 - Transformations and Weighting to correct model inadequacies
- Lecture 22 - Transformations and Weighting to correct model inadequacies (Continued...1)
- Lecture 23 - Transformations and Weighting to correct model inadequacies (Continued...2)
- Lecture 24 - Dummy Variables
- Lecture 25 - Dummy Variables (Continued...1)
- Lecture 26 - Dummy Variables (Continued...2)
- Lecture 27 - Polynomial Regression Models
- Lecture 28 - Polynomial Regression Models (Continued...1)
- Lecture 29 - Polynomial Regression Models (Continued...2)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Generalized Linear Models
- Lecture 31 - Generalized Linear Models (Continued.)
- Lecture 32 - Non-Linear Estimation
- Lecture 33 - Regression Models with Autocorrelated Errors
- Lecture 34 - Regression Models with Autocorrelated Errors (Continued.)
- Lecture 35 - Measurement Errors & Calibration Problem
- Lecture 36 - Tutorial - I
- Lecture 37 - Tutorial - II
- Lecture 38 - Tutorial - III
- Lecture 39 - Tutorial - IV
- Lecture 40 - Tutorial - V

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Statistical Inference

Subject Co-ordinator - Prof. Somesh Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction and Motivation  
Lecture 2 - Basic Concepts of Point Estimations - I  
Lecture 3 - Basic Concepts of Point Estimations - II  
Lecture 4 - Finding Estimators - I  
Lecture 5 - Finding Estimators - II  
Lecture 6 - Finding Estimators - III  
Lecture 7 - Properties of MLEs  
Lecture 8 - Lower Bounds for Variance - I  
Lecture 9 - Lower Bounds for Variance - II  
Lecture 10 - Lower Bounds for Variance - III  
Lecture 11 - Lower Bounds for Variance - IV  
Lecture 12 - Sufficiency  
Lecture 13 - Sufficiency and Information  
Lecture 14 - Minimal Sufficiency, Completeness  
Lecture 15 - UMVU Estimation, Ancillarity  
Lecture 16 - Invariance - I  
Lecture 17 - Invariance - II  
Lecture 18 - Bayes and Minimax Estimation - I  
Lecture 19 - Bayes and Minimax Estimation - II  
Lecture 20 - Bayes and Minimax Estimation - III  
Lecture 21 - Testing of Hypotheses  
Lecture 22 - Neyman Pearson Fundamental Lemma  
Lecture 23 - Applications of NP lemma  
Lecture 24 - UMP Tests  
Lecture 25 - UMP Tests (Continued.)  
Lecture 26 - UMP Unbiased Tests  
Lecture 27 - UMP Unbiased Tests (Continued.)  
Lecture 28 - UMP Unbiased Tests  
Lecture 29 - Unbiased Tests for Normal Populations

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Unbiased Tests for Normal Populations (Continued.)
- Lecture 31 - Likelihood Ratio Tests - I
- Lecture 32 - Likelihood Ratio Tests - II
- Lecture 33 - Likelihood Ratio Tests - III
- Lecture 34 - Likelihood Ratio Tests - IV
- Lecture 35 - Invariant Tests
- Lecture 36 - Test for Goodness of Fit
- Lecture 37 - Sequential Procedure
- Lecture 38 - Sequential Procedure (Continued.)
- Lecture 39 - Confidence Intervals
- Lecture 40 - Confidence Intervals (Continued.)

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - A Basic Course in Real Analysis

Subject Co-ordinator - Prof. P.D. Srivastava

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Rational Numbers and Rational Cuts
- Lecture 2 - Irrational numbers, Dedekind's Theorem
- Lecture 3 - Continuum and Exercises
- Lecture 4 - Continuum and Exercises (Continued.)
- Lecture 5 - Cantor's Theory of Irrational Numbers
- Lecture 6 - Cantor's Theory of Irrational Numbers (Continued.)
- Lecture 7 - Equivalence of Dedekind and Cantor's Theory
- Lecture 8 - Finite, Infinite, Countable and Uncountable Sets of Real Numbers
- Lecture 9 - Types of Sets with Examples, Metric Space
- Lecture 10 - Various properties of open set, closure of a set
- Lecture 11 - Ordered set, Least upper bound, greatest lower bound of a set
- Lecture 12 - Compact Sets and its properties
- Lecture 13 - Weiersstrass Theorem, Heine Borel Theorem, Connected set
- Lecture 14 - Tutorial - II
- Lecture 15 - Concept of limit of a sequence
- Lecture 16 - Some Important limits, Ratio tests for sequences of Real Numbers
- Lecture 17 - Cauchy theorems on limit of sequences with examples
- Lecture 18 - Fundamental theorems on limits, Bolzano-Weiersstrass Theorem
- Lecture 19 - Theorems on Convergent and divergent sequences
- Lecture 20 - Cauchy sequence and its properties
- Lecture 21 - Infinite series of real numbers
- Lecture 22 - Comparison tests for series, Absolutely convergent and Conditional convergent series
- Lecture 23 - Tests for absolutely convergent series
- Lecture 24 - Raabe's test, limit of functions, Cluster point
- Lecture 25 - Some results on limit of functions
- Lecture 26 - Limit Theorems for functions
- Lecture 27 - Extension of limit concept (one sided limits)
- Lecture 28 - Continuity of Functions
- Lecture 29 - Properties of Continuous Functions

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Boundedness Theorem, Max-Min Theorem and Bolzano's theorem
- Lecture 31 - Uniform Continuity and Absolute Continuity
- Lecture 32 - Types of Discontinuities, Continuity and Compactness
- Lecture 33 - Continuity and Compactness (Continued.), Connectedness
- Lecture 34 - Differentiability of real valued function, Mean Value Theorem
- Lecture 35 - Mean Value Theorem (Continued.)
- Lecture 36 - Application of MVT , Darboux Theorem, L Hospital Rule
- Lecture 37 - L'Hospital Rule and Taylor's Theorem
- Lecture 38 - Tutorial - III
- Lecture 39 - Riemann/Riemann Stieltjes Integral
- Lecture 40 - Existence of Reimann Stieltjes Integral
- Lecture 41 - Properties of Reimann Stieltjes Integral
- Lecture 42 - Properties of Reimann Stieltjes Integral (Continued.)
- Lecture 43 - Definite and Indefinite Integral
- Lecture 44 - Fundamental Theorems of Integral Calculus
- Lecture 45 - Improper Integrals
- Lecture 46 - Convergence Test for Improper Integrals

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Statistical Methods for Scientists and Engineers

Subject Co-ordinator - Prof. Somesh Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Foundations of Probability
- Lecture 2 - Laws of Probability
- Lecture 3 - Random Variables
- Lecture 4 - Moments and Special Distributions
- Lecture 5 - Moments and Special Distributions (Continued...)
- Lecture 6 - Special Distributions (Continued...)
- Lecture 7 - Special Distributions (Continued...)
- Lecture 8 - Sampling Distributions
- Lecture 9 - Parametric Methods - I
- Lecture 10 - Parametric Methods - II
- Lecture 11 - Parametric Methods - III
- Lecture 12 - Parametric Methods - IV
- Lecture 13 - Parametric Methods - V
- Lecture 14 - Parametric Methods - VI
- Lecture 15 - Parametric Methods - VII
- Lecture 16 - Multivariate Analysis - I
- Lecture 17 - Multivariate Analysis - II
- Lecture 18 - Multivariate Analysis - III
- Lecture 19 - Multivariate Analysis - IV
- Lecture 20 - Multivariate Analysis - V
- Lecture 21 - Multivariate Analysis - VI
- Lecture 22 - Multivariate Analysis - VII
- Lecture 23 - Multivariate Analysis - VIII
- Lecture 24 - Multivariate Analysis - IX
- Lecture 25 - Multivariate Analysis - X
- Lecture 26 - Multivariate Analysis - XI
- Lecture 27 - Multivariate Analysis - XII
- Lecture 28 - Non parametric Methods - I
- Lecture 29 - Non parametric Methods - II

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Non parametric Methods - III
- Lecture 31 - Non parametric Methods - IV
- Lecture 32 - Nonparametric Methods - V
- Lecture 33 - Nonparametric Methods - VI
- Lecture 34 - Nonparametric Methods - VII
- Lecture 35 - Nonparametric Methods - VIII
- Lecture 36 - Nonparametric Methods - IX
- Lecture 37 - Nonparametric Methods - X
- Lecture 38 - Nonparametric Methods - XI
- Lecture 39 - Nonparametric Methods - XII
- Lecture 40 - Nonparametric Methods - XIII

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Probability and Statistics

Subject Co-ordinator - Prof. Somesh Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Problems on Normal Distribution
- Lecture 31 - Problems on Special Distributions - I
- Lecture 32 - Problems on Special Distributions - II
- Lecture 33 - Function of a random variable - I
- Lecture 34 - Function of a random variable - II
- Lecture 35 - Joint Distributions - I
- Lecture 36 - Joint Distributions - II
- Lecture 37 - Independence, Product Moments
- Lecture 38 - Linearity Property of Correlation and Examples
- Lecture 39 - Bivariate Normal Distribution - I
- Lecture 40 - Bivariate Normal Distribution - II
- Lecture 41 - Additive Properties of Distributions - I
- Lecture 42 - Additive Properties of Distributions - II
- Lecture 43 - Transformation of Random Variables
- Lecture 44 - Distribution of Order Statistics
- Lecture 45 - Basic Concepts
- Lecture 46 - Chi-Square Distribution
- Lecture 47 - Chi-Square Distribution (Continued...), t-Distribution
- Lecture 48 - F-Distribution
- Lecture 49 - Descriptive Statistics - I
- Lecture 50 - Descriptive Statistics - II
- Lecture 51 - Descriptive Statistics - III
- Lecture 52 - Descriptive Statistics - IV
- Lecture 53 - Introduction to Estimation
- Lecture 54 - Unbiased and Consistent Estimators
- Lecture 55 - LSE, MME
- Lecture 56 - Examples on MME, MLE
- Lecture 57 - Examples on MLE - I
- Lecture 58 - Examples on MLE - II, MSE
- Lecture 59 - UMVUE, Sufficiency, Completeness
- Lecture 60 - Rao - Blackwell Theorem and Its Applications
- Lecture 61 - Confidence Intervals - I
- Lecture 62 - Confidence Intervals - II
- Lecture 63 - Confidence Intervals - III
- Lecture 64 - Confidence Intervals - IV
- Lecture 65 - Basic Definitions
- Lecture 66 - Two Types of Errors
- Lecture 67 - Neyman-Pearson Fundamental Lemma
- Lecture 68 - Applications of N-P Lemma - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Applied Multivariate Statistical Modeling

Subject Co-ordinator - Dr J Maiti

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Multivariate Statistical Modeling
- Lecture 2 - Introduction to Multivariate Statistical Modeling: Data types, models, and modeling
- Lecture 3 - Statistical approaches to model building
- Lecture 4 - Statistical approaches to model building (Continued...)
- Lecture 5 - Univariate Descriptive Statistics
- Lecture 6 - Univariate Descriptive Statistics (Continued...)
- Lecture 7 - Normal Distribution and Chi-squared Distribution
- Lecture 8 - t-distribution, F-distribution, and Central Limit Theorem
- Lecture 9 - Univariate Inferential Statistics: Estimation
- Lecture 10 - Univariate Inferential Statistics: Estimation (Continued...)
- Lecture 11 - Univariate Inferential Statistics: Hypothesis Testing
- Lecture 12 - Hypothesis Testing (Continued...): Decision Making Scenarios
- Lecture 13 - Multivariate Descriptive Statistics: Mean Vector
- Lecture 14 - Multivariate Descriptive Statistics: Covariance Matrix
- Lecture 15 - Multivariate Descriptive Statistics: Correlation Matrix
- Lecture 16 - Multivariate Descriptive Statistics: Relationship between correlation and covariance matrices
- Lecture 17 - Multivariate Normal Distribution
- Lecture 18 - Multivariate Normal Distribution (Continued...)
- Lecture 19 - Multivariate Normal Distribution (Continued...): Geometrical Interpretation
- Lecture 20 - Multivariate Normal Distribution (Continued...): Examining data for multivariate normal distribution
- Lecture 21 - Multivariate Inferential Statistics: Basics and Hotelling T-square statistic
- Lecture 22 - Multivariate Inferential Statistics: Confidence Region
- Lecture 23 - Multivariate Inferential Statistics: Simultaneous confidence interval and Hypothesis testing
- Lecture 24 - Multivariate Inferential Statistics: Hypothesis testing for equality of two population mean vectors
- Lecture 25 - Analysis of Variance (ANOVA)
- Lecture 26 - Analysis of Variance (ANOVA): Decomposition of Total sum of squares
- Lecture 27 - Analysis of Variance (ANOVA): Estimation of Parameters and Model Adequacy tests
- Lecture 28 - Two-way and Three-way Analysis of Variance (ANOVA)
- Lecture 29 - Tutorial ANOVA

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Tutorial ANOVA (Continued...)
- Lecture 31 - Multivariate Analysis of Variance (MANOVA): Conceptual Model
- Lecture 32 - Multivariate Analysis of Variance (MANOVA): Assumptions and Decomposition of total sum square and cross products
- Lecture 33 - Multivariate Analysis of Variance (MANOVA): Decomposition of total sum square and cross products
- Lecture 34 - Multivariate Analysis of Variance (MANOVA): Estimation and Hypothesis testing
- Lecture 35 - MANOVA Case Study
- Lecture 36 - Multiple Linear Regression: Introduction
- Lecture 37 - Multiple Linear Regression: Assumptions and Estimation of model parameters
- Lecture 38 - Multiple Linear Regression: Sampling Distribution of parameter estimates
- Lecture 39 - Multiple Linear Regression: Sampling Distribution of parameter estimates (Continued...)
- Lecture 40 - Multiple Linear Regression: Model Adequacy Tests
- Lecture 41 - Multiple Linear Regression: Model Adequacy Tests (Continued...)
- Lecture 42 - Multiple Linear Regression: Test of Assumptions
- Lecture 43 - MLR-Model diagnostics
- Lecture 44 - MLR-case study
- Lecture 45 - Multivariate Linear Regression: Conceptual model and assumptions
- Lecture 46 - Multivariate Linear Regression: Estimation of parameters
- Lecture 47 - Multivariate Linear Regression: Estimation of parameters (Continued...)
- Lecture 48 - Multiple Linear Regression: Sampling Distribution of parameter estimates
- Lecture 49 - Multivariate Linear Regression: Model Adequacy Tests
- Lecture 50 - Multiple Linear Regression: Model Adequacy Tests (Continued...)
- Lecture 51 - Regression modeling using SPSS
- Lecture 52 - Principal Component Analysis (PCA): Conceptual Model
- Lecture 53 - Principal Component Analysis (PCA): Extraction of Principal components (PCs)
- Lecture 54 - Principal Component Analysis (PCA): Model Adequacy and Interpretation
- Lecture 55 - Principal Component Analysis (PCA): Model Adequacy and Interpretation (Continued...)
- Lecture 56 - Factor Analysis: Basics and Orthogonal factor models
- Lecture 57 - Factor Analysis: Types of models and key questions
- Lecture 58 - Factor Analysis: Parameter Estimation
- Lecture 59 - Factor Analysis: Parameter Estimation (Continued...)
- Lecture 60 - Factor Analysis: Model Adequacy tests and factor rotation
- Lecture 61 - Factor Analysis: Factor scores and case study

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. S. De

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to PDE

Lecture 2 - Classification of PDE

Lecture 3 - Principle of Linear Superposition

Lecture 4 - Standard Eigen Value Problem and Special ODEs

Lecture 5 - Adjoint Operator

Lecture 6 - Generalized Sturm - Liouville Problem

Lecture 7 - Properties of Adjoint Operator

Lecture 8 - Separation of Variables

Lecture 9 - Solution of 3 Dimensional Parabolic Problem

Lecture 10 - Solution of 4 Dimensional Parabolic problem

Lecture 11 - Solution of 4 Dimensional Parabolic Problem (Continued...)

Lecture 12 - Solution of Elliptical PDE

Lecture 13 - Solution of Hyperbolic PDE

Lecture 14 - Orthogonality of Bessel Function and 2 Dimensional Cylindrical Coordinate System

Lecture 15 - Cylindrical Co-ordinate System - 3 Dimensional Problem

Lecture 16 - Spherical Polar Coordinate System

Lecture 17 - Spherical Polar Coordinate System (Continued...)

Lecture 18 - Example of Generalized 3 Dimensional Problem

Lecture 19 - Example of Application Oriented Problems

Lecture 20 - Examples of Application Oriented Problems (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC: Introductory Course in Real Analysis

Subject Co-ordinator - Prof. P.D. Srivastava

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Countable and Uncountable sets
- Lecture 2 - Properties of Countable and Uncountable sets
- Lecture 3 - Examples of Countable and Uncountable sets
- Lecture 4 - Concepts of Metric Space
- Lecture 5 - Open ball, Closed ball, Limit point of a set
- Lecture 6 - Tutorial-I
- Lecture 7 - Some theorems on Open and Closed sets
- Lecture 8 - Ordered set, Least upper bound, Greatest lower bound of a set
- Lecture 9 - Ordered set, Least upper bound, Greatest lower bound of a set (Continued...)
- Lecture 10 - Compact Set
- Lecture 11 - Properties of Compact sets
- Lecture 12 - Tutorial-II
- Lecture 13 - Heine Borel Theorem
- Lecture 14 - Weierstrass Theorem
- Lecture 15 - Cantor set and its properties
- Lecture 16 - Derived set and Dense set
- Lecture 17 - Limit of a sequence and monotone sequence
- Lecture 18 - Tutorial-III
- Lecture 19 - Some Important limits of sequences
- Lecture 20 - Ratio Test Cauchy's theorems on limits of sequences of real numbers
- Lecture 21 - Fundamental theorems on limits
- Lecture 22 - Some results on limits and Bolzano-Weierstrass Theorem
- Lecture 23 - Criteria for convergent sequence
- Lecture 24 - Tutorial-IV
- Lecture 25 - Criteria for Divergent Sequence
- Lecture 26 - Cauchy Sequence
- Lecture 27 - Cauchy Convergence Criteria for Sequences
- Lecture 28 - Infinite Series of Real Numbers
- Lecture 29 - Convergence Criteria for Series of Positive Real Numbers

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- Lecture 30 - Tutorial-V
- Lecture 31 - Comparison Test for Series
- Lecture 32 - Absolutely and Conditionally Convergent Series
- Lecture 33 - Rearrangement Theorem and Test for Convergence of Series
- Lecture 34 - Ratio and Integral Test for Convergence of Series
- Lecture 35 - Raabe's Test for Convergence of Series
- Lecture 36 - Tutorial-VI
- Lecture 37 - Limit of Functions and Cluster Point
- Lecture 38 - Limit of Functions (Continued...)
- Lecture 39 - Divergence Criteria for Limit
- Lecture 40 - Various Properties of Limit of Functions
- Lecture 41 - Left and Right Hand Limits for Functions
- Lecture 42 - Tutorial-VII
- Lecture 43 - Limit of Functions at Infinity
- Lecture 44 - Continuous Functions (Cauchy's Definition)
- Lecture 45 - Continuous Functions (Heine's Definition)
- Lecture 46 - Properties of Continuous Functions
- Lecture 47 - Properties of Continuous Functions (Continued...)
- Lecture 48 - Tutorial-VIII
- Lecture 49 - Boundness Theorem and Max-Min Theorem
- Lecture 50 - Location of Root and Bolzano's Theorem
- Lecture 51 - Uniform Continuity and Related Theorems
- Lecture 52 - Absolute Continuity and Related Theorems
- Lecture 53 - Types of Discontinuities
- Lecture 54 - Tutorial-IX
- Lecture 55 - Types of Discontinuities (Continued...)
- Lecture 56 - Relation between Continuity and Compact Sets
- Lecture 57 - Differentiability of Real Valued Functions
- Lecture 58 - Local Max. - Min. Cauchy's and Lagrange's Mean Value Theorem
- Lecture 59 - Rolle's Mean Value Theorems and Its Applications
- Lecture 60 - Tutorial-X
- Lecture 61
- Lecture 62
- Lecture 63
- Lecture 64
- Lecture 65
- Lecture 66
- Lecture 67
- Lecture 68

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Lecture 69  
Lecture 70  
Lecture 71  
Lecture 72  
Lecture 73

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Modeling Transport Phenomena of Microparticles

Subject Co-ordinator - Dr. G.P. Raja Sekhar, Prof. Somnath Bhattacharyya

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Preliminary concepts
- Lecture 2 - Cauchy's equation of motion and Navier-Stokes equations
- Lecture 3 - Reduced forms of Navier-Stokes equations and Boundary conditions
- Lecture 4 - Exact solutions of Navier-Stokes equations in particular cases
- Lecture 5 - Dimensional Analysis - Non-dimensionalization of Navier-Stokes's equations
- Lecture 6 - Stream function formulation of Navier-Stokes equations
- Lecture 7 - Stokes flow past a cylinder
- Lecture 8 - Stokes flow past a sphere
- Lecture 9 - Elementary Lubrication Theory
- Lecture 10 - Hydrodynamics of Squeeze flow
- Lecture 11 - Solution of arbitrary Stokes flows
- Lecture 12 - Mechanics of Swimming Microorganisms
- Lecture 13 - Viscous flow past a spherical drop
- Lecture 14 - Migration of a viscous drop under Marangoni effects
- Lecture 15 - Singularities of Stokes flows
- Lecture 16 - Introduction to porous media
- Lecture 17 - Flow through porous media - elementary geometries
- Lecture 18 - Flow through composite porous channels
- Lecture 19 - Modeling transport of particles inside capillaries
- Lecture 20 - Modeling transport of microparticles - some applications
- Lecture 21 - Introduction to Electrokinetics
- Lecture 22 - Basics on Electrostatics
- Lecture 23 - Transport Equations for Electrokinetics, Part-I
- Lecture 24 - Transport Equations for Electrokinetics, Part-II
- Lecture 25 - Electric Double Layer
- Lecture 26 - Electroosmotic flow (EOF) of ionized fluid
- Lecture 27 - EOF in micro-channel
- Lecture 28 - Non-linear EOF, Overlapping Debye Layer
- Lecture 29 - Two-dimensional EOF

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- Lecture 30 - EOF near heterogeneous surface potential
- Lecture 31 - Electroosmosis in hydrophobic surface
- Lecture 32 - Numerical Methods for Boundary Value Problems (BVP)
- Lecture 33 - Numerical Methods for nonlinear BVP
- Lecture 34 - Numerical Methods for coupled set of BVP
- Lecture 35 - Numerical Methods for PDEs
- Lecture 36 - Numerical Methods for transport equations, Part-I
- Lecture 37 - Numerical Methods for transport equations, Part-II
- Lecture 38 - Electrophoresis of charged colloids, Part-I
- Lecture 39 - Electrophoresis of charged colloids, Part-II
- Lecture 40 - Gel Electrophoresis

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Constrained and Unconstrained Optimization

Subject Co-ordinator - Dr. Debjani Chakraborty, Prof. A. Goswami

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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
- 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
- Lecture 12 - Two Phase Method
- 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
- Lecture 25 - Mixed Integer Programming Problem
- Lecture 26
- Lecture 27
- Lecture 28
- Lecture 29

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- Lecture 30
- Lecture 31 - Introduction to Nonlinear programming
- Lecture 32 - Graphical Solution of NLP
- Lecture 33 - Types of NLP
- Lecture 34 - One dimensional 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Matrix Solver

Subject Co-ordinator - Prof. Somnath Roy

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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-Jordan 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 - Eigenvalues and eigenvectors for real symmetric matrix

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- Lecture 30 - Positive definiteness of a matrix
- Lecture 31 - Positive definiteness of a matrix (Continued...)
- Lecture 32 - Basic Iterative Methods
- Lecture 33 - Basic Iterative Methods
- Lecture 34 - Convergence Rate and Convergence Factor for Iterative Methods
- Lecture 35 - Numerical Experiments on Convergence
- Lecture 36 - Steepest Descent Method
- Lecture 37 - Steepest Descent Method
- Lecture 38 - Steepest Descent Method
- Lecture 39 - Introduction to General Projection Methods
- Lecture 40 - Residue Norm and Minimum Residual Algorithm
- Lecture 41 - Developing computer programs for basic iterative methods
- Lecture 42 - Developing computer programs for projection based methods
- Lecture 43 - Introduction to Krylov subspace methods
- Lecture 44 - Krylov subspace methods for linear systems
- Lecture 45 - Iterative methods for solving linear systems using Krylov subspace methods
- Lecture 46 - Conjugate gradient methods
- Lecture 47 - Conjugate gradient methods (Continued...)
- Lecture 48 - Conjugate gradient methods (Continued...) and Introduction to GMRES
- Lecture 49 - GMRES (Continued...)
- Lecture 50 - Lanczos Biorthogonalization and BCG Algorithm
- Lecture 51 - Numerical issues in BICG and polynomial based formulation
- Lecture 52 - Conjugate gradient squared and Biconjugate gradient stabilized
- Lecture 53 - Line relaxation method
- Lecture 54 - Block relaxation method
- Lecture 55 - Domain Decomposition and Parallel Computing
- Lecture 56 - Preconditioners
- Lecture 57 - Preconditioned conjugate gradient
- Lecture 58 - Preconditioned GMRES
- Lecture 59 - Multigrid methods - I
- Lecture 60 - Multigrid methods - II

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Abstract and Linear Algebra

Subject Co-ordinator - Prof.Sourav Mukhopadhyay

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Linear Space
- Lecture 31 - Rank of a matrix
- Lecture 32 - Rank of a matrix (Continued...)
- Lecture 33 - System of linear equations
- Lecture 34 - Row rank and Column rank
- Lecture 35 - Eigen value of a matrix
- Lecture 36 - Eigen Vector
- Lecture 37 - Geometric multiplicity
- Lecture 38 - More on eigen value
- Lecture 39 - Similar matrices
- Lecture 40 - Diagonalisable

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Engineering Mathematics-I

Subject Co-ordinator - Prof. Jitendra Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Rolle's Theorem
- Lecture 2 - Mean Value Theorems
- Lecture 3 - Indeterminate Forms - Part 1
- Lecture 4 - Indeterminate Forms - Part 2
- Lecture 5 - Taylor Polynomial and Taylor Series
- Lecture 6 - Limit of Functions of Two Variables
- Lecture 7 - Evaluation of Limit of Functions of Two Variables
- Lecture 8 - Continuity of Functions of Two Variables
- Lecture 9 - Partial Derivatives of Functions of Two Variables
- Lecture 10 - Partial Derivatives of Higher Order
- Lecture 11 - Derivative and Differentiability
- Lecture 12 - Differentiability of Functions of Two Variables
- Lecture 13 - Differentiability of Functions of Two Variables (Continued...)
- Lecture 14 - Differentiability of Functions of Two Variables (Continued...)
- Lecture 15 - Composite and Homogeneous Functions
- Lecture 16 - Taylor's Theorem for Functions of Two Variables
- Lecture 17 - Maxima and Minima of Functions of Two Variables
- Lecture 18 - Maxima and Minima of Functions of Two Variables (Continued...)
- Lecture 19 - Maxima and Minima of Functions of Two Variables (Continued...)
- Lecture 20 - Constrained Maxima and Minima
- Lecture 21 - Improper Integrals
- Lecture 22 - Improper Integrals (Continued...)
- Lecture 23 - Improper Integrals (Continued...)
- Lecture 24 - Improper Integrals (Continued...)
- Lecture 25 - Beta and Gamma Function
- Lecture 26 - Beta and Gamma Function (Continued...)
- Lecture 27 - Differentiation Under Integral Sign
- Lecture 28 - Double Integrals
- Lecture 29 - Double Integrals (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Double Integrals (Continued...)
- Lecture 31 - Integral Calculus Double Integrals in Polar Form
- Lecture 32 - Integral Calculus Double Integrals
- Lecture 33 - Integral Calculus Double Integrals
- 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
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC: Integral and Vector Calculus

Subject Co-ordinator - Prof. Hari Shankar Mahato

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Partition, Riemann integrability and One example
- Lecture 2 - Partition, Riemann integrability and One example (Continued...)
- Lecture 3 - Condition of integrability
- Lecture 4 - Theorems on Riemann integrations
- Lecture 5 - Examples
- Lecture 6 - Examples (Continued...)
- Lecture 7 - Reduction formula
- Lecture 8 - Reduction formula (Continued...)
- Lecture 9 - Improper Integral
- Lecture 10 - Improper Integral (Continued...)
- Lecture 11 - Improper Integral (Continued...)
- Lecture 12 - Improper Integral (Continued...)
- Lecture 13 - Introduction to Beta and Gamma Function
- Lecture 14 - Beta and Gamma Function
- Lecture 15 - Differentiation under Integral Sign
- Lecture 16 - Differentiation under Integral Sign (Continued...)
- Lecture 17 - Double Integral
- Lecture 18 - Double Integral over a Region E
- Lecture 19 - Examples of Integral over a Region E
- Lecture 20 - Change of variables in a Double Integral
- Lecture 21 - Change of order of Integration
- Lecture 22 - Triple Integral
- Lecture 23 - Triple Integral (Continued...)
- Lecture 24 - Area of Plane Region
- Lecture 25 - Area of Plane Region (Continued...)
- Lecture 26 - Rectification
- Lecture 27 - Rectification (Continued...)
- Lecture 28 - Surface Integral
- Lecture 29 - Surface Integral (Continued...)

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## NPTTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Surface Integral (Continued...)
- Lecture 31 - Volume Integral, Gauss Divergence Theorem
- Lecture 32 - Vector Calculus
- Lecture 33 - Limit, Continuity, Differentiability
- Lecture 34 - Successive Differentiation
- Lecture 35 - Integration of Vector Function
- Lecture 36 - Gradient of a Function
- Lecture 37 - Divergence and Curl
- Lecture 38 - Divergence and Curl Examples
- Lecture 39 - Divergence and Curl important Identities
- Lecture 40 - Level Surface Relevant Theorems
- Lecture 41 - Directional Derivative (Concept and Few Results)
- Lecture 42 - Directional Derivative (Concept and Few Results) (Continued...)
- Lecture 43 - Directional Derivatives, Level Surfaces
- Lecture 44 - Application to Mechanics
- Lecture 45 - Equation of Tangent, Unit Tangent Vector
- Lecture 46 - Unit Normal, Unit binormal, Equation of Normal Plane
- Lecture 47 - Introduction and Derivation of Serret-Frenet Formula, few results
- Lecture 48 - Example on binormal, normal tangent, Serret-Frenet Formula
- Lecture 49 - Osculating Plane, Rectifying plane, Normal plane
- Lecture 50 - Application to Mechanics, Velocity, speed, acceleration
- Lecture 51 - Angular Momentum, Newton's Law
- Lecture 52 - Example on derivation of equation of motion of particle
- Lecture 53 - Line Integral
- Lecture 54 - Surface integral
- Lecture 55 - Surface integral (Continued...)
- Lecture 56 - Green's Theorem and Example
- Lecture 57 - Volume integral, Gauss theorem
- Lecture 58 - Gauss divergence theorem
- Lecture 59 - Stoke's Theorem
- Lecture 60 - Overview of Course

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Transform Calculus and its applications in Differential Equations

Subject Co-ordinator - Prof. A. Goswami

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Integral Transform and Laplace Transform

Lecture 2 - Existence of Laplace Transform

Lecture 3 - Shifting Properties of Laplace Transform

Lecture 4 - Laplace Transform of Derivatives and Integration of a Function - I

Lecture 5 - Laplace Transform of Derivatives and Integration of a Function - II

Lecture 6 - Explanation of properties of Laplace Transform using Examples

Lecture 7 - Laplace Transform of Periodic Function

Lecture 8 - Laplace Transform of some special Functions

Lecture 9 - Error Function, Dirac Delta Function and their Laplace Transform

Lecture 10 - Bessel Function and its Laplace Transform

Lecture 11 - Introduction to Inverse Laplace Transform

Lecture 12 - Properties of Inverse Laplace Transform

Lecture 13 - Convolution and its Applications

Lecture 14 - Evaluation of Integrals using Laplace Transform

Lecture 15 - Solution of Ordinary Differential Equations with constant coefficients using Laplace Transform

Lecture 16 - Solution of Ordinary Differential Equations with variable coefficients using Laplace Transform

Lecture 17 - Solution of Simultaneous Ordinary Differential Equations using Laplace Transform

Lecture 18 - Introduction to Integral Equation and its Solution Process

Lecture 19 - Introduction to Fourier Series

Lecture 20 - Fourier Series for Even and Odd Functions

Lecture 21 - Fourier Series of Functions having arbitrary period - I

Lecture 22 - Fourier Series of Functions having arbitrary period - II

Lecture 23 - Half Range Fourier Series

Lecture 24 - Parseval's Theorem and its Applications

Lecture 25 - Complex form of Fourier Series

Lecture 26 - Fourier Integral Representation

Lecture 27 - Introduction to Fourier Transform

Lecture 28 - Derivation of Fourier Cosine Transform and Fourier Sine Transform of Functions

Lecture 29 - Evaluation of Fourier Transform of various functions

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Linearity Property and Shifting Properties of Fourier Transform
- Lecture 31 - Change of Scale and Modulation Properties of Fourier Transform
- 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 PDEs
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Statistical Inference (2019)

Subject Co-ordinator - Prof. Somesh Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction and Motivation - I  
Lecture 2 - Introduction and Motivation - II  
Lecture 3 - Basic Concepts of Point Estimations - I  
Lecture 4 - Basic Concepts of Point Estimations - II  
Lecture 5 - Basic Concepts of Point Estimations - III  
Lecture 6 - Basic Concepts of Point Estimations - IV  
Lecture 7 - Finding Estimators - I  
Lecture 8 - Finding Estimators - II  
Lecture 9 - Finding Estimators - III  
Lecture 10 - Finding Estimators - IV  
Lecture 11 - Finding Estimators - V  
Lecture 12 - Finding Estimators - VI  
Lecture 13 - Properties of MLEs - I  
Lecture 14 - Properties of MLEs - II  
Lecture 15 - Lower Bounds for Variance - I  
Lecture 16 - Lower Bounds for Variance - II  
Lecture 17 - Lower Bounds for Variance - III  
Lecture 18 - Lower Bounds for Variance - IV  
Lecture 19 - Lower Bounds for Variance - V  
Lecture 20 - Lower Bounds for Variance - VI  
Lecture 21 - Lower Bounds for Variance - VII  
Lecture 22 - Lower Bounds for Variance - VIII  
Lecture 23 - Sufficiency - I  
Lecture 24 - Sufficiency - II  
Lecture 25 - Sufficiency and Information - I  
Lecture 26 - Sufficiency and Information - II  
Lecture 27 - Minimal Sufficiency, Completeness - I  
Lecture 28 - Minimal Sufficiency, Completeness - II  
Lecture 29 - UMVU Estimation, Ancillarity - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - UMVU Estimation, Ancillarity - II
- Lecture 31 - Testing of Hypotheses
- Lecture 32 - Testing of Hypotheses
- Lecture 33 - Neyman Pearson Fundamental Lemma - I
- Lecture 34 - Neyman Pearson Fundamental Lemma - II
- Lecture 35 - Application of NP-Lemma - I
- Lecture 36 - Application of NP-Lemma - II
- Lecture 37 - UMP Tests - I
- Lecture 38 - UMP Tests - II
- Lecture 39 - UMP Tests - III
- Lecture 40 - UMP Tests - IV
- Lecture 41 - UMP Unbiased Tests - I
- Lecture 42 - UMP Unbiased Tests - II
- Lecture 43 - UMP Unbiased Tests - III
- Lecture 44 - UMP Unbiased Tests - IV
- Lecture 45 - Applications of UMP Unbiased Tests - I
- Lecture 46 - Applications of UMP Unbiased Tests - II
- Lecture 47 - Unbiased Test for Normal Populations - I
- Lecture 48 - Unbiased Test for Normal Populations - II
- Lecture 49 - Unbiased Test for Normal Populations - III
- Lecture 50 - Unbiased Test for Normal Populations - IV
- Lecture 51 - Likelihood Ratio Tests - I
- Lecture 52 - Likelihood Ratio Tests - II
- Lecture 53 - Likelihood Ratio Tests - III
- Lecture 54 - Likelihood Ratio Tests - IV
- Lecture 55 - Likelihood Ratio Tests - V
- Lecture 56 - Likelihood Ratio Tests - VI
- Lecture 57 - Likelihood Ratio Tests - VII
- Lecture 58 - Likelihood Ratio Tests - VIII
- Lecture 59 - Test for Goodness of Fit - I
- Lecture 60 - Test for Goodness of Fit - II
- Lecture 61 - Interval Estimation - I
- Lecture 62 - Interval Estimation - II
- Lecture 63 - Interval Estimation - III
- Lecture 64 - Interval Estimation - IV

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Methods for Boundary Value Problems

Subject Co-ordinator - Prof. Somnath Bhattacharyya

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Sturm-Liouville Problems, Linear BVP

Lecture 2 - Sturm-Liouville Problems, Linear BVP (Continued...)

Lecture 3 - Solution of BVPs by Eigen function expansion

Lecture 4 - Solution of BVPs by Eigen function expansion (Continued...)

Lecture 5 - Solutions of linear parabolic, hyperbolic and elliptic PDEs with finite domain by Eigen function

Lecture 6 - Solutions of linear parabolic, hyperbolic and elliptic PDEs with finite domain by Eigen function

Lecture 7 - Green's Function for BVP and Dirichlet Problem

Lecture 8 - Green's Function for BVP and Dirichlet Problem (Continued...)

Lecture 9 - Numerical Techniques for IVP; Shooting Method for BVP

Lecture 10 - Numerical Techniques for IVP; Shooting Method for BVP (Continued...)

Lecture 11 - Finite difference methods for linear BVP; Thomas Algorithm

Lecture 12 - Finite difference methods for linear BVP; Thomas Algorithm (Continued...)

Lecture 13 - Finite difference method for Higher-order BVP; Block tri-diagonal System

Lecture 14 - Finite difference method for Higher-order BVP; Block tri-diagonal System (Continued...)

Lecture 15 - Iterative methods for nonlinear BVP; Control volume formulation

Lecture 16 - Iterative methods for nonlinear BVP; Control volume formulation (Continued...)

Lecture 17 - Implicit scheme; Truncation error; Crank-Nicolson scheme

Lecture 18 - Implicit scheme; Truncation error; Crank-Nicolson scheme (Continued...)

Lecture 19 - Stability analysis of numerical schemes

Lecture 20 - Alternating-Direction-Implicit Scheme; Successive-Over-Relaxation technique for Poisson equation

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Engineering Mathematics-II

Subject Co-ordinator - Prof. Jitendra Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Vector Functions
- Lecture 2 - Vector and Scalar Fields
- Lecture 3 - Divergence and Curl of a Vector Field
- Lecture 4 - Line Integrals
- Lecture 5 - Conservative Vector Field
- Lecture 6 - Green's Theorem
- Lecture 7 - Surface Integral - I
- Lecture 8 - Surface Integral - II
- Lecture 9 - Stokes's Theorem
- Lecture 10 - Divergence Theorem
- Lecture 11 - Complex Numbers and Functions
- Lecture 12 - Differentiability of Complex Functions
- Lecture 13 - Analytic Functions
- Lecture 14 - Line Integral
- Lecture 15 - Cauchy Integral Theorem
- Lecture 16 - Cauchy Integral Formula
- Lecture 17 - Taylor's Series
- Lecture 18 - Laurent's Series
- Lecture 19 - Singularities
- Lecture 20 - Residue
- Lecture 21 - Iterative Methods for Solving System of Linear Equations
- Lecture 22 - Iterative Methods for Solving System of Linear Equations (Continued...)
- Lecture 23 - Iterative Methods for Solving System of Linear Equations (Continued...)
- Lecture 24 - Roots of Algebraic and Transcendental Equations
- Lecture 25 - Roots of Algebraic and Transcendental Equations (Continued...)
- Lecture 26 - Polynomial Interpolation
- Lecture 27 - Polynomial Interpolation (Continued...)
- Lecture 28 - Polynomial Interpolation (Continued...)
- Lecture 29 - Polynomial Interpolation (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Numerical Integration
- Lecture 31 - Trigonometric Polynomials and Series
- 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 - Bessel's Inequality and Parseval'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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Calculus For Engineers

Subject Co-ordinator - Prof. Somesh Kumar, Prof. Jitendra Kumar

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Rolle's Theorem  
Lecture 2 - Mean Value Theorem  
Lecture 3 - Taylor's Formula (Single Variable)  
Lecture 4 - Indeterminate Forms - Part 1  
Lecture 5 - Indeterminate Forms - Part 2  
Lecture 6 - Introduction to Limit  
Lecture 7 - Evaluation of Limit  
Lecture 8 - Continuity  
Lecture 9 - First Order Partial Derivatives  
Lecture 10 - Higher Order Partial Derivatives  
Lecture 11 - Differentiability - Part 1  
Lecture 12 - Differentiability - Part 2  
Lecture 13 - Differentiability - Part 3  
Lecture 14 - Differentiability - Part 4  
Lecture 15 - Composite and Homogeneous Functions  
Lecture 16 - Taylor's Theorem (Multivariable)  
Lecture 17 - Maxima and Minima - Part 1  
Lecture 18 - Maxima and Minima - Part 2  
Lecture 19 - Maxima and Minima - Part 3  
Lecture 20 - Maxima and Minima - Part 4  
Lecture 21 - Formation of Differential Equations  
Lecture 22 - First Order and First Degree DE  
Lecture 23 - Exact Differential Equations  
Lecture 24 - Integrating Factor  
Lecture 25 - Linear Differential Equations  
Lecture 26 - Introduction to Higher Order DEs  
Lecture 27 - Complementary Function  
Lecture 28 - Particular Integral  
Lecture 29 - Cauchy-Euler Equations

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- Lecture 30 - Method of Variation of Parameters
- Lecture 31 - Improper Integral - Part 1
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Rings and Modules

Subject Co-ordinator - Prof. Ramakrishna Nanduri, Prof. Mousumi Mandal

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Rings
- Lecture 2 - Rings, Subrings
- Lecture 3 - Ring Homomorphism, Ideals
- Lecture 4 - Properties of Ideals
- Lecture 5 - Properties of Ideals (Continued...)
- Lecture 6 - Quotient Ring, Isomorphism Theorem
- Lecture 7 - Isomorphism Theorem, Homomorphism Theorem
- Lecture 8 - Homomorphism Theorem
- Lecture 9 - Integral Domain, Quotient Ring
- Lecture 10 - Quotient Ring
- Lecture 11 - Prime ideals, Maximal ideals
- Lecture 12 - Maximal ideals
- Lecture 13 - Hilbert's Nullstellensatz
- Lecture 14 - Hilbert's Nullstellensatz (Continued...)
- Lecture 15 - Application of Hilbert's Nullstellensatz
- Lecture 16 - Unique Factorization domain
- Lecture 17 - Properties of Unique Factorization domain
- Lecture 18 - Principal ideal domain
- Lecture 19 - Properties of PID and ED
- Lecture 20 - Properties of PID and ED (Continued...)
- Lecture 21 - Prime elements of  $\mathbb{Z}[i]$
- Lecture 22 - Prime elements of  $\mathbb{Z}[i]$  (Continued...)
- Lecture 23 - Application in  $\mathbb{Z}[i]$
- Lecture 24 - Polynomial Rings over UFD
- Lecture 25 - Gauss's Lemma
- Lecture 26 - Polynomial Ring over UFD and Irreducibility Criterion
- Lecture 27 - Irreducibility Criterion
- Lecture 28 - Chinese Remainder Theorem
- Lecture 29 - Nilradical and Jacobson radical

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- Lecture 30 - Examples and Problems
- Lecture 31 - Definition of Modules and Examples
- Lecture 32 - Definition of Modules and Examples (Continued...)
- Lecture 33 - Submodules, direct sum and direct product of modules
- Lecture 34 - Direct sum and direct product of modules, free modules
- Lecture 35 - Finitely generated modules, free modules vs Vector spaces
- Lecture 36 - Free modules vs Vector spaces
- Lecture 37 - Vector spaces vs free modules and Examples
- Lecture 38 - Quotient modules and module homomorphisms
- Lecture 39 - Module homomorphism, Epimorphism theorem
- Lecture 40 - Epimorphism theorem
- Lecture 41 - Maximal submodules, minimal submodules
- Lecture 42 - Freeness of submodules of a free module over a PID
- Lecture 43 - Torsion modules, freeness of torsion-free modules over a PID
- Lecture 44 - Rank of a module,  $p$ -submodules over a PID
- Lecture 45 - Structure of a torsion module over a PID
- Lecture 46 - Structure theorem, chain conditions
- Lecture 47 - Artinian modules, Artinian rings
- Lecture 48 - Noetherian modules, Noetherian rings
- Lecture 49 - Ascending chain condition, Noetherian modules
- Lecture 50 - Examples of Noetherian and Artinian modules and rings
- Lecture 51 - Composition series, Modules of finite length
- Lecture 52 - Jordan-Holder's theorem
- Lecture 53 - Artinian rings
- Lecture 54 - Noetherian rings
- Lecture 55 - Hilbert basis theorem
- Lecture 56 - Cohen's theorem on Noetherianness
- Lecture 57 - Nakayama lemma
- Lecture 58 - Nil and Jacobson radicals in Artinian rings
- Lecture 59 - Structure theorem
- Lecture 60 - Comparison between Artinian and Noetherian rings

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Computational Techniques

Subject Co-ordinator - Prof. Somnath Bhattacharyya

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Polynomial Interpolation
- Lecture 2 - Polynomial Interpolation
- Lecture 3 - Polynomial Interpolation
- Lecture 4 - Spline Interpolation
- Lecture 5 - Spline Interpolation
- Lecture 6 - Numerical Quadrature
- Lecture 7 - Numerical Quadrature (Continued...)
- Lecture 8 - Least Squares Approximation
- Lecture 9 - Linear System of Equations
- Lecture 10 - Linear System of Equations (Continued... )
- Lecture 11 - Initial Value Problems (IVP)
- Lecture 12 - Initial Value Problems (Continued...)
- Lecture 13 - Initial Value Problems (Continued...)
- Lecture 14 - Initial Value Problems (Continued...)
- Lecture 15 - Linear Boundary Value Problem (BVP)
- Lecture 16 - Linear Boundary Value Problem (BVP) (Continued...)
- Lecture 17 - Non-linear BVP, Iterative Method
- Lecture 18 - Linear Parabolic PDE
- Lecture 19 - Hyperbolic PDE
- Lecture 20 - Non-linear advection-diffusion equation

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Applied Linear Algebra in AI and ML

Subject Co-ordinator - Prof. Swanand Khare

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Vector Spaces
- Lecture 2 - Vector Subspaces
- Lecture 3 - Linear Span and Linear Dependence
- Lecture 4 - Linear Independence
- Lecture 5 - Basis and Dimension
- Lecture 6 - Linear Functionals
- Lecture 7 - Norm of Vector - Part I
- Lecture 8 - Norm of Vector - Part II
- Lecture 9 - Linear Functions
- Lecture 10 - Affine Functions and Examples
- Lecture 11 - Examples of Linear and Affine Functions
- Lecture 12 - Function Composition
- Lecture 13 - System of Linear Equations
- Lecture 14 - Left Invertibility
- Lecture 15 - Invertibility of Matrices
- Lecture 16 - Triangular Systems
- Lecture 17 - LU Decomposition - Part I
- Lecture 18 - LU Decomposition - Part II
- Lecture 19 - QR Decomposition (Rotators) - Part I
- Lecture 20 - QR Decomposition (Rotators) - Part II
- Lecture 21 - QR Decomposition (Reflectors) - Part I
- Lecture 22 - QR Decomposition (Reflectors) - Part II
- Lecture 23 - Matrix Norms
- Lecture 24 - Sensitivity Analysis
- Lecture 25 - Condition Number of a Matrix
- Lecture 26 - Sensitivity Analysis - II
- Lecture 27 - Sensitivity Analysis - III
- Lecture 28 - Least Squares - Part I
- Lecture 29 - Least Squares - Part II

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Least Squares - Part III
- Lecture 31 - Least Squares Data Fitting
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Engineering Mathematics (2023)

Subject Co-ordinator - Prof. H S Mahato

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction on functions of a single variable
- Lecture 2 - Basic definitions
- Lecture 3 - Mean value Theorems
- Lecture 4 - Extremum of function of single variable
- Lecture 5 - Examples
- Lecture 6 - Introduction on functions of two variable
- Lecture 7 - Basic definitions
- Lecture 8 - Partial differentiation
- Lecture 9 - Extremum of function of two variable
- Lecture 10 - Examples
- Lecture 11 - Convergence and divergence test
- Lecture 12 - Beta function, Gamma function
- Lecture 13 - Differentiation under integral sign
- Lecture 14 - Line integral, integration in  $R^2$  (Double integral)
- Lecture 15 - Examples
- Lecture 16 - Double integral
- Lecture 17 - Integration in  $R^3$
- Lecture 18 - Triple integral
- Lecture 19 - Examples
- Lecture 20 - Introduction to Differential equation
- Lecture 21 - Exact form
- Lecture 22 - Second order differential equation
- Lecture 23 - Iterative method (bisection and fixed point)
- Lecture 24 - Newton-Raphson, Jacobi and Gauss-Seidel method
- Lecture 25 - Finite difference method
- Lecture 26 - Newton's forward and backward interpolation
- Lecture 27 - Numerical integration
- Lecture 28 - Vector space and Subspace
- Lecture 29 - Basis and dimension

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Rank of a matrix
- Lecture 31 - Gauss-Elimination Method
- Lecture 32 - Linear Transformation
- Lecture 33 - Examples
- Lecture 34 - Matrix Representation
- Lecture 35 - Eigenvalues and Eigenvectors
- Lecture 36 - Cayley-Hamilton Theorem
- Lecture 37 - Diagonalisation of a Matrix
- Lecture 38 - Examples and applications
- Lecture 39 - Types of matrices
- Lecture 40 - Equivalent Matrices and Elementary Matrices
- Lecture 41 - Introduction to the vector function
- Lecture 42 - Differentiation and integration of the vector function
- Lecture 43 - Partial differentiation of vector function
- Lecture 44 - Directional derivative of a vector function
- Lecture 45 - Examples on directional derivative, tangent plane and normal
- Lecture 46 - Divergence and curl of a vector function
- Lecture 47 - Application to mechanics of vector calculus
- Lecture 48 - Serret-Frenet formula and more applications to mechanics
- Lecture 49 - Examples on finding unit vectors, curvature and torsion
- Lecture 50 - Application of vector calculus to the particle dynamics
- Lecture 51 - Line integral of vector function
- Lecture 52 - Surface integral of vector function
- Lecture 53 - Volume integral of vector function and Gauss Divergence Theorem
- Lecture 54 - Green's theorem and Stoke's theorem
- Lecture 55 - Verification and application of Divergencen theorem, Green's theorem and Stoke's theorem
- Lecture 56 - Basic properties of a complex valued function
- Lecture 57 - Analytic Complex valued function
- Lecture 58 - Complex Integration and theorems
- Lecture 59 - Application of Cauchy's integral formula
- Lecture 60 - Regular and Singular point of a complex valued function

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Essentials of Topology

Subject Co-ordinator - Prof. S. P. Tiwari

Co-ordinating Institute - IIT-ISM Dhanbad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction  
Lecture 2 - Sets and Functions - I  
Lecture 3 - Sets and Functions - II  
Lecture 4 - Sets and Functions - III  
Lecture 5 - Sets and Functions - IV  
Lecture 6 - Metric Spaces  
Lecture 7 - Topological Spaces  
Lecture 8 - Topological Spaces (Examples)  
Lecture 9 - Typologies on  $\mathbb{R}$  - I  
Lecture 10 - Typologies on  $\mathbb{R}$  - II  
Lecture 11 - Comparison of topologies  
Lecture 12 - Closed sets  
Lecture 13 - Basis for a topology - I  
Lecture 14 - Basis for a topology - II  
Lecture 15 - A topology on  $\mathbb{R}^2$   
Lecture 16 - Subbasis and Neighborhood  
Lecture 17 - Limit points of sets  
Lecture 18 - Closure of sets  
Lecture 19 - Interior and boundary of sets  
Lecture 20 - Subspaces  
Lecture 21 - Product topology  
Lecture 22 - Product and Box topologies  
Lecture 23 - The Quotient topology  
Lecture 24 - Krakowski closure/interior operator  
Lecture 25 - Countability axioms - I  
Lecture 26 - Countability axioms - II  
Lecture 27 - Countability axioms - III  
Lecture 28 - Continuous functions - I  
Lecture 29 - Continuous functions - II

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- Lecture 30 - Continuous functions - III
- Lecture 31 - Continuous functions - IV
- Lecture 32 - Homeomorphisms - I
- Lecture 33 - Homeomorphisms - II
- Lecture 34 - Homeomorphisms - III
- Lecture 35 - Connectedness - I
- Lecture 36 - Connectedness - II
- Lecture 37 - Connectedness - III
- Lecture 38 - Connectedness - IV
- Lecture 39 - Connectedness - V
- Lecture 40 - Connectedness - VI
- Lecture 41 - Connectedness - VII
- Lecture 42 - Connectedness - VIII
- Lecture 43 - Path connectedness - I
- Lecture 44 - Path connectedness - II
- Lecture 45 - Path connectedness - III
- Lecture 46 - Path components and Local connectedness
- Lecture 47 - Local connectedness
- Lecture 48 - Local path connectedness
- Lecture 49 - Compactness - I
- Lecture 50 - Compactness - II
- Lecture 51 - Compactness - III
- Lecture 52 - Compactness - IV
- Lecture 53 - Compactness - V
- Lecture 54 - Compactness - VI
- Lecture 55 - Compactness - VII
- Lecture 56 - Compactness - VIII
- Lecture 57 - Compactness - IX
- Lecture 58 - Compactness - X
- Lecture 59 - One-point compactifications - I
- Lecture 60 - One-point compactifications - II
- Lecture 61 - Separation axioms - I
- Lecture 62 - Separation axioms - II
- Lecture 63 - Separation axioms - III
- Lecture 64 - Separation axioms - IV
- Lecture 65 - Separation axioms - V
- Lecture 66 - Separation axioms - VI
- Lecture 67 - Separation axioms - VII
- Lecture 68 - Separation axioms - VIII

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Tychonoff theorem - I
- Lecture 70 - Tychonoff theorem - II
- Lecture 71 - Stone-Cech compactification - I
- Lecture 72 - Stone-Cech compactification - II

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Numerical Linear Algebra and Application

Subject Co-ordinator - Prof. Srinivasa Rao Pentyala

Co-ordinating Institute - IIT-ISM Dhanbad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Linear Algebra and Introduction  
Lecture 2 - Computational Difficulties  
Lecture 3 - Computational Error  
Lecture 4 - Stability  
Lecture 5 - Gaussian Elimination  
Lecture 6 - LU Factorization  
Lecture 7 - Iterative refinement  
Lecture 8 - QR Factorization  
Lecture 9 - Gram-Schmidt Orthogonalization  
Lecture 10 - Cholesky Decomposition  
Lecture 11 - Projections  
Lecture 12 - House-Holder Reflectors  
Lecture 13 - Image Compression  
Lecture 14 - Singular Value Decomposition  
Lecture 15 - Least Square Solutions  
Lecture 16 - Pseudo-Inverse  
Lecture 17 - Normal Equations  
Lecture 18 - Eigenvalue problems  
Lecture 19 - Gershgorin Theorem  
Lecture 20 - Similarity Transforms  
Lecture 21 - Eigenvalues  
Lecture 22 - Sensitivity Vectors  
Lecture 23 - Power method  
Lecture 24 - Schur Decomposition  
Lecture 25 - Jordan Canonical form  
Lecture 26 - QR Iteration  
Lecture 27 - Heisenberg transformation  
Lecture 28 - Rayleigh Quotient  
Lecture 29 - Symmetric eigenvalue problem

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- Lecture 30 - Jacobi Method
- Lecture 31 - Divide and Conquer
- Lecture 32 - Computing the Singular Value Decomposition
- Lecture 33 - Golub-Kahan-Reinsch Algorithm
- Lecture 34 - Chan SVD Algorithm
- Lecture 35 - Generalized SVD
- Lecture 36 - Generalized and Quadratic Eigenvalue Problems
- Lecture 37 - Generalized Schur Decomposition (QZ Decomposition)
- Lecture 38 - Iterative Methods for Large Linear Systems: Jacobi
- Lecture 39 - Iterative methods for large linear systems: Gauss-Seidel Method
- Lecture 40 - Iterative methods for large linear systems: SOR method
- Lecture 41 - Convergence of iterative algorithms
- Lecture 42 - Krylov subspace methods
- Lecture 43 - Lanczos
- Lecture 44 - Arnoldi
- Lecture 45 - Stability of the Cholesky QR Algorithm
- Lecture 46 - Conditioning of the eigenvalues
- Lecture 47 - Symmetric definite pencil
- Lecture 48 - AI applications
- Lecture 49 - Sensitive systems
- Lecture 50 - Real Life Systems
- Lecture 51 - Transient thermal systems
- Lecture 52 - Left Inverse
- Lecture 53 - Right Inverse
- Lecture 54 - Generalized Inverse
- Lecture 55 - Applications
- Lecture 56 - Applications (Continued...)
- Lecture 57 - Applications (Continued...)
- Lecture 58 - Applications (Continued...)
- Lecture 59 - Applications (Continued...)
- Lecture 60 - Applications of the Matrices in Real Life Systems
- Lecture 61 - Matrices and Its Fundamentals: Recalling Examples
- Lecture 62 - Properties of Matrices: Recalling and Revision, Examples
- Lecture 63 - Matrices: Finite Digit Arithmetic: recalling and Examples

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematics for Machine Learning

Subject Co-ordinator - Prof. Debjani Chakraborty, Prof. Debashree Guha Adhya

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Machine Learning
- Lecture 2 - Few Instances of Learning
- Lecture 3 - Loss Function Optimization
- Lecture 4 - Phases of Machine Learning Systems
- Lecture 5 - Single-layer and multi-layer neurons
- Lecture 6 - Introduction to Convexity
- Lecture 7 - Study on Convex Function
- Lecture 8 - Formation of Convex Hull
- Lecture 9 - Optimization of Functions
- Lecture 10 - Convex Optimization Problem
- Lecture 11 - Directional derivative, Gradient, Jacobian, First Order Taylor Formula
- Lecture 12 - Gradient, Jacobian, First order Taylor formula
- Lecture 13 - Gradient Descent Optimization Technique
- Lecture 14 - Gradient Descent, Interpretation from Taylor approximation
- Lecture 15 - Sub-Gradient Descent Optimization Technique
- Lecture 16 - Introduction to Underfitting and Overfitting
- Lecture 17 - Relation of Bias and Variance to Underfitting and Overfitting
- Lecture 18 - Bias-Variance Trade-off
- Lecture 19 - Ridge Regression
- Lecture 20 - LASSO Regression
- Lecture 21 - Stochastic Gradient descent
- Lecture 22 - Stochastic Gradient descent (Continued...)
- Lecture 23 - Variants of Gradient descent
- Lecture 24 - Momentum based Gradient descent
- Lecture 25 - Accelerated Gradient descent
- Lecture 26 - Linear Predictors (Logistic Regression)
- Lecture 27 - Linear Predictors (Logistic Regression) (Continued...)
- Lecture 28 - Linear Predictors (Logistic Regression) (Continued...)
- Lecture 29 - Linear Predictors (Logistic Regression) (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Linear Predictors (Support Vector Machines)
- Lecture 31 - Introduction to Theory of Estimation
- Lecture 32 - Probability Theory
- Lecture 33 - Discrete Probability Distribution
- Lecture 34 - Continuous Probability Distribution
- Lecture 35 - Maximum likelihood Estimation
- Lecture 36 - MLE for Discrete Probability Distribution
- Lecture 37 - MLE for Continuous Probability Distribution
- Lecture 38 - Properties of Estimators
- Lecture 39 - MLE for Linear and Logistic Regression
- Lecture 40 - MLE for Naïve Bayes Model
- Lecture 41 - Eigen value and eigen vector, Linearly independent vectors
- Lecture 42 - Orthogonal Basis, Eigen value decomposition
- Lecture 43 - Orthogonal Basis, Eigen value decomposition (Continued...)
- Lecture 44 - Principal Component Analysis
- Lecture 45 - Principal Component Analysis (Continued...)
- Lecture 46 - Introduction to Dynamical System
- Lecture 47 - Dynamical System and Control
- Lecture 48 - Discrete Fourier Transform
- Lecture 49 - Inverse Fourier Transform
- Lecture 50 - Applications: Discrete Fourier Transform
- Lecture 51 - Introduction to Mixture models
- Lecture 52 - Introduction to Gaussian Mixture Models
- Lecture 53 - EM Algorithm
- Lecture 54 - EM Algorithm (Continued...)
- Lecture 55 - A brief application to predict HMM parameters
- Lecture 56 - Conditional probability, Bayes theorem
- Lecture 57 - Bayes Decision Rule
- Lecture 58 - Bayes Decision Rule (Continued...)
- Lecture 59 - Bayes Decision Rule (Bayesian minimum risk classifier)
- Lecture 60 - Bayes Decision Rule (Linear Discriminant Analysis)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Theory of Ordinary Differential Equations

Subject Co-ordinator - Prof. Hari Sankar Mahato

Co-ordinating Institute - IIT - Kharagpur

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to ODEs
- Lecture 2 - Introduction to ODEs (Continued...)
- Lecture 3 - Existence of local solution. Theorems and Examples
- Lecture 4 - Continuation of solutions upto the boundary. Global existence of Solution
- Lecture 5 - Continuation of solution and dependence on initial data
- Lecture 6 - Dependence on Initial data : Examples
- Lecture 7 - Regular Perturbations and linearisation
- Lecture 8 - Linear System of equations and their stability
- Lecture 9 - Linear System of equations and their stability (Continued...)
- Lecture 10 - Stability Analysis
- Lecture 11 - Stability Analysis (Continued...)
- Lecture 12 - Stability of linear systems with constant and periodic co-efficient Matrix
- Lecture 13 - Stability of linear systems with constant and periodic co-efficient Matrix (Continued...)
- Lecture 14 - Stability of nonlinear system, linearization and Lyapunov functions
- Lecture 15 - Stability and Lyapunov functions
- Lecture 16 - Stability and Lyapunov functions (Continued...)
- Lecture 17 - Chaotic Theory - Introduction
- Lecture 18 - Chaotic Theory - Introduction (Continued...)
- Lecture 19 - Lorenz equation, attractor, Lyapunov exponent
- Lecture 20 - Lorenz equation, attractor, Lyapunov exponent (Continued...)
- Lecture 21 - Local divergence, Lyapunov exponents and related topics
- Lecture 22 - Local divergence, Lyapunov exponents and related topics (Continued...)
- Lecture 23 - Strange and Chaotic attractors
- Lecture 24 - Strange and Chaotic attractors
- Lecture 25 - Fractal Dimension and Reconstruction
- Lecture 26 - Fractal Dimension and Reconstruction (Continued...)
- Lecture 27 - Stiff Differential Equations: Introduction
- Lecture 28 - Stiff Differential Equations: Slow and fast time scales
- Lecture 29 - Stiff differential equations: Introduction

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Increment function, A-stable
- Lecture 31 - BDF methods and their implementation, Bifurcation Theory: Introduction
- Lecture 32 - Bifurcation Theory
- Lecture 33 - One dimensional bifurcation for scalar equations
- Lecture 34 - One dimensional bifurcations for planar systems
- Lecture 35 - Few definitions related to Hopf bifurcation
- Lecture 36 - Few definitions related to Hopf bifurcation (Continued...)
- Lecture 37 - Mathematical models with second order equations - Undamped free oscillations
- Lecture 38 - Damped free oscillations
- Lecture 39 - Undamped and Damped Forced Oscillations
- Lecture 40 - Undamped and Damped Forced Oscillations (Continued...)
- Lecture 41 - Higher order linear ODEs
- Lecture 42 - Higher order linear ODEs (Continued...)
- Lecture 43 - Linear Differential Equations of Higher Order with Constant Coefficients
- Lecture 44 - Linear Differential Equations of Higher Order with Constant Coefficients (Continued...)
- Lecture 45 - Higher order linear ODEs - Particular Integrals
- Lecture 46 - Higher order linear ODEs - Particular Integrals (Continued...)
- Lecture 47 - Higher order linear ODEs - Variable Coefficients
- Lecture 48 - Higher order linear ODEs - Variation of Parameters
- Lecture 49 - Series Solution
- Lecture 50 - Series Solution (Continued...)
- Lecture 51 - Series Solution - Frobenius Method
- Lecture 52 - Series Solution - Frobenius method (Continued...)
- Lecture 53 - Special functions
- Lecture 54 - Special functions (Continued...)
- Lecture 55 - Sturm-Liouville Problem - Eigenvalues and Eigenfunctions
- Lecture 56 - Sturm-Liouville Problem - Eigenvalues and Eigenfunctions (Continued...)
- Lecture 57 - Laplace Transform and Its Applications (Continued...)
- Lecture 58 - Laplace Transform
- Lecture 59 - Laplace Transform and Its Applications
- Lecture 60 - Laplace Transform and Its Applications (Continued...)

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Functional Analysis and its Applications

Subject Co-ordinator - Prof. Akhilesh Prasad

Co-ordinating Institute - IIT-ISM Dhanbad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - An Overview and Metric Spaces with Examples
- Lecture 2 - Basic Inequalities and their Applications
- Lecture 3 - Complete Metric Spaces with Examples
- Lecture 4 - Vector Spaces and Subspaces with Examples
- Lecture 5 - Linear Transformation with Examples
- Lecture 6 - Normed Linear Space and Pseudo-Normed Linear Space with Examples
- Lecture 7 - Convergence, Cauchy Sequence in Normed Linear Spaces and Banach Spaces with Examples
- Lecture 8 - Further examples of Banach Spaces
- Lecture 9 - The Linear Space  $C[a, b]$  as Normed Linear Space but not Banachspace
- Lecture 10 - The Linear Spaces  $\ell^p$  and  $\ell^\infty$  as Banach Spaces
- Lecture 11 - The Quotient Space as Banach Space
- Lecture 12 - The  $\ell^p$  spaces as Banach Spaces
- Lecture 13 - Bounded Linear Transformations and Equivalent Norms with Examples
- Lecture 14 - Norm of Bounded (Continuous) Linear Transformations and Some Related Theorems
- Lecture 15 - Continuity of Functions in Normed Linear Spaces and some related Theorems
- Lecture 16 - The set of all Bounded Linear Transformations of Normed Linear Space  $N$  into  $N$  as a
- Lecture 17 - Further Theorems on Bounded Linear Transformations
- Lecture 18 - Linear Functionals, Dual Vector Space and Dual Basis
- Lecture 19 - Continuous (Bounded) Linear Functionals on Normed linear spaces
- Lecture 20 - Consequences of Equivalent Norms with Examples and on a Finite-Dimensional space
- Lecture 21 - Further Theorems on Finite-Dimensional Normed Linear Spaces
- Lecture 22 - Dual Space of  $\ell^p$ ,  $\ell^1$  and  $\ell^\infty$
- Lecture 23 - Dual Space of  $\ell^p$  is  $\ell^q$
- Lecture 24 - Dual Space of  $\ell^1$  is  $\ell^\infty$
- Lecture 25 - Dual Space of  $\ell^\infty$  is  $\ell^1$
- Lecture 26 - Dual Space of  $c$  is  $\ell^1$
- Lecture 27 - Inner Product Space with Examples
- Lecture 28 - Further Example of Inner Product Space and Schwartz's Inequality
- Lecture 29 - Continuity of Inner Product, Parallelogram Law and Polarization Identity

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- Lecture 30 - Hilbert Space with Examples
- Lecture 31 - Application of Polarization Identity
- Lecture 32 - Applications of the Parallelogram Law
- Lecture 33 - Weak Convergence and Strong Convergence
- Lecture 34 - Orthogonality of Vectors
- Lecture 35 - Orthogonal Complement of an Orthogonal Complement
- Lecture 36 - The Orthogonal Decomposition (Projection) Theorem
- Lecture 37 - Orthonormal Sets in Hilbert Spaces and Bessel's Inequality
- Lecture 38 - Complete Orthonormal Sets
- Lecture 39 - Further Theorems on Complete Orthonormal Sets and Riesz-Fischer Theorem
- Lecture 40 - Gram-Schmidt Orthogonalization Process
- Lecture 41 - The Conjugate Space  $H^*$  and The Riesz Representation Theorem
- Lecture 42 - Further Theorems on Conjugate Space  $H^*$
- Lecture 43 - The Conjugate of an Operator
- Lecture 44 - The Adjoint of an Operator on a Hilbert Space
- Lecture 45 - Properties of Adjoint Operators on Hilbert Spaces
- Lecture 46 - Self Adjoint Operators
- Lecture 47 - Partially Ordered Set and Positive Operators
- Lecture 48 - Normal Operators
- Lecture 49 - Further Theorems of Normal Operators
- Lecture 50 - Unitary Operators
- Lecture 51 - Partial Order Relations, Total Order, Maximal and Minimal Elements, Zorn's Lemma
- Lecture 52 - Hahn-Banach Theorem - Part I
- Lecture 53 - Hahn-Banach Theorem - Part II and Proof of the Main Theorem
- Lecture 54 - Sublinear Functional and Generalized Hahn-Banach Theorem
- Lecture 55 - Uniform Boundedness Principle
- Lecture 56 - Application of the Uniform Boundedness Principle and Uniform Boundedness Principle
- Lecture 57 - Applications of Uniform Boundedness Principle for Continuous Linear Functionals
- Lecture 58 - Open Mapping Theorem
- Lecture 59 - Applications of Open Mapping Theorem
- Lecture 60 - The Closed Graph Theorem

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Soft Computing Techniques

Subject Co-ordinator - Prof. Santimoy Kundu

Co-ordinating Institute - IIT-ISM Dhanbad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Fuzzy Sets Fuzzy Membership Function Support Core Crossover points and Bandwidth of a Fuzzy set
- Lecture 2 - Fuzzy Sets and Membership Function Alpha-Cut of a Fuzzy Set Fuzzy subset and Scalar cardinality
- Lecture 3 - Fuzzy Sets and Membership Function Fuzzy subset and Scalar cardinality Basic operations and Properties
- Lecture 4 - Fuzzy Sets and Membership functions, intersection etc
- Lecture 5 - Fuzzy Sets Membership functions Basic operations
- Lecture 6 - Crisp Relation and Example Fuzzy Relation and operations
- Lecture 7 - Crisp relation and fuzzy relation Extension principle Fuzzy arithmetic numbers and operations
- Lecture 8 - Fuzzy relation and operations Fuzzy multi-valued logic Fuzzy implications
- Lecture 9 - Fuzzy relation and fuzzy implications Fuzzy multi-valued logic Defuzzification
- Lecture 10 - Defuzzification
- Lecture 11 - Fuzzy rules Generalised Modus Ponens Generalised Modus Tollens
- Lecture 12 - Fuzzy rules Fuzzy inference system
- Lecture 13 - Fuzzy inference system Mamdani's, Sugeno's and Tsukamoto type inferences
- Lecture 14 - Fuzzy inference systems with examples
- Lecture 15 - Numerical examples
- Lecture 16 - Introduction of Genetic Algorithm Darwin's Principle
- Lecture 17 - Working principle and flow chart of Genetic Algorithm Important terms of Genetic Algorithm
- Lecture 18 - Working procedure of Genetic Algorithm Initial population of Genetic Algorithm
- Lecture 19 - Basic Concepts of Genetic Algorithm Some encoding technique of Genetic Algorithm
- Lecture 20 - Working principle of Genetic Algorithm Population Set Encoding Techniques
- Lecture 21 - Selection operator Population diversity and Selection Pressure Exploration and Exploitation
- Lecture 22 - Population diversity and Selection Pressure Exploration and Exploitation Selection Methods
- Lecture 23 - Selection Methods and Crossover Techniques
- Lecture 24 - Selection Methods Crossover techniques Crossover Probability and Mutation Probability
- Lecture 25 - Crossover techniques
- Lecture 26 - Numerical Examples by using Genetic Algorithm
- Lecture 27 - Numerical Examples
- Lecture 28 - Numerical Examples (Continued...)
- Lecture 29 - Numerical Examples (Continued...)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Numerical Examples (Continued...)
- Lecture 31 - Introduction of Multi-objective optimization
- Lecture 32 - Weighted Sum Method Epsilon-Constraint Method
- Lecture 33 - Weighted Distance Metric Method Lexicographic Ordering Method Reference point method
- Lecture 34 - Few Methods to solve problems of Multi-objective optimization
- Lecture 35 - Introduction of Multi objective GASVEGA Method
- Lecture 36 - Vector Optimized Evolution Strategy (VOES) Weight-Based Genetic Algorithm (WBGA)
- Lecture 37 - NSGA and NSGA - II
- Lecture 38 - Numerical examples by using NSGA - II
- Lecture 39 - Concepts on non-domination Ranking Crowding distance operator NSGA - II
- Lecture 40 - Introduction of SPEA and SPEA 2
- Lecture 41 - Introduction Rough Set theory
- Lecture 42 - Introduction Rough Set theory Indiscernibility Relation
- Lecture 43 - Indiscernibility Relation Lower Approximations Upper Approximations
- Lecture 44 - Lower Approximations Upper Approximations Boundary Regions
- Lecture 45 - Properties of Approximations and Basic classes of Rough Set theory with Numerical examples
- Lecture 46 - Rough membership function Dependency of Attributes
- Lecture 47 - Dependency of Attributes Reduct and Core
- Lecture 48 - Indispensable and Dispensable Attributes Reduct and Core
- Lecture 49 - Reduct and Core Discernibility Matrix and Function
- Lecture 50 - Numerical examples of Discernibility Matrix and Function
- Lecture 51 - Some concepts on Rough set theory Introduction to Rule Generation
- Lecture 52 - Rule Generation based on Reduct and Core
- Lecture 53 - Some Problems of Rule Generations
- Lecture 54 - Fuzzy-Rough Sets
- Lecture 55 - Some problems of Fuzzy-Rough sets
- Lecture 56 - Introduction to Artificial Neural Networks
- Lecture 57 - Numerical example of Backpropagation Algorithm
- Lecture 58 - Intelligent Systems Introduction to Neuro-Fuzzy system
- Lecture 59 - Adaptive Neuro-Fuzzy Systems
- Lecture 60 - Ant colony optimization techniques

## NPTL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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NPTL Video Course - Mathematics - An Introduction to Riemann Surfaces and Algebraic Curves:  
Complex 1-Tori and Elliptic Curves

Subject Co-ordinator - Dr. T.E. Venkata Balaji

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - The Idea of a Riemann Surface
- Lecture 2 - Simple Examples of Riemann Surfaces
- Lecture 3 - Maximal Atlases and Holomorphic Maps of Riemann Surfaces
- Lecture 4 - A Riemann Surface Structure on a Cylinder
- Lecture 5 - A Riemann Surface Structure on a Torus
- Lecture 6 - Riemann Surface Structures on Cylinders and Tori via Covering Spaces
- Lecture 7 - Moebius Transformations Make up Fundamental Groups of Riemann Surfaces
- Lecture 8 - Homotopy and the First Fundamental Group
- Lecture 9 - A First Classification of Riemann Surfaces
- Lecture 10 - The Importance of the Path-lifting Property
- Lecture 11 - Fundamental groups as Fibres of the Universal covering Space
- Lecture 12 - The Monodromy Action
- Lecture 13 - The Universal covering as a Hausdorff Topological Space
- Lecture 14 - The Construction of the Universal Covering Map
- Lecture 15 - Completion of the Construction of the Universal Covering
- Lecture 16 - Completion of the Construction of the Universal Covering
- Lecture 17 - The Riemann Surface Structure on the Topological Covering of a Riemann Surface
- Lecture 18 - Riemann Surfaces with Universal Covering the Plane or the Sphere
- Lecture 19 - Classifying Complex Cylinders
- Lecture 20 - Characterizing Moebius Transformations with a Single Fixed Point
- Lecture 21 - Characterizing Moebius Transformations with Two Fixed Points
- Lecture 22 - Torsion-freeness of the Fundamental Group of a Riemann Surface
- Lecture 23 - Characterizing Riemann Surface Structures on Quotients of the Upper Half-Plane with Abelian Fundamental Groups
- Lecture 24 - Classifying Annuli up to Holomorphic Isomorphism
- Lecture 25 - Orbits of the Integral Unimodular Group in the Upper Half-Plane
- Lecture 26 - Galois Coverings are precisely Quotients by Properly Discontinuous Free Actions
- Lecture 27 - Local Actions at the Region of Discontinuity of a Kleinian Subgroup of Moebius Transformations

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 28 - Quotients by Kleinian Subgroups give rise to Riemann Surfaces
- Lecture 29 - The Unimodular Group is Kleinian
- Lecture 30 - The Necessity of Elliptic Functions for the Classification of Complex Tori
- Lecture 31 - The Uniqueness Property of the Weierstrass Phe-function associated to a Lattice in the Plane
- Lecture 32 - The First Order Degree Two Cubic Ordinary Differential Equation satisfied by the Weierstrass Phe-function
- Lecture 33 - The Values of the Weierstrass Phe-function at the Zeros of its Derivative are nonvanishing Analytic Functions on the Upper Half-Plane
- Lecture 34 - The Construction of a Modular Form of Weight Two on the Upper Half-Plane
- Lecture 35 - The Fundamental Functional Equations satisfied by the Modular Form of Weight Two on the Upper Half-Plane
- Lecture 36 - The Weight Two Modular Form assumes Real Values on the Imaginary Axis in the Upper Half-plane
- Lecture 37 - The Weight Two Modular Form Vanishes at Infinity
- Lecture 38 - The Weight Two Modular Form Decays Exponentially in a Neighbourhood of Infinity
- Lecture 39 - A Suitable Restriction of the Weight Two Modular Form is a Holomorphic Conformal Isomorphism onto the Upper Half-Plane
- Lecture 40 - The J-Invariant of a Complex Torus (or) of an Algebraic Elliptic Curve
- Lecture 41 - A Fundamental Region in the Upper Half-Plane for the Elliptic Modular J-Invariant
- Lecture 42 - The Fundamental Region in the Upper Half-Plane for the Unimodular Group
- Lecture 43 - A Region in the Upper Half-Plane Meeting Each Unimodular Orbit Exactly Once
- Lecture 44 - Moduli of Elliptic Curves
- Lecture 45 - Punctured Complex Tori are Elliptic Algebraic Affine Plane Cubic Curves in Complex 2-Space
- Lecture 46 - The Natural Riemann Surface Structure on an Algebraic Affine Nonsingular Plane Curve
- Lecture 47 - Complex Projective 2-Space as a Compact Complex Manifold of Dimension Two
- Lecture 48 - Complex Tori are the same as Elliptic Algebraic Projective Curves

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Linear Algebra

Subject Co-ordinator - Dr. K.C. Sivakumar

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to the Course Contents

Lecture 2 - Linear Equations

Lecture 3a - Equivalent Systems of Linear Equations I

Lecture 3b - Equivalent Systems of Linear Equations II

Lecture 4 - Row-reduced Echelon Matrices

Lecture 5 - Row-reduced Echelon Matrices and Non-homogeneous Equations

Lecture 6 - Elementary Matrices, Homogeneous Equations and Non-homogeneous Equations

Lecture 7 - Invertible matrices, Homogeneous Equations Non-homogeneous Equations

Lecture 8 - Vector spaces

Lecture 9 - Elementary Properties in Vector Spaces. Subspaces

Lecture 10 - Subspaces (Continued...), Spanning Sets, Linear Independence, Dependence

Lecture 11 - Basis for a vector space

Lecture 12 - Dimension of a vector space

Lecture 13 - Dimensions of Sums of Subspaces

Lecture 14 - Linear Transformations

Lecture 15 - The Null Space and the Range Space of a Linear Transformation

Lecture 16 - The Rank-Nullity-Dimension Theorem. Isomorphisms Between Vector Spaces

Lecture 17 - Isomorphic Vector Spaces, Equality of the Row-rank and the Column-rank - I

Lecture 18 - Equality of the Row-rank and the Column-rank - II

Lecture 19 - The Matrix of a Linear Transformation

Lecture 20 - Matrix for the Composition and the Inverse. Similarity Transformation

Lecture 21 - Linear Functionals. The Dual Space. Dual Basis - I

Lecture 22 - Dual Basis II. Subspace Annihilators - I

Lecture 23 - Subspace Annihilators - II

Lecture 24 - The Double Dual. The Double Annihilator

Lecture 25 - The Transpose of a Linear Transformation. Matrices of a Linear Transformation and its Transpose

Lecture 26 - Eigenvalues and Eigenvectors of Linear Operators

Lecture 27 - Diagonalization of Linear Operators. A Characterization

Lecture 28 - The Minimal Polynomial

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 29 - The Cayley-Hamilton Theorem
- Lecture 30 - Invariant Subspaces
- Lecture 31 - Triangulability, Diagonalization in Terms of the Minimal Polynomial
- Lecture 32 - Independent Subspaces and Projection Operators
- Lecture 33 - Direct Sum Decompositions and Projection Operators - I
- Lecture 34 - Direct Sum Decompositions and Projection Operators - II
- Lecture 35 - The Primary Decomposition Theorem and Jordan Decomposition
- Lecture 36 - Cyclic Subspaces and Annihilators
- Lecture 37 - The Cyclic Decomposition Theorem - I
- Lecture 38 - The Cyclic Decomposition Theorem - II. The Rational Form
- Lecture 39 - Inner Product Spaces
- Lecture 40 - Norms on Vector spaces. The Gram-Schmidt Procedure I
- Lecture 41 - The Gram-Schmidt Procedure II. The QR Decomposition
- Lecture 42 - Bessel's Inequality, Parseval's Identity, Best Approximation
- Lecture 43 - Best Approximation
- Lecture 44 - Orthogonal Complementary Subspaces, Orthogonal Projections
- Lecture 45 - Projection Theorem. Linear Functionals
- Lecture 46 - The Adjoint Operator
- Lecture 47 - Properties of the Adjoint Operation. Inner Product Space Isomorphism
- Lecture 48 - Unitary Operators
- Lecture 49 - Unitary operators - II. Self-Adjoint Operators - I.
- Lecture 50 - Self-Adjoint Operators - II - Spectral Theorem
- Lecture 51 - Normal Operators - Spectral Theorem

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Mathematical Logic

Subject Co-ordinator - Prof. Arindama Singh

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Sets and Strings  
Lecture 2 - Syntax of Propositional Logic  
Lecture 3 - Unique Parsing  
Lecture 4 - Semantics of PL  
Lecture 5 - Consequences and Equivalences  
Lecture 6 - Five results about PL  
Lecture 7 - Calculations and Informal Proofs  
Lecture 8 - More Informal Proofs  
Lecture 9 - Normal forms  
Lecture 10 - SAT and 3SAT  
Lecture 11 - Horn-SAT and Resolution  
Lecture 12 - Resolution  
Lecture 13 - Adequacy of Resolution  
Lecture 14 - Adequacy and Resolution Strategies  
Lecture 15 - Propositional Calculus (PC)  
Lecture 16 - Some Results about PC  
Lecture 17 - Arguing with Proofs  
Lecture 18 - Adequacy of PC  
Lecture 19 - Compactness & Analytic Tableau  
Lecture 20 - Examples of Tableau Proofs  
Lecture 21 - Adequacy of Tableaux  
Lecture 22 - Syntax of First order Logic (FL)  
Lecture 23 - Symbolization & Scope of Quantifiers  
Lecture 24 - Hurdles in giving Meaning  
Lecture 25 - Semantics of FL  
Lecture 26 - Relevance Lemma  
Lecture 27 - Validity, Satisfiability & Equivalence  
Lecture 28 - Six Results about FL  
Lecture 29 - Laws, Calculation & Informal Proof

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Quantifier Laws and Consequences
- Lecture 31 - More Proofs and Prenex Form
- Lecture 32 - Prenex Form Conversion
- Lecture 33 - Skolem Form
- Lecture 34 - Syntactic Interpretation
- Lecture 35 - Herbrand's Theorem
- Lecture 36 - Most General Unifiers
- Lecture 37 - Resolution Rules
- Lecture 38 - Resolution Examples
- Lecture 39 - Axiomatic System FC
- Lecture 40 - FC and Semidecidability of FL
- Lecture 41 - Analytic Tableau for FL
- Lecture 42 - Godels Incompleteness Theorems

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Real Analysis

Subject Co-ordinator - Prof. S.H. Kulkarni

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction

Lecture 2 - Functions and Relations

Lecture 3 - Finite and Infinite Sets

Lecture 4 - Countable Sets

Lecture 5 - Uncountable Sets, Cardinal Number

Lecture 6 - Real Number System

Lecture 7 - LUB Axiom

Lecture 8 - Sequences of Real Numbers

Lecture 9 - Sequences of Real Numbers - (Continued.)

Lecture 10 - Sequences of Real Numbers - (Continued.)

Lecture 11 - Infinite Series of Real Numbers

Lecture 12 - Series of nonnegative Real Numbers

Lecture 13 - Conditional Convergence

Lecture 14 - Metric Spaces

Lecture 15 - Metric Spaces

Lecture 16 - Balls and Spheres

Lecture 17 - Open Sets

Lecture 18 - Closure Points, Limit Points and isolated Points

Lecture 19 - Closed sets

Lecture 20 - Sequences in Metric Spaces

Lecture 21 - Completeness

Lecture 22 - Baire Category Theorem

Lecture 23 - Limit and Continuity of a Function defined on a Metric space

Lecture 24 - Continuous Functions on a Metric Space

Lecture 25 - Uniform Continuity

Lecture 26 - Connectedness

Lecture 27 - Connected Sets

Lecture 28 - Compactness

Lecture 29 - Compactness (Continued.)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Characterizations of Compact Sets
- Lecture 31 - Continuous Functions on Compact Sets
- Lecture 32 - Types of Discontinuity
- Lecture 33 - Differentiation
- Lecture 34 - Mean Value Theorems
- Lecture 35 - Mean Value Theorems (Continued.)
- Lecture 36 - Taylor's Theorem
- Lecture 37 - Differentiation of Vector Valued Functions
- Lecture 38 - Integration
- Lecture 39 - Integrability
- Lecture 40 - Integrable Functions
- Lecture 41 - Integrable Functions (Continued.)
- Lecture 42 - Integration as a Limit of Sum
- Lecture 43 - Integration and Differentiation
- Lecture 44 - Integration of Vector Valued Functions
- Lecture 45 - More Theorems on Integrals
- Lecture 46 - Sequences and Series of Functions
- Lecture 47 - Uniform Convergence
- Lecture 48 - Uniform Convergence and Integration
- Lecture 49 - Uniform Convergence and Differentiation
- Lecture 50 - Construction of Everywhere Continuous Nowhere Differentiable Function
- Lecture 51 - Approximation of a Continuous Function by Polynomials
- Lecture 52 - Equicontinuous family of Functions

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Dynamic Data Assimilation: An Introduction

Subject Co-ordinator - Prof. S. Lakshmivarahan

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - An Overview
- Lecture 2 - Data Mining, Data assimilation and prediction
- Lecture 3 - A classification of forecast errors
- Lecture 4 - Finite Dimensional Vector Space
- Lecture 5 - Matrices
- Lecture 6 - Matrices (Continued...)
- Lecture 7 - Multi-variate Calculus
- Lecture 8 - Optimization in Finite Dimensional Vector spaces
- Lecture 9 - Deterministic, Static, linear Inverse (well-posed) Problems
- Lecture 10 - Deterministic, Static, Linear Inverse (Ill-posed) Problems
- Lecture 11 - A Geometric View  $\hat{A}$  Projections
- Lecture 12 - Deterministic, Static, nonlinear Inverse Problems
- Lecture 13 - On-line Least Squares
- Lecture 14 - Examples of static inverse problems
- Lecture 15 - Interlude and a Way Forward
- Lecture 16 - Matrix Decomposition Algorithms
- Lecture 17 - Matrix Decomposition Algorithms (Continued...)
- Lecture 18 - Minimization algorithms
- Lecture 19 - Minimization algorithms (Continued...)
- Lecture 20 - Inverse problems in deterministic
- Lecture 21 - Inverse problems in deterministic (Continued...)
- Lecture 22 - Forward sensitivity method
- Lecture 23 - Relation between FSM and 4DVAR
- Lecture 24 - Statistical Estimation
- Lecture 25 - Statistical Least Squares
- Lecture 26 - Maximum Likelihood Method
- Lecture 27 - Bayesian Estimation
- Lecture 28 - From Gauss to Kalman-Linear Minimum Variance Estimation
- Lecture 29 - Initialization Classical Method

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Optimal interpolations
- Lecture 31 - A Bayesian Formation-3D-VAR methods
- Lecture 32 - Linear Stochastic Dynamics - Kalman Filter
- Lecture 33 - Linear Stochastic Dynamics - Kalman Filter (Continued...)
- Lecture 34 - Linear Stochastic Dynamics - Kalman Filter (Continued...)
- Lecture 35 - Covariance Square Root Filter
- Lecture 36 - Nonlinear Filtering
- Lecture 37 - Ensemble Reduced Rank Filter
- Lecture 38 - Basic nudging methods
- Lecture 39 - Deterministic predictability
- Lecture 40 - Predictability A stochastic view and Summary

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:An Invitation to Mathematics

Subject Co-ordinator - Prof. Sankaran Vishwanath

Co-ordinating Institute - Institute of Mathematical Sciences

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Long division
- Lecture 3 - Applications of Long division
- Lecture 4 - Lagrange interpolation
- Lecture 5 - The 0-1 idea in other contexts - dot and cross product
- Lecture 6 - Taylors formula
- Lecture 7 - The Chebyshev polynomials
- Lecture 8 - Counting number of monomials - several variables
- Lecture 9 - Permutations, combinations and the binomial theorem
- Lecture 10 - Combinations with repetition, and counting monomials
- Lecture 11 - Combinations with restrictions, recurrence relations
- Lecture 12 - Fibonacci numbers; an identity and a bijective proof
- Lecture 13 - Permutations and cycle type
- Lecture 14 - The sign of a permutation, composition of permutations
- Lecture 15 - Rules for drawing tangle diagrams
- Lecture 16 - Signs and cycle decompositions
- Lecture 17 - Sorting lists of numbers, and crossings in tangle diagrams
- Lecture 18 - Real and integer valued polynomials
- Lecture 19 - Integer valued polynomials revisited
- Lecture 20 - Functions on the real line, continuity
- Lecture 21 - The intermediate value property
- Lecture 22 - Visualizing functions
- Lecture 23 - Functions on the plane, Rigid motions
- Lecture 24 - More examples of functions on the plane, dilations
- Lecture 25 - Composition of functions
- Lecture 26 - Affine and Linear transformations
- Lecture 27 - Length and Area dilation, the derivative
- Lecture 28 - Examples-I
- Lecture 29 - Examples-II

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Linear equations, Lagrange interpolation revisited
- Lecture 31 - Completed Matrices in combinatorics
- Lecture 32 - Polynomials acting on matrices
- Lecture 33 - Divisibility, prime numbers
- Lecture 34 - Congruences, Modular arithmetic
- Lecture 35 - The Chinese remainder theorem
- Lecture 36 - The Euclidean algorithm, the 0-1 idea and the Chinese remainder theorem

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Advanced Complex Analysis

Subject Co-ordinator - Dr. T.E. Venkata Balaji

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Fundamental Theorems Connected with Zeros of Analytic Functions
- Lecture 2 - The Argument (Counting) Principle, Rouché's Theorem and The Fundamental Theorem of Algebra
- Lecture 3 - Morera's Theorem and Normal Limits of Analytic Functions
- Lecture 4 - Hurwitz's Theorem and Normal Limits of Univalent Functions
- Lecture 5 - Local Constancy of Multiplicities of Assumed Values
- Lecture 6 - The Open Mapping Theorem
- Lecture 7 - Introduction to the Inverse Function Theorem
- Lecture 8 - Completion of the Proof of the Inverse Function Theorem
- Lecture 9 - Univalent Analytic Functions have never-zero Derivatives and are Analytic Isomorphisms
- Lecture 10 - Introduction to the Implicit Function Theorem
- Lecture 11 - Proof of the Implicit Function Theorem
- Lecture 12 - Proof of the Implicit Function Theorem
- Lecture 13 - Doing Complex Analysis on a Real Surface
- Lecture 14 -  $F(z,w)=0$  is naturally a Riemann Surface
- Lecture 15 - Constructing the Riemann Surface for the Complex Logarithm
- Lecture 16 - Constructing the Riemann Surface for the  $m$ -th root function
- Lecture 17 - The Riemann Surface for the functional inverse of an analytic mapping at a critical point
- Lecture 18 - The Algebraic nature of the functional inverses of an analytic mapping at a critical point
- Lecture 19 - The Idea of a Direct Analytic Continuation or an Analytic Extension
- Lecture 20 - General or Indirect Analytic Continuation and the Lipschitz Nature of the Radius of Convergence
- Lecture 21 - Analytic Continuation Along Paths via Power Series Part A
- Lecture 22 - Analytic Continuation Along Paths via Power Series Part B
- Lecture 23 - Continuity of Coefficients occurring in Families of Power Series defining Analytic Continuations
- Lecture 24 - Analytic Continuability along Paths
- Lecture 25 - Maximal Domains of Direct and Indirect Analytic Continuation
- Lecture 26 - Deducing the Second (Simply Connected) Version of the Monodromy Theorem from the First (Homotopy)
- Lecture 27 - Existence and Uniqueness of Analytic Continuations on Nearby Paths
- Lecture 28 - Proof of the First (Homotopy) Version of the Monodromy Theorem
- Lecture 29 - Proof of the Algebraic Nature of Analytic Branches of the Functional Inverse of an Analytic Function

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - The Mean-Value Property, Harmonic Functions and the Maximum Principle
- Lecture 31 - Proofs of Maximum Principles and Introduction to Schwarz Lemma
- Lecture 32 - Proof of Schwarz Lemma and Uniqueness of Riemann Mappings
- Lecture 33 - Reducing Existence of Riemann Mappings to Hyperbolic Geometry of Sub-domains of the Unit Disc
- Lecture 34 - Differential or Infinitesimal Schwarz Lemma, Picks Lemma, Hyperbolic Arclengths, Metric and Geodesics
- Lecture 35 - Differential or Infinitesimal Schwarz Lemma, Picks Lemma, Hyperbolic Arclengths, Metric and Geodesics
- Lecture 36 - Hyperbolic Geodesics for the Hyperbolic Metric on the Unit Disc
- Lecture 37 - Schwarz-Pick Lemma for the Hyperbolic Metric on the Unit Disc
- Lecture 38 - Arzela-Ascoli Theorem
- Lecture 39 - Completion of the Proof of the Arzela-Ascoli Theorem and Introduction to Montels Theorem
- Lecture 40 - The Proof of Montels Theorem
- Lecture 41 - The Candidate for a Riemann Mapping
- Lecture 42 - Completion of Proof of The Riemann Mapping Theorem
- Lecture 43 - Completion of Proof of The Riemann Mapping Theorem

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Discrete Mathematics

Subject Co-ordinator - Prof. Sourav Chakraborty

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Course Introduction
- Lecture 2 - Sets, Relations and Functions
- Lecture 3 - Propositional Logic and Predicate Logic
- Lecture 4 - Propositional Logic and Predicate Logic (Part 2)
- Lecture 5 - Elementary Number Theory
- Lecture 6 - Formal Proofs
- Lecture 7 - Direct Proofs
- Lecture 8 - Case Study
- Lecture 9 - Case Study (Part 2)
- Lecture 10 - Sets, Relations, Function and Logic
- Lecture 11 - Proof by Contradiction (Part 1)
- Lecture 12 - Proof by Contradiction (Part 2)
- Lecture 13 - Proof by Contraposition
- Lecture 14 - Proof by Counter Example
- Lecture 15 - Mathematical Induction (Part 1)
- Lecture 16 - Mathematical Induction (Part 2)
- Lecture 17 - Mathematical Induction (Part 3)
- Lecture 18 - Mathematical Induction (Part 4)
- Lecture 19 - Mathematical Induction (Part 5)
- Lecture 20 - Mathematical Induction (Part 6)
- Lecture 21 - Mathematical Induction (Part 7)
- Lecture 22 - Mathematical Induction (Part 8)
- Lecture 23 - Introduction to Graph Theory
- Lecture 24 - Handshake Problem
- Lecture 25 - Tournament Problem
- Lecture 26 - Tournament Problem (Part 2)
- Lecture 27 - Ramsey Problem
- Lecture 28 - Ramsey Problem (Part 2)
- Lecture 29 - Properties of Graphs

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Problem 1
- Lecture 31 - Problem 2
- Lecture 32 - Problem 3 & 4
- Lecture 33 - Counting for Selection
- Lecture 34 - Counting for Distribution
- Lecture 35 - Counting for Distribution (Part 2)
- Lecture 36 - Some Counting Problems
- Lecture 37 - Counting using Recurrence Relations
- Lecture 38 - Counting using Recurrence Relations (Part 2)
- Lecture 39 - Solving Recurrence Relations (Part 1)
- Lecture 40 - Solving Recurrence Relations (Part 2)
- Lecture 41 - Asymptotic Relations (Part 1)
- Lecture 42 - Asymptotic Relations (Part 2)
- Lecture 43 - Asymptotic Relations (Part 3)
- Lecture 44 - Asymptotic Relations (Part 4)
- Lecture 45 - Generating Functions (Part 1)
- Lecture 46 - Generating Functions (Part 2)
- Lecture 47 - Generating Functions (Part 3)
- Lecture 48 - Generating Functions (Part 4)
- Lecture 49 - Proof Techniques
- Lecture 50 - Modeling
- Lecture 51 - Combinatorics

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Advanced Complex Analysis - Part 2

Subject Co-ordinator - Dr. T.E. Venkata Balaji

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Properties of the Image of an Analytic Function - Introduction to the Picard Theorems
- Lecture 2 - Recalling Singularities of Analytic Functions - Non-isolated and Isolated Removable, Pole and Essential
- Lecture 3 - Recalling Riemann's Theorem on Removable Singularities
- Lecture 4 - Casorati-Weierstrass Theorem; Dealing with the Point at Infinity -- Riemann Sphere and Riemann Sphere
- Lecture 5 - Neighborhood of Infinity, Limit at Infinity and Infinity as an Isolated Singularity
- Lecture 6 - Studying Infinity - Formulating Epsilon-Delta Definitions for Infinite Limits and Limits at Infinity
- Lecture 7 - When is a function analytic at infinity ?
- Lecture 8 - Laurent Expansion at Infinity and Riemann's Removable Singularities Theorem for the Point at Infinity
- Lecture 9 - The Generalized Liouville Theorem - Little Brother of Little Picard and Analogue of Casorati-Weierstrass
- Lecture 10 - Morera's Theorem at Infinity, Infinity as a Pole and Behaviour at Infinity of Rational and Meromorphic
- Lecture 11 - Residue at Infinity and Introduction to the Residue Theorem for the Extended Complex Plane - Residue
- Lecture 12 - Proofs of Two Avatars of the Residue Theorem for the Extended Complex Plane and Applications of
- Lecture 13 - Infinity as an Essential Singularity and Transcendental Entire Functions
- Lecture 14 - Meromorphic Functions on the Extended Complex Plane are Precisely Quotients of Polynomials
- Lecture 15 - The Ubiquity of Meromorphic Functions - The Nerves of the Geometric Network Bridging Algebra, Analysis
- Lecture 16 - Continuity of Meromorphic Functions at Poles and Topologies of Spaces of Functions
- Lecture 17 - Why Normal Convergence, but Not Globally Uniform Convergence, is the Inevitable in Complex Analysis
- Lecture 18 - Measuring Distances to Infinity, the Function Infinity and Normal Convergence of Holomorphic Functions
- Lecture 19 - The Invariance Under Inversion of the Spherical Metric on the Extended Complex Plane
- Lecture 20 - Introduction to Hurwitz's Theorem for Normal Convergence of Holomorphic Functions in the Spherical
- Lecture 21 - Completion of Proof of Hurwitz's Theorem for Normal Limits of Analytic Functions in the Spherical
- Lecture 22 - Hurwitz's Theorem for Normal Limits of Meromorphic Functions in the Spherical Metric
- Lecture 23 - What could the Derivative of a Meromorphic Function Relative to the Spherical Metric Possibly Be
- Lecture 24 - Defining the Spherical Derivative of a Meromorphic Function
- Lecture 25 - Well-definedness of the Spherical Derivative of a Meromorphic Function at a Pole and Inversion-in
- Lecture 26 - Topological Preliminaries - Translating Compactness into Boundedness
- Lecture 27 - Introduction to the Arzela-Ascoli Theorem - Passing from abstract Compactness to verifiable Equi
- Lecture 28 - Proof of the Arzela-Ascoli Theorem for Functions - Abstract Compactness Implies Equicontinuity
- Lecture 29 - Proof of the Arzela-Ascoli Theorem for Functions - Equicontinuity Implies Compactness

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Introduction to the Montel Theorem - the Holomorphic Avatar of the Arzela-Ascoli Theorem & Why
- 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
- Lecture 34 - Proof of the other direction of Marty's Theorem - the Meromorphic Avatar of the Montel & Arzela
- Lecture 35 - Normal Convergence at Infinity and Hurwitz's Theorems for Normal Limits of Analytic and Meromorphic
- 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
- 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 Sessions

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Basic Algebraic Geometry : Varieties, Morphisms, Local Rings, Function Fields

Subject Co-ordinator - Dr. T.E. Venkata Balaji

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - What is Algebraic Geometry?
- Lecture 2 - The Zariski Topology and Affine Space
- Lecture 3 - Going back and forth between subsets and ideals
- Lecture 4 - Irreducibility in the Zariski Topology
- Lecture 5 - Irreducible Closed Subsets Correspond to Ideals Whose Radicals are Prime
- Lecture 6 - Understanding the Zariski Topology on the Affine Line; The Noetherian property in Topology and in Algebra
- Lecture 7 - Basic Algebraic Geometry
- Lecture 8 - Topological Dimension, Krull Dimension and Heights of Prime Ideals
- Lecture 9 - The Ring of Polynomial Functions on an Affine Variety
- Lecture 10 - Geometric Hypersurfaces are Precisely Algebraic Hypersurfaces
- Lecture 11 - Why Should We Study Affine Coordinate Rings of Functions on Affine Varieties ?
- Lecture 12 - Capturing an Affine Variety Topologically From the Maximal Spectrum of its Ring of Functions
- Lecture 13 - Analyzing Open Sets and Basic Open Sets for the Zariski Topology
- Lecture 14 - The Ring of Functions on a Basic Open Set in the Zariski Topology
- Lecture 15 - Quasi-Compactness in the Zariski Topology; Regularity of a Function at a point of an Affine Variety
- Lecture 16 - What is a Global Regular Function on a Quasi-Affine Variety?
- Lecture 17 - Characterizing Affine Varieties; Defining Morphisms between Affine or Quasi-Affine Varieties
- Lecture 18 - Translating Morphisms into Affines as  $k$ -Algebra maps and the Grand Hilbert Nullstellensatz
- Lecture 19 - Morphisms into an Affine Correspond to  $k$ -Algebra Homomorphisms from its Coordinate Ring of Functions
- Lecture 20 - The Coordinate Ring of an Affine Variety Determines the Affine Variety and is Intrinsic to it
- Lecture 21 - Automorphisms of Affine Spaces and of Polynomial Rings - The Jacobian Conjecture; The Punctured Plane
- Lecture 22 - The Various Avatars of Projective  $n$ -space
- Lecture 23 - Gluing  $(n+1)$  copies of Affine  $n$ -Space to Produce Projective  $n$ -space in Topology, Manifold Theory
- Lecture 24 - Translating Projective Geometry into Graded Rings and Homogeneous Ideals
- Lecture 25 - Expanding the Category of Varieties to Include Projective and Quasi-Projective Varieties
- Lecture 26 - Translating Homogeneous Localisation into Geometry and Back
- Lecture 27 - Adding a Variable is Undone by Homogenous Localization - What is the Geometric Significance of this?
- Lecture 28 - Doing Calculus Without Limits in Geometry ?
- Lecture 29 - The Birth of Local Rings in Geometry and in Algebra

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - The Formula for the Local Ring at a Point of a Projective Variety Or Playing with Localisations
- Lecture 31 - The Field of Rational Functions or Function Field of a Variety - The Local Ring at the Generic Point
- Lecture 32 - Fields of Rational Functions or Function Fields of Affine and Projective Varieties and their Relationship
- Lecture 33 - Global Regular Functions on Projective Varieties are Simply the Constants
- Lecture 34 - The d-Uple Embedding and the Non-Intrinsic Nature of the Homogeneous Coordinate Ring of a Projective Variety
- Lecture 35 - The Importance of Local Rings - A Morphism is an Isomorphism if it is a Homeomorphism and Induces an Isomorphism of Local Rings
- Lecture 36 - The Importance of Local Rings - A Rational Function in Every Local Ring is Globally Regular
- Lecture 37 - Geometric Meaning of Isomorphism of Local Rings - Local Rings are Almost Global
- Lecture 38 - Local Ring Isomorphism, Equals Function Field Isomorphism, Equals Birationality
- Lecture 39 - Why Local Rings Provide Calculus Without Limits for Algebraic Geometry Pun Intended!
- Lecture 40 - How Local Rings Detect Smoothness or Nonsingularity in Algebraic Geometry
- Lecture 41 - Any Variety is a Smooth Manifold with or without Non-Smooth Boundary
- Lecture 42 - Any Variety is a Smooth Hypersurface On an Open Dense Subset

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Commutative Algebra

Subject Co-ordinator - Prof. A.V.Jayanthan

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Review of Ring Theory
- Lecture 2 - Review of Ring Theory (Continued...)
- Lecture 3 - Ideals in commutative rings
- Lecture 4 - Operations on ideals
- Lecture 5 - Properties of prime ideals
- Lecture 6 - Colon and Radical of ideals
- Lecture 7 - Radicals, extension and contraction of ideals
- Lecture 8 - Modules and homomorphisms
- Lecture 9 - Isomorphism theorems and Operations on modules
- Lecture 10 - Operations on modules (Continued...)
- Lecture 11 - Module homomorphism and determinant trick
- Lecture 12 - Nakayama's lemma and exact sequences
- Lecture 13 - Exact sequences (Continued...)
- Lecture 14 - Homomorphisms and Tensor products
- Lecture 15 - Properties of tensor products
- Lecture 16 - Properties of tensor products (Continued...)
- Lecture 17 - Tensor product of Algebras
- Lecture 18 - Localization
- Lecture 19 - Localization (Continued...)
- Lecture 20 - Local properties
- Lecture 21 - Further properties of localization
- Lecture 22 - Integral dependence
- Lecture 23 - Integral extensions
- Lecture 24 - Lying over and Going-up theorems
- Lecture 25 - Going-down theorem
- Lecture 26 - Going-down theorem (Continued...)
- Lecture 27 - Chain conditions
- Lecture 28 - Noetherian and Artinian modules
- Lecture 29 - Properties of Noetherian and Artinian modules, Composition Series

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Further properties of Noetherian and Artinian modules and rings
- Lecture 31 - Hilbert basis theorem and Primary decomposition
- Lecture 32 - Primary decomposition (Continued...)
- Lecture 33 - Uniqueness of primary decomposition
- Lecture 34 - 2nd Uniqueness theorem, Artinian rings
- Lecture 35 - Properties of Artinian rings
- Lecture 36 - Structure Theorem of Artinian rings
- Lecture 37 - Noether Normalization
- Lecture 38 - Hilberts Nullstellensatz

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Differential Equations

Subject Co-ordinator - Prof. Srinivasa Manam

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to Ordinary Differential Equations (ODE)
- Lecture 2 - Methods for First Order ODE's - Homogeneous Equations
- Lecture 3 - Methods for First order ODE's - Exact Equations
- Lecture 4 - Methods for First Order ODE's - Exact Equations (Continued...)
- Lecture 5 - Methods for First order ODE's - Reducible to Exact Equations
- Lecture 6 - Methods for First order ODE's - Reducible to Exact Equations (Continued...)
- Lecture 7 - Non-Exact Equations - Finding Integrating Factors
- Lecture 8 - Linear First Order ODE and Bernoulli's Equation
- Lecture 9 - Introduction to Second order ODE's
- Lecture 10 - Properties of solutions of second order homogeneous ODE's
- Lecture 11 - Abel's formula to find the other solution
- Lecture 12 - Abel's formula - Demonstration
- Lecture 13 - Second Order ODE's with constant coefficients
- Lecture 14 - Euler - Cauchy equation
- Lecture 15 - Non homogeneous ODEs Variation of Parameters
- Lecture 16 - Method of undetermined coefficients
- Lecture 17 - Demonstration of Method of undetermined coefficients
- Lecture 18 - Power Series and its properties
- Lecture 19 - Power Series Solutions to Second Order ODE's
- Lecture 20 - Power Series Solutions (Continued...)
- Lecture 21 - Legendre Differential Equation
- Lecture 22 - Legendre Polynomials
- Lecture 23 - Properties of Legendre Polynomials
- Lecture 24 - Power series solutions around a regular singular point
- Lecture 25 - Frobenius method of solutions
- Lecture 26 - Frobenius method of solutions (Continued...)
- Lecture 27 - Examples on Frobenius method
- Lecture 28 - Bessel differential equation
- Lecture 29 - Frobenius solutions for Bessel Equation

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Properties of Bessel functions
- Lecture 31 - Properties of Bessel functions (Continued...)
- Lecture 32 - Introduction to Sturm-Liouville theory
- Lecture 33 - Sturm-Liouville Problems
- Lecture 34 - Regular Sturm-Liouville problem
- Lecture 35 - Periodic and singular Sturm-Liouville Problems
- Lecture 36 - Generalized Fourier series
- Lecture 37 - Examples of Sturm-Liouville systems
- Lecture 38 - Examples of Sturm-Liouville systems (Continued...)
- Lecture 39 - Examples of regular Sturm-Liouville systems
- Lecture 40 - Second order linear PDEs
- Lecture 41 - Classification of second order linear PDEs
- Lecture 42 - Reduction to canonical form for equations with constant coefficients
- Lecture 43 - Reduction to canonical form for equations with variable coefficients
- Lecture 44 - Reduction to Normal form-More examples
- Lecture 45 - D'Alembert solution for wave equation
- Lecture 46 - Uniqueness of solutions for wave equation
- Lecture 47 - Vibration of a semi-infinite string
- Lecture 48 - Vibration of a finite string
- Lecture 49 - Finite length string vibrations
- Lecture 50 - Finite length string vibrations (Continued...)
- Lecture 51 - Non-homogeneous wave equation
- Lecture 52 - Vibration of a circular drum
- Lecture 53 - Solutions of heat equation-Properties
- Lecture 54 - Temperature in an infinite rod
- Lecture 55 - Temperature in a semi-infinite rod
- Lecture 56 - Non-homogeneous heat equation
- Lecture 57 - Temperature in a finite rod
- Lecture 58 - Temperature in a finite rod with insulated ends
- Lecture 59 - Laplace equation over a rectangle
- Lecture 60 - Laplace equation over a rectangle with flux boundary conditions
- Lecture 61 - Laplace equation over circular domains
- Lecture 62 - Laplace equation over circular Sectors
- Lecture 63 - Uniqueness of the boundary value problems for Laplace equation
- Lecture 64 - Conclusions

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Numerical Analysis

Subject Co-ordinator - Prof. R. Usha

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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)

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Graph Theory

Subject Co-ordinator - Dr. Soumen Maity

Co-ordinating Institute - IISER - Pune

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Basic Concepts  
Lecture 2 - Basic Concepts - 1  
Lecture 3 - Eulerian and Hamiltonian Graph  
Lecture 4 - Eulerian and Hamiltonian Graph - 1  
Lecture 5 - Bipartite Graph  
Lecture 6 - Bipartite Graph  
Lecture 7 - Diameter of a graph; Isomorphic graphs  
Lecture 8 - Diameter of a graph; Isomorphic graphs  
Lecture 9 - Minimum Spanning Tree  
Lecture 10 - Minimum Spanning Trees (Continued...)  
Lecture 11 - Minimum Spanning Trees (Continued...)  
Lecture 12 - Minimum Spanning Trees (Continued...)  
Lecture 13 - Maximum Matching in Bipartite Graph  
Lecture 14 - Maximum Matching in Bipartite Graph - 1  
Lecture 15 - Hall's Theorem and Konig's Theorem  
Lecture 16 - Hall's Theorem and Konig's Theorem - 1  
Lecture 17 - Independent Set and Edge Cover  
Lecture 18 - Independent Set and Edge Cover - 1  
Lecture 19 - Matching in General Graphs  
Lecture 20 - Proof of Halls Theorem  
Lecture 21 - Stable Matching  
Lecture 22 - Gale-Shapley Algorithm  
Lecture 23 - Graph Connectivity  
Lecture 24 - Graph Connectivity - 1  
Lecture 25 - 2-Connected Graphs  
Lecture 26 - 2-Connected Graphs - 1  
Lecture 27 - Subdivision of an edge; 2-edge-connected graphs  
Lecture 28 - Problems Related to Graphs Connectivity  
Lecture 29 - Flow Network

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Residual Network and Augmenting Path
- Lecture 31 - Augmenting Path Algorithm
- Lecture 32 - Max-Flow and Min-Cut
- Lecture 33 - Max-Flow and Min-Cut Theorem
- Lecture 34 - Vertex Colouring
- Lecture 35 - Chromatic Number and Max. Degree
- Lecture 36 - Edge Colouring
- Lecture 37 - Planar Graphs and Euler's Formula
- Lecture 38 - Characterization Of Planar Graphs
- Lecture 39 - Colouring of Planar Graphs

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Transform Techniques for Engineers

Subject Co-ordinator - Prof. Srinivasa Manam

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Fourier series

Lecture 2 - Fourier series - Examples

Lecture 3 - Complex Fourier series

Lecture 4 - Conditions for the Convergence of Fourier Series

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

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

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

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

Lecture 9 - Properties of Fourier Transform of a Periodic Signal

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

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

Lecture 12 - Fourier integral theorem-an informal proof

Lecture 13 - Definition of Fourier transforms

Lecture 14 - Fourier transform of a Heavyside function

Lecture 15 - Use of Fourier transforms to evaluate some integrals

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

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

Lecture 18 - More properties of Fourier transforms

Lecture 19 - Fourier integral theorem - proof

Lecture 20 - Application of Fourier transform to ODE's

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

Lecture 22 - Evaluation of integrals by Fourier transforms

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

Lecture 24 - Solution of Heat equation by Fourier transform

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

Lecture 26 - Introduction to Laplace transform

Lecture 27 - Laplace transform of elementary functions

Lecture 28 - Properties of Laplace transforms

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Methods of finding inverse Laplace transform
- Lecture 31 - Heavyside expansion theorem
- Lecture 32 - Review of complex function theory
- Lecture 33 - Inverse Laplace transform by contour integration
- Lecture 34 - Application of Laplace transforms - ODEs'
- Lecture 35 - Solutions of initial or boundary value problems for ODEs'
- Lecture 36 - Solving first order PDE's by Laplace transform
- Lecture 37 - Solution of wave equation by Laplace transform
- Lecture 38 - Solving hyperbolic equations by Laplace transform
- Lecture 39 - Solving heat equation by Laplace transform
- Lecture 40 - Initial boundary value problems for heat equations
- Lecture 41 - Solution of Integral Equations by Laplace Transform
- Lecture 42 - Evaluation of Integrals by Laplace Transform
- Lecture 43 - Introduction to Z-Transforms
- Lecture 44 - Properties of Z-Transforms
- Lecture 45 - Inverse Z-transforms
- Lecture 46 - Solution of difference equations by Z-transforms
- Lecture 47 - Evaluation of infinite sums by Z-transforms
- Lecture 48 - conclusions

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Probability and Statistics

Subject Co-ordinator - Prof. G. Srinivasan

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to probability and Statistics
- Lecture 2 - Types of data
- Lecture 3 - Categorical data
- Lecture 4 - Describing Categorical data
- Lecture 5 - Describing Categorical data (Continued...)
- Lecture 6 - Describing numerical data
- Lecture 7 - Describing numerical data (Continued...)
- Lecture 8 - Exercises, Association between categorical variables
- Lecture 9 - Association between categorical variables (Continued...)
- Lecture 10 - Association between numerical variables
- Lecture 11 - Association between numerical variables (Continued...)
- Lecture 12 - Probability
- Lecture 13 - Rules of Probability
- Lecture 14 - Rules of Probability (Continued...)
- Lecture 15 - Conditional Probability
- Lecture 16 - Random variables
- Lecture 17 - Random variables - concepts and exercises
- Lecture 18 - Association between Random variables
- Lecture 19 - Binomial Distribution
- Lecture 20 - Normal distribution
- Lecture 21 - Additional Examples

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Abstract Group Theory

Subject Co-ordinator - Prof. Krishna Hanumanthu

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Motivational examples of groups
- Lecture 2 - Definition of a group and examples
- Lecture 3 - More examples of groups
- Lecture 4 - Basic properties of groups and multiplication tables
- Lecture 5 - Problems - 1
- Lecture 6 - Problems - 2
- Lecture 7 - Problems - 3
- Lecture 8 - Subgroups
- Lecture 9 - Types of groups
- Lecture 10 - Group homomorphisms and examples
- Lecture 11 - Properties of homomorphisms
- Lecture 12 - Group isomorphisms
- Lecture 13 - Normal subgroups
- Lecture 14 - Equivalence relations
- Lecture 15 - Problems - 4
- Lecture 16 - Cosets and Lagrange's theorem
- Lecture 17 -  $S_3$  revisited
- Lecture 18 - Problems - 5
- Lecture 19 - Quotient groups
- Lecture 20 - Examples of quotient groups
- Lecture 21 - First isomorphism theorem
- Lecture 22 - Examples and Second isomorphism theorem
- Lecture 23 - Third isomorphism theorem
- Lecture 24 - Cauchy's theorem
- Lecture 25 - Problems - 6
- Lecture 26 - Symmetric groups - I
- Lecture 27 - Symmetric Groups - II
- Lecture 28 - Symmetric groups - III
- Lecture 29 - Symmetric groups - IV

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Odd and even permutations - I
- Lecture 31 - Odd and even permutations - II
- Lecture 32 - Alternating groups
- Lecture 33 - Group actions
- Lecture 34 - Examples of group actions
- Lecture 35 - Orbits and stabilizers
- Lecture 36 - Counting formula
- Lecture 37 - Cayley's theorem
- Lecture 38 - Problems - 7
- Lecture 39 - Problems - 8 and Class equation
- Lecture 40 - Group actions on subsets
- Lecture 41 - Sylow Theorem - I
- Lecture 42 - Sylow Theorem - II
- Lecture 43 - Sylow Theorem - III
- Lecture 44 - Problems - 9
- Lecture 45 - Problems - 10

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Groups: Motion, Symmetry and Puzzles

Subject Co-ordinator - Prof. Amit Kulshrestha

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Permutation, symmetry and groups
- Lecture 2 - Groups acting on a set/an object
- Lecture 3 - More on group actions
- Lecture 4 - Groups and parity
- Lecture 5 - Parity and puzzles
- Lecture 6 - Generators and relations
- Lecture 7 - Cosets, quotients and homomorphisms
- Lecture 8 - Cayley graphs of groups
- Lecture 9 - Platonic solids
- Lecture 10 - Symmetries of plane and wallpapers
- Lecture 11 - Introduction to GAP
- Lecture 12 - GAP through Rubik's cube
- Lecture 13 - Representing abstract groups
- Lecture 14 - A quick introduction to group representations
- Lecture 15 - Rotations and quaternions
- Lecture 16 - Rotational symmetries of platonic solids
- Lecture 17 - Finite subgroups of  $SO(3)$

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Rings and Fields

Subject Co-ordinator - Prof. Krishna Hanumanthu

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction, main definitions  
Lecture 2 - Examples of rings  
Lecture 3 - More examples  
Lecture 4 - Polynomial Rings - 1  
Lecture 5 - Polynomial Rings - 2  
Lecture 6 - Homomorphisms  
Lecture 7 - Kernels, ideals  
Lecture 8 - Problems - 1  
Lecture 9 - Problems - 2  
Lecture 10 - Problems - 3  
Lecture 11 - Quotient Rings  
Lecture 12 - First isomorphism and correspondence theorems  
Lecture 13 - Examples of correspondence theorem  
Lecture 14 - Prime ideals  
Lecture 15 - Maximal ideals, integral domains  
Lecture 16 - Existence of maximal ideals  
Lecture 17 - Problems - 4  
Lecture 18 - Problems - 5  
Lecture 19 - Problems - 6  
Lecture 20 - Field of fractions, Noetherian rings - 1  
Lecture 21 - Noetherian rings - 2  
Lecture 22 - Hilbert Basis Theorem  
Lecture 23 - Irreducible, prime elements  
Lecture 24 - Irreducible, prime elements, GCD  
Lecture 25 - Principal Ideal Domains  
Lecture 26 - Unique Factorization Domains - 1  
Lecture 27 - Unique Factorization Domains - 2  
Lecture 28 - Gauss Lemma  
Lecture 29 -  $\mathbb{Z}[X]$  is a UFD

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Eisenstein criterion and Problems - 7
- Lecture 31 - Problems - 8
- Lecture 32 - Problems - 9
- Lecture 33 - Field extensions - 1
- Lecture 34 - Field extensions - 2
- Lecture 35 - Degree of a field extension - 1
- Lecture 36 - Degree of a field extension - 2
- Lecture 37 - Algebraic elements form a field
- Lecture 38 - Field homomorphisms
- Lecture 39 - Splitting fields
- Lecture 40 - Finite fields - 1
- Lecture 41 - Finite fields - 2
- Lecture 42 - Finite fields - 3
- Lecture 43 - Problems - 10
- Lecture 44 - Problems - 11

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Probabilistic Methods in PDE

Subject Co-ordinator - Prof. Anindya Goswami

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Prerequisite Measure Theory - Part 1
- Lecture 2 - Prerequisite Measure Theory - Part 2
- Lecture 3 - Prerequisite Measure Theory - Part 3
- Lecture 4 - Random variable
- Lecture 5 - Stochastic Process
- Lecture 6 - Conditional Expectation
- Lecture 7 - Preliminary for Stochastic Integration - Part 1
- Lecture 8 - Preliminary for Stochastic Integration - Part 2
- Lecture 9 - Definition and properties of Stochastic Integration - Part 1
- Lecture 10 - Definition and properties of Stochastic Integration - Part 2
- Lecture 11 - Further properties of Stochastic Integration
- Lecture 12 - Extension of stochastic integral
- Lecture 13 - change of variable formula and proof - Part 1
- Lecture 14 - change of variable formula and proof - Part 2
- Lecture 15 - Brownian motion as the building block
- Lecture 16 - Brownian motion and its martingale property - Part 1
- Lecture 17 - Brownian motion and its martingale property - Part 2
- Lecture 18 - Application of Ito's rule on Ito process
- Lecture 19 - Harmonic function and its properties
- Lecture 20 - Maximum principle of harmonic function
- Lecture 21 - Dirichlet Problem and bounded solution
- Lecture 22 - Example of a Dirichlet problem
- Lecture 23 - Regular points at the boundary
- Lecture 24 - Zarembas cone condition for regularity
- Lecture 25 - Summary of the Zaremba's cone condition
- Lecture 26 - Continuity of candidate solution at regular points - Part 1
- Lecture 27 - Continuity of candidate solution at regular points - Part 2
- Lecture 28 - Summary of bounded solution to the Dirichlet Problem
- Lecture 29 - Stochastic representation of bounded solution to a heat equation - Part 1

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- Lecture 30 - Stochastic representation of bounded solution to a heat equation - Part 2
- Lecture 31 - Uniqueness of solution to the heat equation
- Lecture 32 - Remark on Tychonoff's Theorem
- Lecture 33 - Widder's result and its extension on heat equation
- Lecture 34 - Solution to the mixed initial boundary value problem
- Lecture 35 - The Feynman-Kac formula
- Lecture 36 - Kac's theorem on the stochastic representation of solution to a second-order linear ODE - Part 1
- Lecture 37 - Kac'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
- Lecture 43 - Stochastic differential equations
- Lecture 44 - Stochastic differential equations
- Lecture 45 - Stochastic differential equations
- Lecture 46 - Stochastic differential equations
- 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
- Lecture 50 - Cauchy Problem with variable coefficients
- 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  $C_0$  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 Resolvent 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
- Lecture 65 - Existence of classical solution - Part 1
- Lecture 66 - Existence of classical solution - Part 2
- Lecture 67 - Conclusion video

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. Pranav Haridas

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Vector Spaces
- Lecture 2 - Examples of Vector Spaces
- Lecture 3 - Vector Subspaces
- Lecture 4 - Linear Combinations and Span
- Lecture 5 - Linear Independence
- Lecture 6 - Basis
- Lecture 7 - Dimension
- Lecture 8 - Replacement theorem consequences
- Lecture 9 - Rank Nullity
- Lecture 10 - Linear Transformations
- Lecture 11 - Linear Transformation Basis
- Lecture 12 - Linear Transformation and Matrices
- Lecture 13 - Problem session
- Lecture 14 - Linear Transformation and Matrices (Continued...)
- Lecture 15 - Invertible Linear Transformations
- Lecture 16 - Invertible Linear Transformations and Matrices
- Lecture 17 - Change of Basis
- Lecture 18 - Product of Vector Spaces
- Lecture 19 - Quotient Spaces
- Lecture 20 - Dual Spaces
- Lecture 21 - Row operations
- Lecture 22 - Rank of a Matrix
- Lecture 23 - Inverting matrices
- Lecture 24 - Determinants
- Lecture 25 - Problem Session
- Lecture 26 - Diagonal Matrices
- Lecture 27 - Eigenvectors and eigenvalues
- Lecture 28 - Computing eigenvalues
- Lecture 29 - Characteristic polynomials

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Diagonalizability
- Lecture 31 - Multiplicity of eigenvalues
- Lecture 32 - Invariant subspaces
- Lecture 33 - Complex Vector Spaces
- Lecture 34 - Inner Product Spaces
- Lecture 35 - Inner Product and Length
- Lecture 36 - Orthogonality
- Lecture 37 - Problem Session
- Lecture 38 - Problem Session
- Lecture 39 - Orthonormal Basis
- Lecture 40 - Gram Schmidt Orthogonalization
- Lecture 41 - Orthogonal Complements
- Lecture 42 - Problem Session
- Lecture 43 - Riesz Representation Theorem
- Lecture 44 - Adjoint of a linear transformation
- Lecture 45 - Problem Session
- Lecture 46 - Normal Operators
- Lecture 47 - Self Adjoint Operators
- Lecture 48 - Spectral Theorem

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Algebra - I

Subject Co-ordinator - Prof. Amritanshu Prasad, Prof. S. Viswanath

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Permutations  
Lecture 2 - Group Axioms  
Lecture 3 - Order and Conjugacy  
Lecture 4 - Subgroups  
Lecture 5 - Problem solving  
Lecture 6 - Group Actions  
Lecture 7 - Cosets  
Lecture 8 - Group Homomorphisms  
Lecture 9 - Normal subgroups  
Lecture 10 - Quotient Groups  
Lecture 11 - Product and Chinese Remainder Theorem  
Lecture 12 - Dihedral Groups  
Lecture 13 - Semidirect products  
Lecture 14 - Problem solving  
Lecture 15 - The Orbit Counting Theorem  
Lecture 16 - Fixed points of group actions  
Lecture 17 - Second application  
Lecture 18 - Sylow Theorem - a preliminary proposition  
Lecture 19 - Sylow Theorem - I  
Lecture 20 - Problem solving - I  
Lecture 21 - Problem solving - II  
Lecture 22 - Sylow Theorem - II  
Lecture 23 - Sylow Theorem - III  
Lecture 24 - Problem solving - I  
Lecture 25 - Problem solving - II  
Lecture 26 - Free Groups - I  
Lecture 27 - Free Groups - IIa  
Lecture 28 - Free Groups - IIb  
Lecture 29 - Free Groups - III

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- Lecture 30 - Free Groups - IV
- Lecture 31 - Problem Solving/Examples
- Lecture 32 - Generators and relations for symmetric groups  $\hat{A}_n$  I
- Lecture 33 - Generators and relations for symmetric groups  $\hat{A}_n$  II
- Lecture 34 - Definition of a Ring
- Lecture 35 - Euclidean Domains
- Lecture 36 - Gaussian Integers
- Lecture 37 - The Fundamental Theorem of Arithmetic
- Lecture 38 - Divisibility and Ideals
- Lecture 39 - Factorization and the Noetherian Condition
- Lecture 40 - Examples of Ideals in Commutative Rings
- Lecture 41 - Problem Solving/Examples
- Lecture 42 - The Ring of Formal Power Series
- Lecture 43 - Fraction Fields
- Lecture 44 - Path Algebra of a Quiver
- Lecture 45 - Ideals In Non-Commutative Rings
- Lecture 46 - Product of Rings
- Lecture 47 - Ring Homomorphisms
- Lecture 48 - Quotient Rings
- Lecture 49 - Problem solving
- Lecture 50 - Tensor and Exterior Algebras
- Lecture 51 - Modules
- Lecture 52 - Modules over polynomial rings  $K[x]$
- Lecture 53 - Modules
- Lecture 54 - Modules
- Lecture 55 - Submodules
- Lecture 56 - General constructions of submodules
- Lecture 57 - Problem Solving
- Lecture 58 - Quotient modules
- Lecture 59 - Homomorphisms
- Lecture 60 - More examples of homomorphisms
- Lecture 61 - First isomorphism theorem
- Lecture 62 - Direct sums of modules
- Lecture 63 - Complementary submodules
- Lecture 64 - Change of ring
- Lecture 65 - Problem solving
- Lecture 66 - Free Modules (finitely generated)
- Lecture 67 - Determinants
- Lecture 68 - Primary Decomposition

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Computational Commutative Algebra

Subject Co-ordinator - Prof. Manoj Kummini

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Definitions  
Lecture 2 - Homomorphisms  
Lecture 3 - Quotient rings  
Lecture 4 - Noetherian rings  
Lecture 5 - Monomials  
Lecture 6 - Initial ideals  
Lecture 7 - Division algorithm  
Lecture 8 - Grobner basis  
Lecture 9 - Solving Polynomial Equations  
Lecture 10 - Nullstellensatz - Part 1  
Lecture 11 - Nullstellensatz - Part 2  
Lecture 12 - Buchberger criterion  
Lecture 13 - Monomial basis  
Lecture 14 - Elimination  
Lecture 15 - Modules - Part 1  
Lecture 16 - Modules - Part 2  
Lecture 17 - Localisation  
Lecture 18 - Nakayama Lemma  
Lecture 19 - Spectrum - Part 1  
Lecture 20 - Spectrum - Part 2  
Lecture 21 - Associated primes  
Lecture 22 - Primary Decomposition  
Lecture 23 - Support of a module  
Lecture 24 - Associated primes  
Lecture 25 - Prime avoidance  
Lecture 26 - Saturation - Part 1  
Lecture 27 - Saturation - Part 2  
Lecture 28 - Saturation - Part 3  
Lecture 29 - Morphisms - Part 1

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## NPTTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Morphisms - Part 2
- Lecture 31 - Integral extensions
- Lecture 32 - Noether normalisation lemma
- Lecture 33 - Noether normalisation lemma
- Lecture 34 - Polynomial rings
- Lecture 35 - Going up theorem
- Lecture 36 - Artinian rings
- Lecture 37 - Graded modules
- Lecture 38 - Hilbert polynomial
- Lecture 39 - Hilbert-Samuel polynomial
- Lecture 40 - Artin Rees Lemma
- Lecture 41 - Degree of Hilbert-Samuel polynomial
- Lecture 42 - Dimension of noetherian local rings - Part 1
- Lecture 43 - Dimension of noetherian local rings - Part 2
- Lecture 44 - Dimension of polynomial rings
- Lecture 45 - Algebras over a field
- Lecture 46 - Graded rings - Part 1
- Lecture 47 - Graded rings - Part 2
- Lecture 48 - Polynomial rings over fields
- Lecture 49 - Hilbert series - Part 1
- Lecture 50 - Hilbert series - Part 2
- Lecture 51 - Proj of a graded ring
- Lecture 52 - Homogenization - Part 1
- Lecture 53 - Homogenization - Part 2
- Lecture 54 - More on graded rings
- Lecture 55 - Free resolutions
- Lecture 56 - Computing syzygies
- Lecture 57 - Koszul complex
- Lecture 58 - More on Koszul complexes
- Lecture 59 - Castelnuovo Mumford regularity
- Lecture 60 - Castelnuovo Mumford regularity

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Laplace Transform

Subject Co-ordinator - Prof. Indrava Roy

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction and Motivation for Laplace transforms - Part 1
- Lecture 2 - Introduction and Motivation for Laplace transforms - Part 2
- Lecture 3 - Improper Riemann integrals
- Lecture 4 - Improper Riemann integrals
- Lecture 5 - Existence of Laplace transforms and Examples
- Lecture 6 - Properties of Laplace transforms-I - Part 1
- Lecture 7 - Properties of Laplace transforms-I - Part 2
- Lecture 8 - Existence of Laplace transforms for functions with vertical asymptote at the Y-axis - Part 1
- Lecture 9 - Existence of Laplace transforms for functions with vertical asymptote at the Y-axis - Part 2
- Lecture 10 - Properties of Laplace transforms-II - Part 1
- Lecture 11 - Properties of Laplace transforms-II - Part 2
- Lecture 12 - Laplace transform of Derivatives - Part 1
- Lecture 13 - Laplace transform of Derivatives - Part 2
- Lecture 14 - Laplace transform of Periodic functions and Integrals - I
- Lecture 15 - Laplace transform of Integrals-II - Part 1
- Lecture 16 - Laplace transform of Integrals-II - Part 2
- Lecture 17 - Inverse Laplace transform and asymptotic behaviour - Part 1
- Lecture 18 - Inverse Laplace transform and asymptotic behaviour - Part 2
- Lecture 19 - Methods of finding Inverse Laplace transform-I- Partial Fractions
- Lecture 20 - Methods of finding Inverse Laplace transform-II- Convolution theorem
- Lecture 21 - Convolution theorem for Laplace transforms
- Lecture 22 - Applications of Laplace transforms
- Lecture 23 - Applications of Laplace Transform to physical systems
- Lecture 24 - Solving Linear ODE's with polynomial coefficients
- Lecture 25 - Integral and Integro-differential equation
- Lecture 26 - Further application of Laplace transforms - Part 1
- Lecture 27 - Further application of Laplace transforms - Part 2

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. Indrava Roy

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Finite Sets and Cardinality
- Lecture 2 - Infinite Sets and the Banach-Tarski Paradox - Part 1
- Lecture 3 - Infinite Sets and the Banach-Tarski Paradox - Part 2
- Lecture 4 - Elementary Sets and Elementary measure - Part 1
- Lecture 5 - Elementary Sets and Elementary measure - Part 2
- Lecture 6 - Properties of elementary measure - Part 1
- Lecture 7 - Properties of elementary measure - Part 2
- Lecture 8 - Uniqueness of elementary measure and Jordan measurability - Part 1
- Lecture 9 - Uniqueness of elementary measure and Jordan measurability - Part 2
- Lecture 10 - Characterization of Jordan measurable sets and basic properties of Jordan measure - Part 1
- Lecture 11 - Characterization of Jordan measurable sets and basic properties of Jordan measure - Part 2
- Lecture 12 - Examples of Jordan measurable sets-I
- Lecture 13 - Examples of Jordan measurable sets-II - Part 1
- Lecture 14 - Examples of Jordan measurable sets-II - Part 2
- Lecture 15 - Jordan measure under Linear transformations - Part 1
- Lecture 16 - Jordan measure under Linear transformations - Part 2
- Lecture 17 - Connecting the Jordan measure with the Riemann integral - Part 1
- Lecture 18 - Connecting the Jordan measure with the Riemann integral - Part 2
- Lecture 19 - Outer measure - Motivation and Axioms of outer measure
- Lecture 20 - Comparing Inner Jordan measure, Lebesgue outer measure and Jordan Outer measure
- Lecture 21 - Finite additivity of outer measure on Separated sets, Outer regularity - Part 1
- Lecture 22 - Finite additivity of outer measure on Separated sets, Outer regularity - Part 2
- Lecture 23 - Lebesgue measurable class of sets and their Properties - Part 1
- Lecture 24 - Lebesgue measurable class of sets and their Properties - Part 2
- Lecture 25 - Equivalent criteria for lebesgue measurability of a subset - Part 1
- Lecture 26 - Equivalent criteria for lebesgue measurability of a subset - Part 2
- Lecture 27 - The measure axioms and the Borel-Cantelli Lemma
- Lecture 28 - Properties of the Lebesgue measure
- Lecture 29 - Properties of the Lebesgue measure

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- Lecture 30 - Lebesgue measurability under Linear transformation, Construction of Vitali Set - Part 1
- Lecture 31 - Lebesgue measurability under Linear transformation, Construction of Vitali Set - Part 2
- Lecture 32 - Abstract measure spaces
- 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  $\mathbb{R}^d$
- Lecture 37 - Examples of Measures defined on  $\mathbb{R}^d$  via Hahn Kolmogorov extension - Part 1
- Lecture 38 - Examples of Measures defined on  $\mathbb{R}^d$  via Hahn Kolmogorov extension - Part 2
- Lecture 39 - Measurable functions
- Lecture 40 - Measurable functions
- Lecture 41 - Egorov's theorem
- Lecture 42 - Lebesgue integral of unsigned simple measurable functions
- Lecture 43 - Lebesgue integral of unsigned measurable functions
- Lecture 44 - Fundamental convergence theorems in Lebesgue integration
- Lecture 45 - Lebesgue integral for complex and real measurable functions
- Lecture 46 - Basic properties of  $L^1$ -functions and Lebesgue's Dominated convergence theorem
- Lecture 47 -  $L^1$  functions on  $\mathbb{R}^d$
- Lecture 48 -  $L^1$  functions on  $\mathbb{R}^d$
- Lecture 49 -  $L^1$  functions on  $\mathbb{R}^d$
- Lecture 50 -  $L^1$  functions on  $\mathbb{R}^d$
- Lecture 51 - Various modes of convergence of measurable functions
- Lecture 52 - Easy implications from one mode of convergence to another
- Lecture 53 - Implication map for modes of convergence with various examples
- Lecture 54 - Uniqueness of limits across various modes of convergence
- Lecture 55 - Some criteria for reverse implications for modes of convergence
- Lecture 56 - Riesz Representation theorem- Motivation
- Lecture 57 - Basics on Locally compact Hausdorff spaces
- Lecture 58 - Borel and Radon measures on LCH spaces
- Lecture 59 - Properties of Radon measures and Lusin's theorem on LCH spaces
- Lecture 60 - Riesz Representation theorem - Complete statement and proof - Part 1
- Lecture 61 - Riesz Representation theorem - Complete statement and proof - Part 2
- Lecture 62 - Examples of measures constructed using RRT
- Lecture 63 - Theorems of Tonelli and Fubini- interchanging the order of integration for repeated integrals
- Lecture 64 - Product measures
- Lecture 65 - Tonelli's theorem for sets - Part 1
- Lecture 66 - Tonelli's theorem for sets - Part 2
- Lecture 67 - Fubini-Tonelli theorem
- Lecture 68 - Lebesgue's differentiation theorem

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- Lecture 69 - Lebesgue's differentiation theorem
- Lecture 70 - Lebesgue's differentiation theorem
- Lecture 71 - Differentiation theorems
- Lecture 72 - Differentiation theorems
- Lecture 73 - Riesz's Rising Sun Lemma
- Lecture 74 - Differentiation theorem for monotone continuous functions
- Lecture 75 - Differentiation theorem for general monotone functions and Second fundamental theorem of calculus

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Complex Analysis

Subject Co-ordinator - Prof. Pranav Haridas

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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 - Möbius 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

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- Lecture 30 - Open mapping theorem
- Lecture 31 - Schwarz reflection principle
- Lecture 32 - Problem session
- Lecture 33 - Singularities of a holomorphic function
- Lecture 34 - Pole of a function
- Lecture 35 - Laurent Series
- Lecture 36 - Casorati Weierstrass theorem
- Lecture 37 - Problem Session
- Lecture 38 - Residue theorem
- Lecture 39 - Argument principle
- Lecture 40 - Problem Session
- Lecture 41 - Branch of the Complex logarithm
- Lecture 42 - Automorphisms of the Unit disk
- Lecture 43 - Phragmen Lindelof method
- Lecture 44 - Problem Session
- Lecture 45 - Lifting of maps
- Lecture 46 - Covering spaces
- Lecture 47 - Bloch's theorem
- Lecture 48 - Little Picard's theorem

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Real Analysis - I

Subject Co-ordinator - Prof. Jaikrishnan J

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - WEEK 1 - INTRODUCTION  
Lecture 2 - Why study Real Analysis  
Lecture 3 - Square root of 2  
Lecture 4 - Wason's selection task  
Lecture 5 - Zeno's Paradox  
Lecture 6 - Basic set theory  
Lecture 7 - Basic logic  
Lecture 8 - Quantifiers  
Lecture 9 - Proofs  
Lecture 10 - Functions and relations  
Lecture 11 - Axioms of Set Theory  
Lecture 12 - Equivalence relations  
Lecture 13 - What are the rationals  
Lecture 14 - Cardinality  
Lecture 15 - WEEK 2 - INTRODUCTION  
Lecture 16 - Field axioms  
Lecture 17 - Order axioms  
Lecture 18 - Absolute value  
Lecture 19 - The completeness axiom  
Lecture 20 - Nested intervals property  
Lecture 21 - NIP+APâ Completeness  
Lecture 22 - Existence of square roots  
Lecture 23 - Uncountability of the real numbers  
Lecture 24 - Density of rationals and irrationals  
Lecture 25 - WEEK 3 - INTRODUCTION  
Lecture 26 - Motivation for infinite sums  
Lecture 27 - Definition of sequence and examples  
Lecture 28 - Definition of convergence  
Lecture 29 - Uniqueness of limits

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- Lecture 30 - Achilles and the tortoise
- Lecture 31 - Deep dive into the definition of convergence
- 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  $x^2$
- Lecture 60 - Limit laws
- Lecture 61 - Limit of  $\sin x$
- Lecture 62 - Relationship between limits and continuity
- Lecture 63 - Global continuity and open sets
- Lecture 64 - Continuity of square root
- Lecture 65 - Operations on continuous functions
- Lecture 66 - Language for limits
- Lecture 67 - Infinite limits
- Lecture 68 - One sided limits

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- Lecture 69 - Limits of polynomials
- Lecture 70 - Compactness
- Lecture 71 - The Heine-Borel theorem
- Lecture 72 - Open covers and compactness
- Lecture 73 - Equivalent notions of compactness
- Lecture 74 - The extreme value theorem
- Lecture 75 - Uniform continuity
- Lecture 76 - Connectedness
- Lecture 77 - Intermediate Value Theorem
- Lecture 78 - Darboux continuity and monotone functions
- Lecture 79 - Perfect sets and the Cantor set
- Lecture 80 - The structure of open sets
- Lecture 81 - The Baire Category theorem
- Lecture 82 - Discontinuities
- Lecture 83 - Classification of discontinuities and monotone functions
- Lecture 84 - Structure of set of discontinuities
- Lecture 85 - WEEK 8 and 9 - INTRODUCTION
- Lecture 86 - Definition and interpretation of the derivative
- Lecture 87 - Basic properties of the derivative
- Lecture 88 - Examples of differentiation
- Lecture 89 - Darboux's theorem
- Lecture 90 - The mean value theorem
- Lecture 91 - Applications of the mean value theorem
- Lecture 92 - Taylor's theorem NEW
- Lecture 93 - The ratio mean value theorem and L'Hospital's rule
- Lecture 94 - Axiomatic characterisation of area and the Riemann integral
- Lecture 95 - Proof of axiomatic characterization
- Lecture 96 - The definition of the Riemann integral
- Lecture 97 - Criteria for Riemann integrability
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Variational Calculus and its applications in Control Theory and Nanome

Subject Co-ordinator - Prof. Sarthok Sircar

Co-ordinating Institute - IIIT - Delhi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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 Holonomic and non- Holonomic Constraints, Variable Endpts - Part 1  
Lecture 26 - Problems with Holonomic and non- Holonomic Constraints, Variable Endpts - Part 2  
Lecture 27 - Problems with Holonomic and non- Holonomic Constraints, Variable Endpts - Part 3  
Lecture 28 - Problems with Holonomic and non- Holonomic Constraints, Variable Endpts - Part 4  
Lecture 29 - Problems with Holonomic and non- Holonomic Constraints, Variable Endpts - Part 5

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## NPTTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Problems with Holonomic and non- Holonomic Constraints, Variable Endpts - Part 6
- Lecture 31 - Broken extremals / Hamiltonian Formulation - Part 1
- Lecture 32 - Broken extremals / Hamiltonian Formulation - Part 2
- Lecture 33 - Broken extremals / Hamiltonian Formulation - Part 3
- Lecture 34 - Broken extremals / Hamiltonian Formulation - Part 4
- Lecture 35 - Broken extremals / Hamiltonian Formulation - Part 5
- Lecture 36 - Broken extremals / Hamiltonian Formulation - Part 6
- Lecture 37 - Hamilton-Jacobi Equations - Part 1
- Lecture 38 - Hamilton-Jacobi Equations - Part 2
- Lecture 39 - Hamilton-Jacobi Equations - Part 3
- Lecture 40 - Hamilton-Jacobi Equations - Part 4
- Lecture 41 - Hamilton-Jacobi Equations - Part 5
- Lecture 42 - Hamilton-Jacobi Equations - Part 6
- Lecture 43 - Noether's Theorem / Introduction to Second Variation - Part 1
- Lecture 44 - Noether's Theorem / Introduction to Second Variation - Part 2
- Lecture 45 - Noether's Theorem / Introduction to Second Variation - Part 3
- Lecture 46 - Noether's Theorem / Introduction to Second Variation - Part 4
- Lecture 47 - Noether's Theorem / Introduction to Second Variation - Part 5
- Lecture 48 - Noether's Theorem / Introduction to Second Variation - Part 6
- Lecture 49 - Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 1
- Lecture 50 - Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 2
- Lecture 51 - Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 3
- Lecture 52 - Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 4
- Lecture 53 - Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 5
- Lecture 54 - Conjugate points / Jacobi Accessory Equations / Introduction to Optimal Control Theory - Part 6
- Lecture 55 - Constrained Optimization in Optimal Control Theory - Part 1
- Lecture 56 - Constrained Optimization in Optimal Control Theory - Part 2
- Lecture 57 - Constrained Optimization in Optimal Control Theory - Part 3
- Lecture 58 - Constrained Optimization in Optimal Control Theory - Part 4
- Lecture 59 - Constrained Optimization in Optimal Control Theory - Part 5
- Lecture 60 - Constrained Optimization in Optimal Control Theory - Part 6
- Lecture 61 - Introduction to Nanomechanics - Part 1
- Lecture 62 - Introduction to Nanomechanics - Part 2
- Lecture 63 - Introduction to Nanomechanics - Part 3
- Lecture 64 - Introduction to Nanomechanics - Part 4
- Lecture 65 - Introduction to Nanomechanics - Part 5
- Lecture 66 - Introduction to Nanomechanics - Part 6

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Galois Theory

Subject Co-ordinator - Prof. Krishna Hanumanthu

Co-ordinating Institute - Chennai Mathematical Institute

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Motivation and overview of the course  
Lecture 2 - Review of group theory  
Lecture 3 - Review of ring theory - I  
Lecture 4 - Review of ring theory - II  
Lecture 5 - Review of field theory - I  
Lecture 6 - Review of field theory - II  
Lecture 7 - Review of field theory - III  
Lecture 8 - Problem Session - Part 1  
Lecture 9 - Problem Session - Part 2  
Lecture 10 - Beginning of Galois theory  
Lecture 11 - Fixed fields  
Lecture 12 - Theorem I on fixed fields  
Lecture 13 - Theorem II on fixed fields  
Lecture 14 - Galois extensions, Galois groups  
Lecture 15 - Normal extensions  
Lecture 16 - Problem Session - Part 3  
Lecture 17 - Problem Session - Part 4  
Lecture 18 - Separable extension - Part 1  
Lecture 19 - Separable extension - Part 2  
Lecture 20 - Characterization of Galois extensions - Part 1  
Lecture 21 - Characterization of Galois extensions - Part 2  
Lecture 22 - Examples of Galois extensions  
Lecture 23 - Motivating the main theorem of Galois theory  
Lecture 24 - Main theorem of Galois theory - Part 1  
Lecture 25 - Main theorem of Galois theory - Part 2  
Lecture 26 - Fundamental theorem of algebra  
Lecture 27 - Problem Session - Part 5  
Lecture 28 - Problem Session - Part 6  
Lecture 29 - Problem Session - Part 7

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Problem Session - Part 8
- Lecture 31 - Problem Session - Part 9
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Basic Calculus 1

Subject Co-ordinator - Prof. Arindama Singh

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - The Real line - Part 1  
Lecture 2 - The Real line - Part 2  
Lecture 3 - Absolute value - Part 1  
Lecture 4 - Absolute value - Part 2  
Lecture 5 - Functions - Part 1  
Lecture 6 - Functions - Part 2  
Lecture 7 - Transcendental and trigonometric Functions - Part 1  
Lecture 8 - Transcendental and trigonometric Functions - Part 2  
Lecture 9 - Limits of functions - Part 1  
Lecture 10 - Limits of functions - Part 2  
Lecture 11 - Algebra of limits - Part 1  
Lecture 12 - Algebra of limits - Part 2  
Lecture 13 - One-sided limits - Part 1  
Lecture 14 - One-sided limits - Part 2  
Lecture 15 - Limits at infinity - Part 1  
Lecture 16 - Limits at infinity - Part 2  
Lecture 17 - Infinite limits - Part 1  
Lecture 18 - Infinite limits - Part 2  
Lecture 19 - Continuity - Part 1  
Lecture 20 - Continuity - Part 2  
Lecture 21 - Algebra of continuous functions - Part 1  
Lecture 22 - Algebra of continuous functions - Part 2  
Lecture 23 - Results on continuity - Part 1  
Lecture 24 - Results on continuity - Part 2  
Lecture 25 - Differentiability - Part 1  
Lecture 26 - Differentiability - Part 2  
Lecture 27 - Derivative and tangent - Part 1  
Lecture 28 - Derivative and tangent - Part 2  
Lecture 29 - Rules of differentiation - Part 1

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Rules of differentiation - Part 2
- Lecture 31 - Differentiation exercises - Part 1
- Lecture 32 - Differentiation exercises - Part 2
- Lecture 33 - Maxima and minima - Part 1
- Lecture 34 - Maxima and minima - Part 2
- Lecture 35 - Rolle's theorem and mean value theorem - Part 1
- Lecture 36 - Rolle's theorem and mean value theorem - Part 2
- Lecture 37 - Using Rolle's theorem and Mean value theorem - Part 1
- Lecture 38 - Using Rolle's theorem and Mean value theorem - Part 2
- Lecture 39 - First derivative test - Part 1
- Lecture 40 - First derivative test - Part 2
- Lecture 41 - Second derivative test - Part 1
- Lecture 42 - Second derivative test - Part 2
- Lecture 43 - Concavity - Part 1
- Lecture 44 - Concavity - Part 2
- Lecture 45 - Linearization and differential - Part 1
- Lecture 46 - Linearization and differential - Part 2
- Lecture 47 - L'Hôpital's rules - Part 1
- Lecture 48 - L'Hôpital's rules - Part 2
- Lecture 49 - Definite integral - Part 1
- Lecture 50 - Definite integral - Part 2
- Lecture 51 - Properties of integral - Part 1
- Lecture 52 - Properties of integral - Part 2
- Lecture 53 - Fundamental theorem of calculus - Part 1
- Lecture 54 - Fundamental theorem of calculus - Part 2
- Lecture 55 - Applications of Fundamental theorem of calculus - Part 1
- Lecture 56 - Applications of Fundamental theorem of calculus - Part 2
- Lecture 57 - Rule of substitution - Part 1
- Lecture 58 - Rule of substitution - Part 2
- Lecture 59 - Area between curves - Part 1
- Lecture 60 - Area between curves - Part 2
- Lecture 61 - Volumes by slicing - Part 1
- Lecture 62 - Volumes by slicing - Part 2
- Lecture 63 - The disk method - Part 1
- Lecture 64 - The disk method - Part 2
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Lengths of curves - Part 1
- Lecture 70 - Lengths of curves - Part 2
- Lecture 71 - Areas of surface of revolution - Part 1
- Lecture 72 - Areas of surface of revolution - Part 2

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Functional Analysis

Subject Co-ordinator - Prof. Kesavan

Co-ordinating Institute - Institute of Mathematical Sciences

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Normed Linear Spaces  
Lecture 2 - Examples of Normed Linear Spaces  
Lecture 3 - Examples (Continued...)  
Lecture 4 - Continuous linear maps - Part 1  
Lecture 5 - Continuous linear maps - Part 2  
Lecture 6 - Isomorphisms  
Lecture 7 - Exercises  
Lecture 8 - Exercises (Continued...)  
Lecture 9 - Hahn-Banach Theorems  
Lecture 10 - Reflexivity  
Lecture 11 - Geometric version  
Lecture 12 - Geometric version (Continued...)  
Lecture 13 - Vector valued integration  
Lecture 14 - Exercises - Part 1  
Lecture 15 - Exercises - Part 2  
Lecture 16 - Baire's Theorem and Applications  
Lecture 17 - Application to Fourier series  
Lecture 18 - Open mapping and closed graph theorems  
Lecture 19 - Annihilators  
Lecture 20 - Complemented subspaces  
Lecture 21 - Unbounded Operators, Adjoints - Part 1  
Lecture 22 - Unbounded Operators, Adjoints - Part 2  
Lecture 23 - Orthogonality relations  
Lecture 24 - Exercises  
Lecture 25 - Exercises (Continued...)  
Lecture 26 - Weak topology - Part 1  
Lecture 27 - Weak topology - Part 2  
Lecture 28 - Weak topology - Part 3  
Lecture 29 - Weak\* topology - Part 1

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Weak\* topology - Part 2
- Lecture 31 - Reflexive Spaces
- Lecture 32 - Separable Spaces - Part 1
- Lecture 33 - Separable Spaces - Part 2
- Lecture 34 - Uniformly Convex Spaces
- Lecture 35 - Applications
- Lecture 36 - Exercises
- Lecture 37 - L-p Spaces - Part 1
- Lecture 38 - L-p Spaces - Part 2
- Lecture 39 - Completeness
- Lecture 40 - Duality
- Lecture 41 - L-p Spaces in Euclidean spaces - Part 1
- Lecture 42 - L-p Spaces in Euclidean spaces - Part 2
- Lecture 43 - Dual of L-1
- Lecture 44 - The space L-1 (Continued...)
- Lecture 45 - Exercises - Part 1
- Lecture 46 - Exercises - Part 2
- Lecture 47 - Exercises - Part 3
- Lecture 48 - Exercises - Part 4
- Lecture 49 - Hilbert spaces - Part 1
- Lecture 50 - Hilbert spaces - Part 2
- Lecture 51 - Duality
- Lecture 52 - Adjoints
- Lecture 53 - Applications
- Lecture 54 - Orthonormal sets
- Lecture 55 - Orthonormal bases - Part 1
- Lecture 56 - Orthonormal bases - Part 2
- Lecture 57 - Fourier series
- Lecture 58 - Spectrum of an operator - Part 1
- Lecture 59 - Spectrum of an operator - Part 2
- Lecture 60 - Exercises - Part 1
- Lecture 61 - Exercises - Part 2
- Lecture 62 - Exercises - Part 3
- Lecture 63 - Compact operators - Part 1
- Lecture 64 - Compact operators - Part 2
- Lecture 65 - Riesz-Fredholm theory - Part 1
- Lecture 66 - Riesz-Fredholm theory - Part 2
- Lecture 67 - Riesz-Fredholm theory
- Lecture 68 - Spectrum of a compact operator

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Spectrum of a compact self-adjoint operator
- Lecture 70 - Eigenvalues of a compact self-adjoint operator
- Lecture 71 - Exercises - Part 1
- Lecture 72 - Exercises - Part 2
- Lecture 73 - Exercises - Part 3
- Lecture 74 - Exercises - Part 4

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Methods in Physics 1

Subject Co-ordinator - Prof. Auditya Sharma

Co-ordinating Institute - IISER - Bhopal

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Vectors
- Lecture 2 - Linear vector spaces
- Lecture 3 - Linear vector spaces: immediate consequences
- Lecture 4 - Dot product of Euclidean vectors
- Lecture 5 - Inner product on a Linear vector space
- Lecture 6 - Cauchy-Schwartz inequality for Euclidean vectors
- Lecture 7 - Cauchy-Schwartz inequality for vectors from LVS
- Lecture 8 - Applications of the Cauchy-Schwartz inequality
- Lecture 9 - Triangle inequality
- Lecture 10 - Linear dependence and independence of vectors
- Lecture 11 - Row reduction of matrices
- Lecture 12 - Rank of a matrix
- Lecture 13 - Rank of a matrix: consequences
- Lecture 14 - Determinants and their properties
- Lecture 15 - The rank of a matrix using determinants
- Lecture 16 - Cramer's rule
- Lecture 17 - Square system of equations
- Lecture 18 - Homogeneous equations
- Lecture 19 - The rank of a matrix and linear dependence
- Lecture 20 - Span, basis, and dimension of a LVS
- Lecture 21 - Gram-Schmidt orthogonalization
- Lecture 22 - Vector subspaces
- Lecture 23 - Linear operators
- Lecture 24 - Inverse of an operator
- Lecture 25 - Adjoint of an operator
- Lecture 26 - Projection operators
- Lecture 27 - Eigenvalues and Eigenvectors
- Lecture 28 - Hermitian operators
- Lecture 29 - Unitary operators

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Normal operators
- Lecture 31 - Similarity and Unitary transformations
- 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
- Lecture 65 - 2nd order Homogeneous linear equations with constant coefficients
- Lecture 66 - The use of a known solution to find another
- Lecture 67 - An alternate approach to auxiliary equation
- Lecture 68 - Inhomogeneous second order equations

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Methods to find a Particular solution
- Lecture 70 - Successive Integration of two first order equations
- Lecture 71 - Illustrative examples
- Lecture 72 - Variation of Parameters
- Lecture 73 - Vibrations in mechanical systems
- Lecture 74 - Forced Vibrations
- Lecture 75 - Resonance
- Lecture 76 - Linear Superposition
- Lecture 77 - Laplace Transform (LT)
- Lecture 78 - Basic Properties of Laplace Transforms
- Lecture 79 - Step functions, Translations, and Periodic functions
- Lecture 80 - The Inverse Laplace Transform
- Lecture 81 - Convolution of functions
- Lecture 82 - Solving ODEs using Laplace transforms
- Lecture 83 - The Dirac Delta function
- Lecture 84 - Properties of the Dirac Delta function
- Lecture 85 - Green's function method
- Lecture 86 - Green's function method: Boundary value problem
- Lecture 87 - Power series method
- Lecture 88 - Power series solutions about an ordinary point
- Lecture 89 - Initial value problem: power series solution
- Lecture 90 - Frobenius method for regular singular points

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Computational Mathematics with SageMath

Subject Co-ordinator - Prof. Ajit Kumar

Co-ordinating Institute - Institute of Chemical Technology - Mumbai

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Installation of Python
- Lecture 2 - Getting Started with Python
- Lecture 3 - Python as an advanced calculator
- Lecture 4 - Lists in Python
- Lecture 5 - Tuple, Sets and Dictionaries in Python
- Lecture 6 - Functions and Branching
- Lecture 7 - For loop in Python
- Lecture 8 - While loop in Python
- Lecture 9 - Creating Modules and Introduction to NumPy
- Lecture 10 - Use of NumPy module
- Lecture 11 - Python Graphics using Matplotlib
- Lecture 12 - Use of SciPy and SymPy in Python
- Lecture 13 - Classes in Python - Part 1
- Lecture 14 - Classes in Python - Part 2
- Lecture 15 - Introduction and Installation of SageMath
- Lecture 16 - Exploring integers in SageMath
- Lecture 17 - Solving Equations in SageMath
- Lecture 18 - 2d Plotting with SageMath
- Lecture 19 - 3d Plotting with SageMath
- Lecture 20 - Calculus of one variable with SageMath - Part 1
- Lecture 21 - Calculus of one variable with SageMath - Part 2
- Lecture 22 - Applications of derivatives
- Lecture 23 - Integration with SageMath
- Lecture 24 - Improper Integral using SageMath
- Lecture 25 - Application of integration using SageMath
- Lecture 26 - Limit and Continuity of real valued functions
- Lecture 27 - Partial Derivative with SageMath
- Lecture 28 - Local Maximum and Minimum
- Lecture 29 - Application of local maximum and local minimum

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Constrained optimization using Lagrange multipliers
- Lecture 31 - Working with vectors in SageMath
- 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 Problems 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
- Lecture 65 - Revised Simplex Method in SageMath
- Lecture 66 - Two Phase Simplex Method in SageMath
- Lecture 67 - Big-M Method in SageMath
- Lecture 68 - Duality of Linear Program

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Dual Simplex Method in SageMath
- Lecture 70 - Review and What next in SageMath?

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. Siva Athreya

Co-ordinating Institute - ISI - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Sample Space, Events and Probability  
Lecture 2 - Properties of Probability  
Lecture 3 - Equally likely Outcomes  
Lecture 4 - Conditional Probability  
Lecture 5 - Bayes Theorem  
Lecture 6 - Independence - Part 1  
Lecture 7 - Independence - Part 2  
Lecture 8 - Sampling and Repeated Trials  
Lecture 9 - Sampling and Repeated Trials - Part 1  
Lecture 10 - Sampling and Repeated Trials - Part 2  
Lecture 11 - Sampling with and Without Replacement  
Lecture 12 - Sampling without Replacement  
Lecture 13 - Hypergeometric Distribution and Discrete Random Variables  
Lecture 14 - Discrete Random Variables - Part 1  
Lecture 15 - Discrete Random Variables - Part 2  
Lecture 16 - Conditional, Joint and Marginal Distributions  
Lecture 17 - Memoryless property of Geometric Distribution  
Lecture 18 - Functions of Random Variables  
Lecture 19 - Sums of Independent Random Variables  
Lecture 20 - Functions and Independence  
Lecture 21 - Expectation of Random Variables  
Lecture 22 - Properties of Expectation  
Lecture 23 - Expectation: Independence and Functions  
Lecture 24 - Variance of Discrete Random Variables  
Lecture 25 - Markov and Chebyshev Inequalities  
Lecture 26 - Conditional Expectation and Covariance  
Lecture 27 - Continuous Random Variables - Part 1  
Lecture 28 - Continuous Random Variables - Part 2  
Lecture 29 - Distribution Function

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Exponential and Normal Random Variable
- Lecture 31 - Normal Random Variable
- Lecture 32 - Change of Variable
- Lecture 33 - Joint Distribution of Continuous Random Variables
- Lecture 34 - Marginal Density and Independence
- Lecture 35 - Conditional Density
- Lecture 36 - Sums of Independent Random Variables
- Lecture 37 - Quotient of Independent Random Variables
- Lecture 38 - Expectation and Variance of Continuous Random Variables
- Lecture 39 - Sampling Distribution and Sample Mean
- Lecture 40 - Weak Law of Large Numbers
- Lecture 41 - Revisit of Variance and Expectation
- Lecture 42 - Revisit of Properties of Variance
- Lecture 43 - Revisit Weak Law of Large Numbers
- Lecture 44 - Demoivre-Laplace Central Limit Theorem and Normal Random Variables
- Lecture 45 - Revisit Normal Random Variables
- Lecture 46 - Normal Tables, Mean and Variance

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Algebra-II

Subject Co-ordinator - Prof. Amritanshu Prasad, Prof. S. Viswanath

Co-ordinating Institute - Institute of Mathematical Sciences

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Algebraic and Transcendental Numbers
- Lecture 2 - Extensions Generated by Elements
- Lecture 3 - Isomorphic Extensions
- Lecture 4 - Degree of an Extension
- Lecture 5 - Constructible Numbers
- Lecture 6 - The Field of Constructible Numbers
- Lecture 7 - Characterization of Constructible Numbers
- Lecture 8 - Solved Problems (Week 1)
- Lecture 9 - Some Things can't be Constructed
- Lecture 10 - Symbolic Adjunction
- Lecture 11 - Repeated Roots
- Lecture 12 - Gauss Lemma
- Lecture 13 - Eisenstein's criterion
- Lecture 14 - Existence Theorem for Finite Fields
- Lecture 15 - Subfields of a Finite Field
- Lecture 16 - Multiplicative Group of a Finite Field
- Lecture 17 - Uniqueness Theorem for Finite Fields
- Lecture 18 - Solved Problems (Week 2)
- Lecture 19 - Algebraic Extensions and Algebraic Closures
- Lecture 20 - Existence of Algebraic Closures
- Lecture 21 - Uniqueness of Algebraic Closure
- Lecture 22 - Solved Problems - Part 1 (Week 3)
- Lecture 23 - Existence of splitting fields, bound on degree
- Lecture 24 - Uniqueness of splitting fields
- Lecture 25 - Solved problems - Part 2 (Week 3)
- Lecture 26 - Normal Extensions
- Lecture 27 - Separable polynomials
- Lecture 28 - Perfect fields, separable extensions
- Lecture 29 - Definition and examples, fixed fields

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Characterization of Galois extensions
- Lecture 31 - Linear Independence of Characters
- Lecture 32 - Solved problems (Week 4)
- Lecture 33 - Artin's Theorem - Part 1
- Lecture 34 - Artin's Theorem - Part 2
- Lecture 35 - Finite Galois Extensions
- Lecture 36 - The fundamental theorem of Galois Theory - 1
- Lecture 37 - The fundamental theorem of Galois Theory - 2
- Lecture 38 - Solved problems (Week 5)
- Lecture 39 - Cyclotomic extensions
- Lecture 40 - Irreducibility of the cyclotomic polynomial
- Lecture 41 - Application: Constructibility of regular n-gons.
- Lecture 42 - Insolvability of the general quintic - Part 1
- Lecture 43 - Insolvability of the general quintic - Part 2
- Lecture 44 - Insolvability of the general quintic - Part 3
- Lecture 45 - What is category theory (and why is it important)?
- Lecture 46 - Definition of a category
- Lecture 47 - Monomorphisms, epimorphisms, and isomorphisms
- Lecture 48 - Categories: First Problem Session
- Lecture 49 - Initial and Terminal Objects
- Lecture 50 - Products and Coproducts
- Lecture 51 - Categories: Second Problem Session
- Lecture 52 - Functors
- Lecture 53 - The Category of Categories
- Lecture 54 - Natural Transformations
- Lecture 55 - Functor Categories
- Lecture 56 - Categories: Third Problem Session
- Lecture 57 - Adjunction
- Lecture 58 - Categories: Fourth Problem Session
- Lecture 59 - Tensor products of  $\mathbb{Z}$ -modules
- Lecture 60 - Free abelian groups and quotient groups
- Lecture 61 - Construction of the tensor product
- Lecture 62 - Problem session
- Lecture 63 - Tensor product of  $R$ -modules
- Lecture 64 - Functoriality of the tensor product
- Lecture 65 - Bimodules
- Lecture 66 - Tensor products of bimodules
- Lecture 67 - Tensor products of modules over commutative rings
- Lecture 68 - Extension of scalars

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 - Schreier'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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Methods in Physics 2

Subject Co-ordinator - Prof. Auditya Sharma

Co-ordinating Institute - IISER - Bhopal

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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 perspective 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 integral
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 Hermite 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 definition
- 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
- Lecture 65 - The Laplace Equation
- Lecture 66 - The Laplace Equation: Separation of Variables
- Lecture 67 - The Laplace Equation: Dirichlet and Neumann boundary conditions
- Lecture 68 - The Laplace Equation in Cartesian coordinates

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - The Laplace Equation for a 3-D rectangular box
- Lecture 70 - The Laplace Equation in spherical coordinates
- Lecture 71 - The Laplace Equation in Spherical Coordinates: Solution
- Lecture 72 - The Laplace Equation in Spherical Coordinates: illustrative examples
- Lecture 73 - The Poisson's Equation: Green's function solution
- Lecture 74 - The heat equation: a heuristic discussion
- Lecture 75 - From the random walk to the diffusion equation
- Lecture 76 - Solution of the Diffusion equation
- Lecture 77 - The Diffusion equation with Dirichlet and Neumann boundary conditions
- Lecture 78 - The Heat equation: illustrative examples
- Lecture 79 - The Wave equation: Method of characteristics
- Lecture 80 - The Wave equation: Separation of variables

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Real Analysis - II

Subject Co-ordinator - Prof. Jaikrishnan J

Co-ordinating Institute - IIT - Palakkad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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-Ascoli 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Examples of differentiation
- Lecture 31 - Properties of the derivative map
- Lecture 32 - The mean-value theorem
- Lecture 33 - Differentiating under the integral sign
- Lecture 34 - Higher-order derivatives
- Lecture 35 - Symmetry of the second derivative
- Lecture 36 - Taylor's theorem
- Lecture 37 - Taylor's theorem with remainder
- Lecture 38 - The Banach fixed point theorem
- Lecture 39 - Newton's method
- Lecture 40 - The inverse function theorem
- Lecture 41 - Diffeomorphism and local diffeomorphisms
- Lecture 42 - The implicit function theorem
- Lecture 43 - Tangent space to a hypersurface
- Lecture 44 - The definition of a manifold
- Lecture 45 - Examples and non examples of manifolds
- Lecture 46 - The tangent space to a manifold
- Lecture 47 - Maxima and minima in several variables
- Lecture 48 - The Hessian and extrema
- Lecture 49 - Completing the squares
- Lecture 50 - Constrained extrema and lagrange multipliers
- Lecture 51 - Curves
- Lecture 52 - Rectifiability and arc-length
- Lecture 53 - The Riemann integral revisited
- Lecture 54 - Monotone sequences of functions
- Lecture 55 - Upper functions and their integrals
- Lecture 56 - Riemann integrable functions as upper functions
- Lecture 57 - Lebesgue integrable functions
- Lecture 58 - Approximation of Lebesgue integrable functions
- Lecture 59 - Levi monotone convergence theorem for step functions
- Lecture 60 - Monotone convergence theorem for upper functions
- Lecture 61 - Monotone convergence theorem for Lebesgue integrable functions
- Lecture 62 - The Lebesgue dominated convergence theorem
- Lecture 63 - Applications of the convergence theorems
- Lecture 64 - The problem of measure
- Lecture 65 - The Lebesgue integral on unbounded intervals
- Lecture 66 - Measurable functions
- Lecture 67 - Solution to the problem of measure
- Lecture 68 - The Lebesgue integral on arbitrary subsets

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Square integrable functions
- Lecture 70 - Norms and inner-products on complex vector spaces
- Lecture 71 - Convergence in  $L^2$
- Lecture 72 - The Riesz-Fischer theorem
- Lecture 73 - Multiple Riemann integration
- Lecture 74 - Multiple Lebesgue integration

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Sobolev Spaces and Partial Differential Equations

Subject Co-ordinator - Prof. Kesavan

Co-ordinating Institute - IMSc

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Test Functions - Part 1  
Lecture 2 - Test Functions - Part 2  
Lecture 3 - Distributions  
Lecture 4 - Examples - Part 1  
Lecture 5 - Distribution Derivatives  
Lecture 6 - More operations on distributions  
Lecture 7 - Support of a distribution  
Lecture 8 - Distributions with compact support; singular support - Part 1  
Lecture 9 - Distributions with compact support; singular support - Part 2  
Lecture 10 - Exercises - Part 1  
Lecture 11 - Convolution of functions - Part 1  
Lecture 12 - Convolution of functions - Part 2  
Lecture 13 - Convolution of functions - Part 3  
Lecture 14 - Convolution of distributions - Part 1  
Lecture 15 - Convolution of distributions - Part 2  
Lecture 16 - Convolution of distributions - Part 3  
Lecture 17 - Exercises - Part 2  
Lecture 18 - Fundamental solutions  
Lecture 19 - The Fourier transform  
Lecture 20 - The Schwarz space - Part 1  
Lecture 21 - The Schwarz space - Part 2  
Lecture 22 - Examples - Part 1  
Lecture 23 - Fourier inversion formula  
Lecture 24 - Tempered distributions  
Lecture 25 - Exercises - Part 3  
Lecture 26 - Sobolev spaces - Part 1  
Lecture 27 - Sobolev spaces - Part 2  
Lecture 28 - Sobolev spaces - Part 3  
Lecture 29 - Approximation by smooth functions

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Chain rule and applications - Part 1
- Lecture 31 - Chain rule and applications - Part 2
- Lecture 32 - Extension theorems - Part 1
- Lecture 33 - Extension theorems - Part 2
- Lecture 34 - Poincare's inequality
- Lecture 35 - Exercises - Part 4
- Lecture 36 - Exercises - Part 5
- Lecture 37 - Imbedding theorems
- Lecture 38 - Imbedding theorems: Case  $p$  less than  $N$  - Part 1
- Lecture 39 - Imbedding theorems: Case  $p = N$  - Part 2
- Lecture 40 - Imbedding theorems: Case  $p$  greater than  $N$  - Part 3
- Lecture 41 - Compactness theorems - Part 1
- Lecture 42 - Compactness theorems - Part 2
- Lecture 43 - Compactness theorems - Part 3
- Lecture 44 - The spaces  $W^{\{s,p\}}$
- Lecture 45 - spaces  $W^{\{s,p\}}$  and Trace spaces
- Lecture 46 - Trace theory - Part 1
- Lecture 47 - Trace theory - Part 2
- Lecture 48 - Trace theory - Part 3
- Lecture 49 - Trace theory - Part 4
- Lecture 50 - Exercises - Part 6
- Lecture 51 - Exercises - Part 7
- Lecture 52 - Abstract variational problems - Part 1
- Lecture 53 - Abstract variational problems - Part 2
- Lecture 54 - Weak solutions of elliptic boundary value problems - Part 1
- Lecture 55 - Weak solutions of elliptic boundary value problems - Part 2
- Lecture 56 - Neumann problems
- Lecture 57 - The Biharmonic operator
- Lecture 58 - The elasticity system
- Lecture 59 - Exercises - Part 8
- Lecture 60 - Exercises - Part 9
- Lecture 61 - Exercises - Part 9
- Lecture 62 - Maximum Principles - Part 1
- Lecture 63 - Maximum Principles - Part 2
- Lecture 64 - Exercises - Part 10
- Lecture 65 - Exercises - Part 11
- Lecture 66 - Eigenvalue problems - Part 1
- Lecture 67 - Eigenvalue problems - Part 2
- Lecture 68 - Eigenvalue problems - Part 3

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Combinatorics

Subject Co-ordinator - Prof. Narayanan N

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Pigeonhole Principle
- Lecture 2 - Dirichlet theorem and Erdos-Szekeres Theorem
- Lecture 3 - Ramey theorem as generalisation of PHP
- Lecture 4 - An infinite flock of Pigeons
- Lecture 5 - Basic Counting - the sum and product rules
- Lecture 6 - Examples of basic counting
- Lecture 7 - Examples: Product and Division rules
- Lecture 8 - Binomial theorem and bijective counting
- Lecture 9 - Counting lattice paths
- Lecture 10 - Multinomial theorem
- Lecture 11 - Applying Multinomial theorem
- Lecture 12 - Integer compositions
- Lecture 13 - Set partitions and Stirling numbers
- Lecture 14 - Stirling and Hemachandra recursions
- Lecture 15 - Integer partitions
- Lecture 16 - Young's diagram and Integer partitions
- Lecture 17 - Principle of Inclusion and Exclusion
- Lecture 18 - Applications of PIE
- Lecture 19 - The twelvefold way
- Lecture 20 - Inclusion exclusion: Linear algebra view
- Lecture 21 - Partial Orders
- Lecture 22 - Mobius Inversion Formula
- Lecture 23 - Product theorem and applications of Mobius Inversion
- Lecture 24 - Formal power series, ordinary generating functions
- Lecture 25 - Application of Ordinary generating functions
- Lecture 26 - Product of Generating functions
- Lecture 27 - Composition of generating functions
- Lecture 28 - Exponential Generating Function
- Lecture 29 - Composition of EGF

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Euler pentagonal number theorem
- Lecture 31 - Graphs - introduction
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Geometry of Vision

Subject Co-ordinator - Prof. Vijay Ravikumar

Co-ordinating Institute - Chennai Mathematical Institute

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction - Geometry of Vision
- Lecture 2 - Chapter One: The Power of Vanishing Points
- Lecture 3 - Drawing parallel lines: a thought experiment
- Lecture 4 - Why do the images of lines terminate ?
- Lecture 5 - Why do some lines share a vanishing point ?
- Lecture 6 - Why do some lines remain parallel ?
- Lecture 7 - The vanishing point theorem
- Lecture 8 - The horizon line theorem
- Lecture 9 - Three views of a tiled floor
- Lecture 10 - Demo: drawing the third perspective view
- Lecture 11 - The second perspective view revisited
- Lecture 12 - Demo: drawing railway tracks
- Lecture 13 - Three views of a box
- Lecture 14 - Demo: drawing in one point and two point perspective
- Lecture 15 - What does a perspective drawing reveal about the viewer ?
- Lecture 16 - Chapter Two: A Geometry of Coincidence
- Lecture 17 - Incidence relations
- Lecture 18 - Linear spaces
- Lecture 19 - Extending the euclidean plane
- Lecture 20 - The shape of this extended plane
- Lecture 21 - Incidence relations in the extended plane
- Lecture 22 - Coincidence #1 the harmonic conjugate theorem
- Lecture 23 - Proof of the harmonic conjugate theorem
- Lecture 24 - Coincidence #2 Pappus's theorem
- Lecture 25 - Coincidence #3 Desargues's theorem
- Lecture 26 - The extended euclidean space  $P^3$
- Lecture 27 - Desargues's theorem in three dimensions
- Lecture 28 - A Shadow drawing challenge
- Lecture 29 - Solution to the Shadow drawing challenge

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Proving Desargues's in three dimensions
- Lecture 31 - Lifting Desargues's theorem from the plane
- Lecture 32 - How to prove the converse
- Lecture 33 - Chapter Three: The Shadow of a Square
- Lecture 34 - Perspectivities the maps that shift perspective
- Lecture 35 - Visualizing perspectivities
- Lecture 36 - Perspectivities are well defined
- Lecture 37 - The harmonic conjugate theorem revisited
- Lecture 38 - Projectivities sequences of perspectivities
- Lecture 39 - 1D projectivities a puzzle
- Lecture 40 - 1D projectivities a harder puzzle
- Lecture 41 - Projectivities as functions
- Lecture 42 - The three fixed points theorem
- Lecture 43 - 1D fundamental theorem of projective geometry
- Lecture 44 - The criss cross construction
- Lecture 45 - Proving pappus's theorem
- Lecture 46 - 2D Fundamental theorem of projective geometry
- Lecture 47 - The four fixed points lemma
- Lecture 48 - The shadow of a square
- Lecture 49 - Chapter Four: The Analytic Framework
- Lecture 50 - Introducing the cross ratio
- Lecture 51 - Evenly spaced points
- Lecture 52 - How many cross ratios ?
- Lecture 53 - Invariance of the cross ratio
- Lecture 54 - Injectivity of the cross ratio
- Lecture 55 - Proving the 3 fixed points theorem
- Lecture 56 - Bonus: the cross ratio as a function
- Lecture 57 - The real projective plane
- Lecture 58 - Homogeneous coordinates
- Lecture 59 - Homogenous proof that parallel lines converge
- Lecture 60 - Bonus: join and meet as cross product
- Lecture 61 - Affine charts
- Lecture 62 - The matrix group of transformations of  $RP^2$
- Lecture 63 - The fundamental theorem of  $PGL(3,R)$
- Lecture 64 - Visualizing the action of  $PGL(3,R)$
- Lecture 65 - Proving the fundamental theorem of  $PGL(3,R)$
- Lecture 66 - Conclusion to Geometry of Vision

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Algebraic Combinatorics

Subject Co-ordinator - Prof. Amritanshu Prasad, Prof. Sankaran Viswanath

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Examples of Mobius Inversion
- Lecture 2 - Partially Ordered Sets
- Lecture 3 - Hasse Diagrams
- Lecture 4 - Isomorphisms of Posets
- Lecture 5 - Maximal, Minimal, Greatest, Least
- Lecture 6 - Induced Subposets
- Lecture 7 - Incidence Algebras
- Lecture 8 - Inversion in Incidence Algebras
- Lecture 9 - Mobius Inversion
- Lecture 10 - Examples of Mobius Functions
- Lecture 11 - Product Posets and their Mobius Functions
- Lecture 12 - Opposite of a Poset
- Lecture 13 - The Poset of Set Partitions
- Lecture 14 - Connected Structures
- Lecture 15 - Lattices
- Lecture 16 - Weisner's Theorem
- Lecture 17 - The Lattice of Non-Crossing Partitions
- Lecture 18 - The Canonical Product Decomposition for Intervals of Non-Crossing Partitions
- Lecture 19 - The Mobius Function for Non-Crossing Partitions
- Lecture 20 - Ideals in a Poset
- Lecture 21 - Mobius Function of  $J(P)$
- Lecture 22 - Young's Lattice
- Lecture 23 - Distributive Lattices
- Lecture 24 - Formal Power Series
- Lecture 25 - The Necklace Problem
- Lecture 26 - Combinatorial Classes
- Lecture 27 - Sums, Products, and Sequences of Combinatorial Classes
- Lecture 28 - Power Set, Multisets, and Sequences
- Lecture 29 - A Little Dendrology

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Super Catalan/Little Schroeder numbers
- Lecture 31 - Regular Languages
- Lecture 32 - Finite Automata
- Lecture 33 - The Pumping Lemma
- Lecture 34 - The Dyck Language
- Lecture 35 - Permutations and their cycles
- Lecture 36 - Permutation Groups
- Lecture 37 - Orbits, fixed points, stabilizers
- Lecture 38 - The orbit counting theorem
- Lecture 39 - The Polya Enumeration Theorem
- Lecture 40 - The Cycle Index Polynomials
- Lecture 41 - Cycle Index of the Octahedral Group
- Lecture 42 - Cycle Index of the Full Permutation Group
- Lecture 43 - Combinatorial Species
- Lecture 44 - Generating Series of a Species
- Lecture 45 - Cycle Index Series of a Species
- Lecture 46 - Isomorphism of Species
- Lecture 47 - Visualization of Species
- Lecture 48 - Sum of Species
- Lecture 49 - Product of Species
- Lecture 50 - Sums and Products: More Examples
- Lecture 51 - Substitution of Species
- Lecture 52 - Derivative of a Species
- Lecture 53 - Powers and Sequences of Binomial Type
- Lecture 54 - Pointing and Cayley's Theorem
- Lecture 55 - R-enriched Trees
- Lecture 56 - R-enriched Endofunctions
- Lecture 57 - Lagrange Inversion Formula
- Lecture 58 - Motivation for the LGV Lemma
- Lecture 59 - Statement of the LGV Lemma
- Lecture 60 - Nice Applications of the LGV Lemma
- Lecture 61 - Sign-Reversing Involutions
- Lecture 62 - Proof of the LGV Lemma
- Lecture 63 - The Cauchy-Binet Formula
- Lecture 64 - Symmetric polynomials: definition and examples
- Lecture 65 - Monomial symmetric polynomials
- Lecture 66 - Elementary and Complete symmetric polynomials - Part 1
- Lecture 67 - Elementary and Complete symmetric polynomials - Part 2
- Lecture 68 - Alternating polynomials

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Labelled abaci and alternants
- Lecture 70 - Schur polynomials
- Lecture 71 - Pieri Rule - Statement and Examples
- Lecture 72 - Pieri Rule - Proof
- Lecture 73 - The second Pieri rule
- Lecture 74 - Semi-standard tableaux
- Lecture 75 - Triangularity of Kostka matrix
- Lecture 76 - Monomial expansion of Schur
- Lecture 77 - The RSK correspondence
- Lecture 78 - Jacobi Trudi identities via LGV lemma
- Lecture 79 - Formal ring of symmetric functions in infinitely many variables
- Lecture 80 - Monomial expansions and RSK
- Lecture 81 - Generating functions for  $e$ ,  $h$
- Lecture 82 - The power sum symmetric functions
- Lecture 83 - The inner product and Cauchy identity
- Lecture 84 - Skew Schur functions and the LR rule

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:An Invitation to Topology

Subject Co-ordinator - Prof. Indrava Roy

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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  $\mathbb{R}$

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Some conditions for Connectedness
- Lecture 31 - Connectedness of the Real Line
- Lecture 32 - Connectedness of a Linear Continuum
- Lecture 33 - The Intermediate Value Theorem
- Lecture 34 - Path-connectedness
- Lecture 35 - Connectedness does not imply Path-connectedness - Part 1
- Lecture 36 - Connectedness does not imply Path-connectedness - Part 2
- Lecture 37 - Connected and Path-connected Components
- Lecture 38 - Local connectedness and Local Path-connectedness
- Lecture 39 - Compactness
- Lecture 40 - Properties of compact spaces
- Lecture 41 - The Heine-Borel Theorem
- Lecture 42 - Tychonoff's theorem
- Lecture 43 - Proof of Tychonoff's theorem - Part 1
- Lecture 44 - Proof of Tychonoff's theorem - Part 2
- Lecture 45 - Compactness in metric spaces
- Lecture 46 - Lebesgue Number Lemma and the Uniform Continuity theorem
- Lecture 47 - Different Kinds of Compactness
- Lecture 48 - Equivalence of various compactness properties for Metric Spaces
- Lecture 49 - Compactness and Sequential Compactness in arbitrary topological spaces
- Lecture 50 - Baire Spaces
- Lecture 51 - Properties and Examples of Baire Spaces
- Lecture 52 - The Baire Category Theorem
- Lecture 53 - Complete Metric Spaces and the Baire Category theorem - Part 1
- Lecture 54 - Complete Metric Spaces and the Baire Category theorem - Part 2
- Lecture 55 - Application of the Baire Category theorem
- Lecture 56 - Regular and Normal spaces
- Lecture 57 - Properties and examples of regular and normal spaces
- Lecture 58 - Urysohn's Lemma
- Lecture 59 - Proof of Urysohn's Lemma
- Lecture 60 - Tietze Extension theorem - Part 1
- Lecture 61 - Tietze Extension theorem - Part 2
- Lecture 62 - Compactness and Completeness in Metric spaces
- Lecture 63 - The space of continuous functions - Part 1
- Lecture 64 - The space of continuous functions - Part 2
- Lecture 65 - Equicontinuity
- Lecture 66 - Total boundedness and Equicontinuity - Part 1
- Lecture 67 - Total boundedness and Equicontinuity - Part 2
- Lecture 68 - Topology of compact convergence - Part 1

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 69 - Topology of compact convergence - Part 2
- Lecture 70 - Equicontinuity revisited - Part 1
- Lecture 71 - Equicontinuity revisited - Part 2
- Lecture 72 - Locally compact Hausdorff spaces
- Lecture 73 - The Arzelà - Ascoli theorem

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Operator Theory

Subject Co-ordinator - Prof. G. Ramesh

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Semi Inner product spaces  
Lecture 2 - Inner Product Spaces  
Lecture 3 - Parallelogram law  
Lecture 4 - Hilbert Spaces  
Lecture 5 - Orthogonality  
Lecture 6 - Projection Theorem  
Lecture 7 - Linear Operator  
Lecture 8 - Bounded Operators  
Lecture 9 - Norm of a linear operator  
Lecture 10 - Examples of bounded operators  
Lecture 11 - The Adjoint Operator  
Lecture 12 - The Adjoint: Properties  
Lecture 13 - Closed range operators - 1  
Lecture 14 - Closed range operators - 2  
Lecture 15 - Self-adjoint Operators  
Lecture 16 - Normal operators  
Lecture 17 - Isometris and Unitaries  
Lecture 18 - Isometris and Unitaries  
Lecture 19 - Mutually Orthogonal Projections  
Lecture 20 - Invariant Subspaces  
Lecture 21 - Monotone Convergence Theorem  
Lecture 22 - Square root  
Lecture 23 - Polar decomposition  
Lecture 24 - Invertibility  
Lecture 25 - Spectrum  
Lecture 26 - Spectral Mapping Theorem  
Lecture 27 - The spectral radius formula  
Lecture 28 - multiplicative linear functionals  
Lecture 29 - The GKZ-theorem

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Maximal Ideal Space
- Lecture 31 - Commutative  $C^*$ -algebras
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Measure and Integration

Subject Co-ordinator - Prof. S. Kesavan

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Preamble  
Lecture 2 - Algebras of sets  
Lecture 3 - Measures on rings  
Lecture 4 - Outer-measure  
Lecture 5 - Measurable sets  
Lecture 6 - Caratheodory's method  
Lecture 7 - Exercises  
Lecture 8 - Exercises  
Lecture 9 - Lebesgue measure: the ring  
Lecture 10 - Construction of the Lebesgue measure  
Lecture 11 - Errata  
Lecture 12 - The Cantor set  
Lecture 13 - Approximation  
Lecture 14 - Approximation  
Lecture 15 - Approximation  
Lecture 16 - Translation Invariance  
Lecture 17 - Non-measurable sets  
Lecture 18 - Exercises  
Lecture 19 - Measurable functions  
Lecture 20 - Measurable functions  
Lecture 21 - The Cantor function  
Lecture 22 - Exercises  
Lecture 23 - Egorov's theorem  
Lecture 24 - Convergence in measure  
Lecture 25 - Convergence in measure  
Lecture 26 - Convergence in measure  
Lecture 27 - Exercises  
Lecture 28 - Integration: Simple functions  
Lecture 29 - Non-negative functions

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- Lecture 30 - Monotone convergence theorem
- Lecture 31 - Examples
- Lecture 32 - Fatou's lemma
- Lecture 33 - Integrable functions
- Lecture 34 - Dominated convergence theorem
- Lecture 35 - Dominated convergence theorem: Applications
- Lecture 36 - Absolute continuity
- Lecture 37 - Integration on the real line
- Lecture 38 - Examples
- Lecture 39 - Weierstrass' theorem
- Lecture 40 - Exercises
- Lecture 41 - Exercises
- Lecture 42 - Vitali covering lemma
- Lecture 43 - Monotonic functions
- Lecture 44 - Functions of bounded variation
- Lecture 45 - Functions of bounded variation
- Lecture 46 - Functions of bounded variation
- Lecture 47 - Differentiation of an indefinite integral
- Lecture 48 - Absolute continuity
- Lecture 49 - Exercises
- Lecture 50 - Product spaces
- Lecture 51 - Product spaces: measurable functions
- Lecture 52 - Product measure
- Lecture 53 - Fubini's theorem
- Lecture 54 - Examples
- Lecture 55 - Examples
- Lecture 56 - Integration of radial functions
- Lecture 57 - Measure of the unit ball in N dimensions
- Lecture 58 - Exercises
- Lecture 59 - Signed measures
- Lecture 60 - Hahn and Jordan decompositions
- Lecture 61 - Upper, lower and total variations of a signed measure; Absolute continuity
- Lecture 62 - Absolute continuity
- Lecture 63 - Radon-Nikodym theorem
- Lecture 64 - Radon-Nikodym theorem
- Lecture 65 - Exercises
- Lecture 66 - Lebesgue spaces
- Lecture 67 - Examples. Inclusion questions
- Lecture 68 - Convergence in  $L^p$

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- Lecture 69 - Approximation
- Lecture 70 - Applications
- Lecture 71 - Duality
- Lecture 72 - Duality
- Lecture 73 - Convolutions
- Lecture 74 - Convolutions
- Lecture 75 - Convolutions
- Lecture 76 - Exercises
- Lecture 77 - Exercises
- Lecture 78 - Change of variable
- Lecture 79 - Change of variable

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Approximate Reasoning using Fuzzy Set Theory

Subject Co-ordinator - Prof. Balasubramaniam Jayaram

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Flow of the Course: A not-so-sneak peek
- Lecture 2 - Fuzzy Sets - The Necessity
- Lecture 3 - Fuzzy Sets - Representations
- Lecture 4 - Fuzziness vs Probability
- Lecture 5 - Fuzzy Sets - Some Important Notions
- Lecture 6 - Operations on Fuzzy Sets
- Lecture 7 - Posets on Fuzzy Sets
- Lecture 8 - Lattice of Fuzzy Sets
- Lecture 9 - Boolean Algebra of Sets
- Lecture 10 - Algebras on Fuzzy Sets
- Lecture 11 - Triangular Norms
- Lecture 12 - Triangular Norms: Analytical Aspects
- Lecture 13 - Triangular Norms: Algebraic Aspects
- Lecture 14 - T-Norms: Construction and Representations
- Lecture 15 - T-Norms:Complementation and Duality
- Lecture 16 - Fuzzy Implications
- Lecture 17 - Fuzzy Implications - Desirable Properties
- Lecture 18 - Construction of Fuzzy Implication - I
- Lecture 19 - Construction of Fuzzy Implication - II
- Lecture 20 - Construction of Fuzzy Implication - II
- Lecture 21 - Construction of Fuzzy Implication - III
- Lecture 22 - Construction of Fuzzy Implication - IV
- Lecture 23 - (N, T, I)- An Organic Relationship
- Lecture 24 - Fuzzy Relations
- Lecture 25 - Composition of Fuzzy Relations
- Lecture 26 - Similarity and Compatibility Classes
- Lecture 27 - On the Transitivity of Fuzzy Relations - I
- Lecture 28 - On the Transitivity of Fuzzy Relations - II
- Lecture 29 - Fuzzy Propositions: Some Interpretations

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- Lecture 30 - Fuzzy If-Then Rules
- Lecture 31 - Fuzzy Relational Inference
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Probability-II with Examples Using R

Subject Co-ordinator - Prof. Siva Athreya

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Continuous Random Variables - Part 1  
Lecture 2 - Continuous Random Variables - Part 2  
Lecture 3 - R Set Up  
Lecture 4 - Exponential and Normal Random Variable  
Lecture 5 - Normal Random Variable  
Lecture 6 - Distribution Function  
Lecture 7 - Normal Distribution  
Lecture 8 - Problem Solving for Week 12 - Part 2  
Lecture 9 - Joint Distribution of Continuous Random Variables  
Lecture 10 - Marginal Density and Independence  
Lecture 11 - Uniform Distribution in  $R^2$   
Lecture 12 - Problem Solving  
Lecture 13 - Bivariate Normal - Part 1  
Lecture 14 - Problem Solving 1 - Calculating Probabilities  
Lecture 15 - Problem Solving 2 - Quadratic Equation, Random Coefficients  
Lecture 16 - Conditional Density  
Lecture 17 - Sums of Independent Random Variables  
Lecture 18 - Quotient of Independent Random Variables  
Lecture 19 - Simulating Bivariate Normal Random Variables  
Lecture 20 - Problem Solving Conditional Density  
Lecture 21 - Expectation and Variance of Continuous Random Variables  
Lecture 22 - Revisit of Variance and Expectation  
Lecture 23 - Revisit of Properties of Variance  
Lecture 24 - Covariance and Correlation  
Lecture 25 - Conditional Expectation and Conditional Variance  
Lecture 26 - Analysis of Variance Formula  
Lecture 27 - Problem Solving Expectations  
Lecture 28 - Moment Generating Function  
Lecture 29 - Moments and Moment Generating Function

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- Lecture 30 - Bivariate Normal - Part 2
- Lecture 31 - Problem Solving Conditional Expectation and Conditional Variance
- Lecture 32 - Sampling Distribution and Sample Mean
- Lecture 33 - Weak Law of Large Numbers
- Lecture 34 - Revisit Weak Law of Large Numbers
- Lecture 35 - Problem Solving
- Lecture 36 - Demoivre-Laplace Central Limit Theorem and Normal Random Variables
- Lecture 37 - Revisit Normal Random Variables
- Lecture 38 - Normal Tables, Mean and Variance
- Lecture 39 - Problem Solving
- Lecture 40 - Bivariate Normal Random Variables\_Characterisation
- Lecture 41 - Bivariate Normal Random Variables\_Independence
- Lecture 42 - Problem Solving
- Lecture 43 - Bivariate Normal Random Variables Joint Density Calculation - Part 1
- Lecture 44 - Bivariate Normal Random Variables Joint Density Calculation - Part 2
- Lecture 45 - Problem Solving - Review of Transformation of Random Variables

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Predictive Analytics - Regression and Classification

Subject Co-ordinator - Prof. Sourish Das

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction  
Lecture 2 - Least Squares method  
Lecture 3 - Hands-on with Python - Part 1  
Lecture 4 - Hands-on with R - Part 1  
Lecture 5 - Categorical Variable as Predictor - Part 1  
Lecture 6 - Categorical Variable as Predictor - Part 2  
Lecture 7 - Hands-on with R - Part 2  
Lecture 8 - Understanding the joint probability from data perspective  
Lecture 9 - Hands-on with R - Part 3  
Lecture 10 - Regression Line as Conditional Expectation  
Lecture 11 - Normal Equations  
Lecture 12 - Gauss Markov Theorem  
Lecture 13 - Hands-on with Python - Part 2  
Lecture 14 - Geometry of Regression Model and Feature Engineering  
Lecture 15 - Sampling Distribution and Statistical Inference of Regression Coefficient  
Lecture 16 - Hands-on with R - Part 4  
Lecture 17 - Checking Model Assumptions  
Lecture 18 - Comparing Models with Predictive Accuracy  
Lecture 19 - Hands-on with Julia  
Lecture 20 - Model Complexity, Bias and Variance Tradeoff  
Lecture 21 - Feature Selection, Variable Selection  
Lecture 22 - Hands on with R - Part 5  
Lecture 23 - Understanding Multicollinearity  
Lecture 24 - Ill-Posed Problem and Regularisation, LASSO and Ridge  
Lecture 25 - Hands-on with Python - Part 3  
Lecture 26 - Time Series Forecasting with Regression Model  
Lecture 27 - Hands on with R - Part 6  
Lecture 28 - Granger Causal model  
Lecture 29 - Hands on with R - Part 7

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- Lecture 30 - Capital Asset Pricing Model
- Lecture 31 - Hands on with R for CAPM
- Lecture 32 - Bootstrap Regression
- Lecture 33 - Hands on with R for Bootstrap Regression
- Lecture 34 - Hands on with Python: Handle multicollinearity with Ridge correction
- Lecture 35 - Hands on with Julia: Implemente Chennai Temperature Analysis with Julia and CRRao
- Lecture 36 - Introduction to logistic Regression
- Lecture 37 - Maximum Likelihood Estimate for Logistic Regression
- Lecture 38 - Hands on with R for Logistic Regression
- Lecture 39 - Hands on with R: Measure Time performance of R code
- Lecture 40 - Statistical Inference of Logistic Regression
- Lecture 41 - Hands on with R with Iris Dataset
- Lecture 42 - Multi-Class Classification with Discriminant Analysis
- Lecture 43 - Hands on with R: Implement LDA
- Lecture 44 - Effect of Feature Engineer in Logistic Regression
- Lecture 45 - Logistic Regression to Deep Learning Neural Network
- Lecture 46 - Hands on with R: Feature Engineer in Logistic Regression
- Lecture 47 - Generalised Linear Model
- Lecture 48 - Hands on with R: Poisson Regression with Football Data
- Lecture 49 - Gaussian Process Regression
- Lecture 50 - Hands on with R: Implement GP Regression from scratch
- Lecture 51 - Tree Structured Regression
- Lecture 52 - Hands on with R: Implement Tree Regression and Random Forest with Simulated Data
- Lecture 53 - Hands on with R: Implement Tree Regression and Random Forest with EPL football Data
- Lecture 54 - Hands on with Python : Analysis of Bangalore House Price Data
- Lecture 55 - Hands on with R: Prediction of Bangalore House Price
- Lecture 56 - Hands on with R: More Prediction of Bangalore House Price
- Lecture 57 - Hands on with R: Some Correction with Bangalore House Price Data Prediction
- Lecture 58 - Hands on with R: Classify fake bank note with GLM
- Lecture 59 - Hands on with R: Dynamic Pricing with Cheese Data
- Lecture 60 - Hands on with Julia - Bayesian Logistic Regression with Horse Shoe Prior - Genetic Data Analysis
- Lecture 61 - Hands on with Julia - Bayesian Poisson Regression with Horse Shoe Prior English Premier League D
- Lecture 62 - Why Julia is Future for Data Science Projects ?
- Lecture 63 - Concluding Remarks
- Lecture 64 - Course Review

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Algebraic Geometry

Subject Co-ordinator - Prof. Arijit Dey

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Commutative Algebra - Part 1  
Lecture 2 - Commutative Algebra - Part 2  
Lecture 3 - Commutative Algebra - Part 3  
Lecture 4 - Commutative Algebra - Part 4  
Lecture 5 - Commutative Algebra - Part 5  
Lecture 6 - Tutorial 1 : Cayley-Hamilton Theorem, Nakayama's Lemma  
Lecture 7 - Commutative Algebra - Part 6  
Lecture 8 - Commutative Algebra - Part 7  
Lecture 9 - Commutative Algebra - Part 8  
Lecture 10 - Affine Algebraic Sets - Part 1  
Lecture 11 - Affine Algebraic Sets - Part 2  
Lecture 12 - Tutorial 2 : Noether Normalization Lemma, Some Important Results in Dimension Theory  
Lecture 13 - Regular Morphisms  
Lecture 14 - Abstract Algebraic Sets  
Lecture 15 - Zariski Topology on Affine Space  
Lecture 16 - Irreducible Affine Algebraic Sets  
Lecture 17 - Ring of Regular Functions  
Lecture 18 - Projective Space  
Lecture 19 - Tutorial 3 : Some Applications of Dimension Theory  
Lecture 20 - Zariski Topology on Projective Space  
Lecture 21 - Affine Open Cover of Projective Space  
Lecture 22 - Projective and Quasi-Projective Varieties  
Lecture 23 - Regular Functions on Quasi-Projective Varieties  
Lecture 24 - Presheaves and Sheaves  
Lecture 25 - Morphism of Presheaves/Sheaves  
Lecture 26 - Tutorial 4 : More Applications of Dimension Theory  
Lecture 27 - A Brief Overview of Sheaf Theory - Part 1  
Lecture 28 - A Brief Overview of Sheaf Theory - Part 2  
Lecture 29 - A Brief Overview of Sheaf Theory - Part 3

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- Lecture 30 - Prevarieties
- Lecture 31 - Sheaf of Regular Functions
- 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 Affine Variety
- 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 Projective Varieties are Constants - Part 1
- Lecture 44 - Global Regular Functions on Projective Varieties 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...)
- Lecture 65 - Smooth Morphisms
- Lecture 66 - Bertini's Theorem
- Lecture 67 - Sard's Theorem
- Lecture 68 - Tutorial 11 : Dimension of fiber of a morphism

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- Lecture 69 - Introduction to Affine Schemes - Spectrum of a Ring
- Lecture 70 - Introduction to Affine Schemes - Topology on Spec A
- Lecture 71 - Introduction to Affine Schemes - Topology on Spec A (Continued...)
- Lecture 72 - Introduction to Affine Schemes - Sheaf Structure on Spec A
- Lecture 73 - Abstract Non-singular Curves - Part 1
- Lecture 74 - Abstract Non-singular Curves - Part 2
- Lecture 75 - Tutorial 12 : Extension of Regular Functions

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Statistics

Subject Co-ordinator - Prof. Sameen Naqvi

Co-ordinating Institute - IIT - Hyderabad

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Types of variables  
Lecture 2 - Types of studies  
Lecture 3 - Types of sampling strategies  
Lecture 4 - Python - Session 1  
Lecture 5 - Python - Session 2  
Lecture 6 - Summary measures of categorical and numerical variables  
Lecture 7 - Measures of Dispersion  
Lecture 8 - Measures of Skewness  
Lecture 9 - Python - Session 3  
Lecture 10 - Python - Session 4  
Lecture 11 - Visualizing categorical and numerical data  
Lecture 12 - Visualizing numerical data  
Lecture 13 - Python - Session 5  
Lecture 14 - Python - Session 6  
Lecture 15 - Python - Session 7  
Lecture 16 - Sampling distribution of sample mean  
Lecture 17 - Central Limit Theorem  
Lecture 18 - Sampling distribution of sample variance and proportion  
Lecture 19 - Python - Session 8  
Lecture 20 - Python - Session 9  
Lecture 21 - Sampling distribution of difference of sample means - Part 1  
Lecture 22 - Sampling distribution of difference of sample means - Part 2  
Lecture 23 - Sampling distribution of ratio of sample variances and difference of sample proportions  
Lecture 24 - Python - Session 10  
Lecture 25 - Python - Session 11  
Lecture 26 - Point estimation - Part 1  
Lecture 27 - Point estimation - Part 2  
Lecture 28 - Point estimation - Part 3  
Lecture 29 - Python - Session 12

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- Lecture 30 - Python - Session 13
- Lecture 31 - Unbiased estimation
- Lecture 32 - EM algorithm - Part 1
- Lecture 33 - EM algorithm - Part 2
- Lecture 34 - Python - Session 14
- Lecture 35 - Python - Session 15
- Lecture 36 - Hypothesis Testing - Part 1
- Lecture 37 - Hypothesis Testing - Part 2
- Lecture 38 - Hypothesis Testing - Part 3
- Lecture 39 - Python - Session 16
- Lecture 40 - Python - Session 17
- Lecture 41 - Hypothesis Testing for two sample problem - Part 1
- Lecture 42 - Hypothesis Testing for two sample problem - Part 2
- Lecture 43 - Hypothesis Testing for two sample problem - Part 3
- Lecture 44 - Python - Session 18
- Lecture 45 - Python - Session 19
- Lecture 46 - Bootstrap Hypothesis Testing - Part 1
- Lecture 47 - Python - Session 20
- Lecture 48 - Python - Session 21
- Lecture 49 - Bootstrap Hypothesis Testing - Part 2
- Lecture 50 - Python - Session 22
- Lecture 51 - Confidence Interval Estimation - Part 1
- Lecture 52 - Confidence Interval Estimation - Part 2
- Lecture 53 - Confidence Interval Estimation - Part 3
- Lecture 54 - Python - Session 23
- Lecture 55 - Python - Session 24
- Lecture 56 - Confidence interval for two sample problem
- Lecture 57 - Python - Session 25
- Lecture 58 - Bootstrap Confidence Interval
- Lecture 59 - Python - Session 26
- Lecture 60 - Python - Session 27

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Probability Theory for Data Science

Subject Co-ordinator - Prof. Ishapathik Das

Co-ordinating Institute - IIT - Thirupathi

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction
- Lecture 2 - Sample Space and Events
- Lecture 3 - Special Events and Various Approaches to Defining Probability
- Lecture 4 - Important Theorems
- Lecture 5 - Numerical Examples and Introduction to Conditional Probability
- Lecture 6 - Definition of Conditional Probability and Independence
- Lecture 7 - Bayes' Theorem
- Lecture 8 - Random Variable
- Lecture 9 - Events Defined by a Random Variable
- Lecture 10 - Cumulative Distribution Function
- Lecture 11 - Properties of the Cumulative Distribution Function and Discrete Random Variable
- Lecture 12 - Probability Mass Function
- Lecture 13 - Continuous Random Variable and Probability Density Function
- Lecture 14 - Numerical Examples
- Lecture 15 - Moments
- Lecture 16 - Higher Order Moments and Variance of a Random Variable
- Lecture 17 - Numerical Examples of Moments and Bernoulli Distribution
- Lecture 18 - Binomial Distribution
- Lecture 19 - Applications of Binomial Distribution
- Lecture 20 - Poisson Distribution
- Lecture 21 - Applications of Poisson Distribution
- Lecture 22 - Numerical Examples of Poisson Distribution and Uniform Distribution
- Lecture 23 - Application of Uniform Distribution and Exponential Distribution
- Lecture 24 - Applications of Exponential Distribution
- Lecture 25 - Memoryless Property and Gamma Distribution
- Lecture 26 - Example of Gamma Distribution and Normal Distribution
- Lecture 27 - Properties of Normal Distributions
- Lecture 28 - Numerical Examples of Normal Distributions
- Lecture 29 - Applications of Normal Distributions and Conditional Distribution Function

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Examples of Conditional Distribution Function and Bivariate Random Variable
- Lecture 31 - Example of Bivariate Random Variable
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Discrete Mathematics

Subject Co-ordinator - Dr. Aditi Gangopadhyay, Dr. Sugata Gangopadhyay, Dr. Tanuja Srivastava

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to the theory of sets
- Lecture 2 - Set operation and laws of set operation
- Lecture 3 - The principle of inclusion and exclusion
- Lecture 4 - Application of the principle of inclusion and exclusion
- Lecture 5 - Fundamentals of logic
- Lecture 6 - Logical Inferences
- Lecture 7 - Methods of proof of an implication
- Lecture 8 - First order logic (1)
- Lecture 9 - First order logic (2)
- Lecture 10 - Rules of inference for quantified propositions
- Lecture 11 - Mathematical Induction (1)
- Lecture 12 - Mathematical Induction (2)
- Lecture 13 - Sample space, events
- Lecture 14 - Probability, conditional probability
- Lecture 15 - Independent events, Bayes theorem
- Lecture 16 - Information and mutual information
- Lecture 17 - Basic definition
- Lecture 18 - Isomorphism and sub graphs
- Lecture 19 - Walks, paths and circuits operations on graphs
- Lecture 20 - Euler graphs, Hamiltonian circuits
- Lecture 21 - Shortest path problem
- Lecture 22 - Planar graphs
- Lecture 23 - Basic definition
- Lecture 24 - Properties of relations
- Lecture 25 - Graph of relations
- Lecture 26 - Matrix of relation
- Lecture 27 - Closure of relation (1)
- Lecture 28 - Closure of relation (2)
- Lecture 29 - Warshall's algorithm

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Partially ordered relation
- Lecture 31 - Partially ordered sets
- Lecture 32 - Lattices
- Lecture 33 - Boolean algebra
- Lecture 34 - Boolean function (1)
- Lecture 35 - Boolean function (2)
- Lecture 36 - Discrete numeric function
- Lecture 37 - Generating function
- Lecture 38 - Introduction to recurrence relations
- Lecture 39 - Second order recurrence relation with constant coefficients (1)
- Lecture 40 - Second order recurrence relation with constant coefficients (2)
- Lecture 41 - Application of recurrence relation

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Methods and its Applications

Subject Co-ordinator - Prof. P.N. Agarwal, S. K. Gupta

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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
- Lecture 7 - Methods for finding Particular Integral for second-order linear differential equations with constant coefficients
- Lecture 8 - Methods for finding Particular Integral for second-order linear differential equations with constant coefficients
- 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 Lagrange's equation - I
- Lecture 18 - Solution of Lagrange'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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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 - Z<sup>-1</sup> 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 - Parseval'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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC: Integral Equations, Calculus of Variations and its Applications

Subject Co-ordinator - Prof.D. N Pandey, Prof. P.N. Agarwal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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
- Lecture 7 - Fredholm integral equation with separable kernel
- 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
- Lecture 11 - Fredholm integral equations with symmetric kernels
- Lecture 12 - Fredholm integral equations with symmetric kernels
- Lecture 13 - Fredholm integral equations with symmetric kernels
- 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
- Lecture 22 - Classical Fredholm theory
- Lecture 23 - Classical Fredholm theory
- 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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
- Lecture 40 - Calculus of variations
- Lecture 41 - Calculus of variations
- Lecture 42 - Calculus of variations
- Lecture 43 - Euler equation
- Lecture 44 - Euler equation
- 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

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Nonlinear Programming

Subject Co-ordinator - S. K. Gupta

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Convex Sets and Functions

Lecture 2 - Properties of Convex Functions - I

Lecture 3 - Properties of Convex Functions - II

Lecture 4 - Properties of Convex Functions- III

Lecture 5 - Convex Programming Problems

Lecture 6 - KKT optimality conditions

Lecture 7 - Quadratic Programming Problems - I

Lecture 8 - Quadratic Programming Problems - II

Lecture 9 - Separable Programming - I

Lecture 10 - Separable Programming - II

Lecture 11 - Geometric Programming - I

Lecture 12 - Geometric Programming - II

Lecture 13 - Geometric Programming - III

Lecture 14 - Dynamic Programming - I

Lecture 15 - Dynamic Programming - II

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

Lecture 17 - Dynamic Programming - IV

Lecture 18 - Search Techniques - I

Lecture 19 - Search Techniques - II

Lecture 20 - Search Techniques - III

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Numerical Methods

Subject Co-ordinator - Prof. Sanjeev Kumar, Prof. Ameeya Kumar Nayak

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to error analysis and linear systems
- Lecture 2 - Gaussian elimination with Partial pivoting
- Lecture 3 - LU decomposition
- Lecture 4 - Jacobi and Gauss Seidel methods
- Lecture 5 - Iterative methods-II
- Lecture 6 - Introduction to Non-linear equations and Bisection method
- Lecture 7 - Regula Falsi and Secant methods
- Lecture 8 - Newton-Raphson method
- Lecture 9 - Fixed point iteration method
- Lecture 10 - System of Nonlinear equations
- Lecture 11 - Introduction to Eigenvalues and Eigenvectors
- Lecture 12 - Similarity Transformations and Gershgorin Theorem
- Lecture 13 - Jacobi's Method for Computing Eigenvalues
- Lecture 14 - Power Method
- Lecture 15 - Inverse Power Method
- Lecture 16 - Interpolation - Part I (Introduction to Interpolation)
- Lecture 17 - Interpolation - Part II (Some basic operators and their properties)
- Lecture 18 - Interpolation - Part III (Newton's Forward/ Backward difference and derivation of general error formula)
- Lecture 19 - Interpolation - Part IV (Error in approximating a function by a polynomial using Newton's Forward/ Backward difference formula)
- Lecture 20 - Interpolation - Part V (Solving problems using Newton's Forward and Backward difference formula)
- Lecture 21 - Interpolation - Part VI (Central difference formula)
- Lecture 22 - Interpolation - Part VII (Lagrange interpolation formula with examples)
- Lecture 23 - Interpolation - Part VIII (Divided difference interpolation with examples)
- Lecture 24 - Interpolation - Part IX (Hermite's interpolation with examples)
- Lecture 25 - Numerical differentiation - Part I (Introduction to numerical differentiation by interpolation formula)
- Lecture 26 - Numerical differentiation - Part II (Numerical differentiation based on Lagrange's interpolation formula)
- Lecture 27 - Numerical differentiation - Part III (Numerical differentiation based on Divided difference formula)
- Lecture 28 - Numerical differentiation - Part IV (Maxima and minima of a tabulated function and differentiation by finite difference operators)
- Lecture 29 - Numerical differentiation - Part V (Differentiation based on finite difference operators)

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Numerical differentiation - Part VI (Method of undetermined coefficients and Derivatives with un
- 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)
- 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 exam
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Numerical Linear Algebra

Subject Co-ordinator - Prof.D. N Pandey, Prof. P.N. Agrawal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Matrix Operations and Types of Matrices
- Lecture 2 - Determinant of a Matrix
- Lecture 3 - Rank of a Matrix
- Lecture 4 - Vector Space - I
- Lecture 5 - Vector Space - II
- Lecture 6 - Linear dependence and independence
- Lecture 7 - Bases and Dimension - I
- Lecture 8 - Bases and Dimension - II
- Lecture 9 - Linear Transformation - I
- Lecture 10 - Linear Transformation - II
- Lecture 11 - Orthogonal Subspaces
- Lecture 12 - Row Space, Column Space and Null Space
- Lecture 13 - Eigen Values and Eigen Vectors - I
- Lecture 14 - Eigen Values and Eigen Vectors - II
- Lecture 15 - Diagonalizable Matrices
- Lecture 16 - Orthogonal Sets
- Lecture 17 - Gram Schmidt orthogonalization and orthogonal bases
- Lecture 18 - Introduction to Matlab
- Lecture 19 - Sign Integer Representation
- Lecture 20 - Computer Representation of Numbers
- Lecture 21 - Floating Point Representation
- Lecture 22 - Round-off Error
- Lecture 23 - Error Propagation in Computer Arithmetic
- Lecture 24 - Addition and Multiplication of Floating Point Numbers
- Lecture 25 - Conditioning and Condition Numbers - I
- Lecture 26 - Conditioning and Condition Numbers - II
- Lecture 27 - Stability of Numerical Algorithms - I
- Lecture 28 - Stability of Numerical Algorithms - II
- Lecture 29 - Vector Norms - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Vector Norms - II
- Lecture 31 - Matrix Norms - I
- 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
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Numerical Methods - Finite Difference Approach

Subject Co-ordinator - Prof. Ameeya Kumar Nayak

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to Numerical solutions

Lecture 2 - Numerical Solution of ODE

Lecture 3 - Numerical solution of PDE

Lecture 4 - Finite difference approximation

Lecture 5 - Polynomial fitting and one-sided approximation

Lecture 6 - Solution of parabolic equation

Lecture 7 - Implicit and C-N scheme for solving 1D parabolic equation

Lecture 8 - Stability analysis of Explicit scheme for solving parabolic equation

Lecture 9 - Stability of Crank-Nicolson's scheme

Lecture 10 - Approximation of derivative boundary conditions

Lecture 11 - Solution of two-dimensional parabolic equation

Lecture 12 - Solution of 2D parabolic equation using ADI scheme

Lecture 13 - Solution of Elliptic Equation

Lecture 14 - Solution of Elliptic equation using SOR method

Lecture 15 - Solution of Elliptic equation using ADI scheme

Lecture 16 - Solution of Hyperbolic equation

Lecture 17 - Stability analysis for Hyperbolic equations

Lecture 18 - Characteristics of PDE

Lecture 19 - Lax-Wendroff's method

Lecture 20 - Wendroff's method

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Multivariable Calculus

Subject Co-ordinator - Dr. Sanjeev Kumar, S. K. Gupta

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Functions of several variables  
Lecture 2 - Limits for multivariable functions - I  
Lecture 3 - Limits for multivariable functions - II  
Lecture 4 - Continuity of multivariable functions  
Lecture 5 - Partial Derivatives - I  
Lecture 6 - Partial Derivatives - II  
Lecture 7 - Differentiability - I  
Lecture 8 - Differentiability - II  
Lecture 9 - Chain rule - I  
Lecture 10 - Chain rule - II  
Lecture 11 - Change of variables  
Lecture 12 - Euler's theorem for homogeneous functions  
Lecture 13 - Tangent planes and Normal lines  
Lecture 14 - Extreme values - I  
Lecture 15 - Extreme values - II  
Lecture 16 - Lagrange multipliers  
Lecture 17 - Taylor's theorem  
Lecture 18 - Error approximation  
Lecture 19 - Polar-curves  
Lecture 20 - Multiple Integrals  
Lecture 21 - Change Of Order Of Integration  
Lecture 22 - Change of Variables in Multiple Integral  
Lecture 23 - Introduction to Gamma Function  
Lecture 24 - Introduction to Beta Function  
Lecture 25 - Properties of Beta and Gamma Functions - I  
Lecture 26 - Properties of Beta and Gamma Functions - II  
Lecture 27 - Dirichlet's Integral  
Lecture 28 - Applications of Multiple Integrals  
Lecture 29 - Vector Differentiation

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Gradient of a Scalar Field and Directional Derivative
- Lecture 31 - Normal Vector and Potential field
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Ordinary and Partial Differential Equations and Applications

Subject Co-ordinator - Prof.D. N Pandey, Prof. P.N. Agrawal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction to differential equations - I
- Lecture 2 - Introduction to differential equations - II
- Lecture 3 - Existence and uniqueness of solutions of differential equations - I
- Lecture 4 - Existence and uniqueness of solutions of differential equations - II
- Lecture 5 - Existence and uniqueness of solutions of differential equations - III
- Lecture 6 - Existence and uniqueness of solutions of a system of differential equations
- Lecture 7 - Linear System
- Lecture 8 - Properties of Homogeneous Systems
- Lecture 9 - Solution of Homogeneous Linear System with Constant Coefficients - I
- Lecture 10 - Solution of Homogeneous Linear System with Constant Coefficients - II
- Lecture 11 - Solution of Homogeneous Linear System with Constant Coefficients - III
- Lecture 12 - Solution of Non-Homogeneous Linear System with Constant Coefficients
- Lecture 13 - Power Series
- Lecture 14 - Uniform Convergence of Power Series
- Lecture 15 - Power Series Solution of Second Order Homogeneous Equations
- Lecture 16 - Regular singular points - I
- Lecture 17 - Regular singular points - II
- Lecture 18 - Regular singular points - III
- Lecture 19 - Regular singular points - IV
- Lecture 20 - Regular singular points - V
- Lecture 21 - Critical points
- Lecture 22 - Stability of Linear Systems - I
- Lecture 23 - Stability of Linear Systems - II
- Lecture 24 - Stability of Linear Systems - III
- Lecture 25 - Critical Points and Paths of Non-linear Systems
- Lecture 26 - Boundary value problems for second order differential equations
- Lecture 27 - Self - adjoint Forms
- Lecture 28 - Sturm - Liouville problem and its properties
- Lecture 29 - Sturm - Liouville problem and its applications

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Green's function and its applications - I
- Lecture 31 - Green's function and its applications - II
- Lecture 32 - Origins and Classification of First Order PDE
- Lecture 33 - Initial Value Problem for Quasi-linear First Order Equations
- Lecture 34 - Existence and Uniqueness of Solutions
- Lecture 35 - Surfaces orthogonal to a given system of surfaces
- Lecture 36 - Nonlinear PDE of first order
- Lecture 37 - Cauchy method of characteristics - I
- Lecture 38 - Cauchy method of characteristics - II
- Lecture 39 - Compatible systems of first order equations
- Lecture 40 - Charpit's method - I
- Lecture 41 - Charpit's method - II
- Lecture 42 - Second Order PDE with Variable Coefficients
- Lecture 43 - Classification and Canonical Form of Second Order PDE - I
- Lecture 44 - Classification and Canonical Form of Second Order PDE - II
- Lecture 45 - Classification and Characteristic Curves of Second Order PDEs
- Lecture 46 - Review of Integral Transforms - I
- Lecture 47 - Review of Integral Transforms - II
- Lecture 48 - Review of Integral Transforms - II
- Lecture 49 - Review of Integral Transforms - III
- Lecture 50 - Laplace Equation - I
- Lecture 51 - Laplace Equation - II
- Lecture 52 - Laplace and Poisson Equations
- Lecture 53 - One dimensional wave equation and its solution - I
- Lecture 54 - One dimensional wave equation and its solution - II
- Lecture 55 - One dimensional wave equation and its solution - III
- Lecture 56 - Two dimensional wave equation and its solution - I
- Lecture 57 - Solution of non-homogeneous wave equation
- Lecture 58 - Solution of homogeneous diffusion equation - I
- Lecture 59 - Solution of homogeneous diffusion equation - II
- Lecture 60 - Duhamel's principle

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Matrix Analysis with Applications

Subject Co-ordinator - Dr. Sanjeev Kumar, S. K. Gupta

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Elementary row operations
- Lecture 2 - Echelon form of a matrix
- Lecture 3 - Rank of a matrix
- Lecture 4 - System of Linear Equations - I
- Lecture 5 - System of Linear Equations - II
- Lecture 6 - Introduction to Vector Spaces
- Lecture 7 - Subspaces
- Lecture 8 - Basis and Dimension
- Lecture 9 - Linear Transformations
- Lecture 10 - Rank and Nullity
- Lecture 11 - Inverse of a Linear Transformation
- Lecture 12 - Matrix Associated with a LT
- Lecture 13 - Eigenvalues and Eigenvectors
- Lecture 14 - Cayley-Hamilton Theorem and Minimal Polynomial
- Lecture 15 - Diagonalization
- Lecture 16 - Special Matrices
- Lecture 17 - More on Special Matrices and Gerschgorin Theorem
- Lecture 18 - Inner Product Spaces
- Lecture 19 - Vector and Matrix Norms
- Lecture 20 - Gram Schmidt Process
- Lecture 21 - Normal Matrices
- Lecture 22 - Positive Definite Matrices
- Lecture 23 - Positive Definite and Quadratic Forms
- Lecture 24 - Gram Matrix and Minimization of Quadratic Forms
- Lecture 25 - Generalized Eigenvectors and Jordan Canonical Form
- Lecture 26 - Evaluation of Matrix Functions
- Lecture 27 - Least Square Approximation
- Lecture 28 - Singular Value Decomposition
- Lecture 29 - Pseudo-Inverse and SVD

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Introduction to Ill-Conditioned Systems
- Lecture 31 - Regularization of Ill-Conditioned Systems
- Lecture 32 - Linear Systems
- Lecture 33 - Linear Systems
- Lecture 34 - Non-Stationary Iterative Methods
- Lecture 35 - Non-Stationary Iterative Methods
- Lecture 36 - Krylov Subspace Iterative Methods (Conjugate Gradient Method)
- Lecture 37 - Krylov Subspace Iterative Methods (CG and Pre-Conditioning)
- Lecture 38 - Introduction to Positive Matrices
- Lecture 39 - Positive Matrices, Positive Eigenpair, Perron Root and vector, Example
- Lecture 40 - Polar Decomposition

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Mathematical Modelling: Analysis and Applications

Subject Co-ordinator - Prof. Ameeya Kumar Nayak

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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

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# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Dynamical System and Control

Subject Co-ordinator - Prof.D. N Pandey, Dr. N. Sukavanam

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Formulation of Dynamical Systems - I  
Lecture 2 - Formulation of Dynamical Systems - II  
Lecture 3 - Existence and Uniqueness Theorem - I  
Lecture 4 - Existence and Uniqueness Theorem - II  
Lecture 5 - Linear Systems - I  
Lecture 6 - Linear Systems - II  
Lecture 7 - Solutions of Linear Systems - I  
Lecture 8 - Solutions of Linear Systems - II  
Lecture 9 - Solutions of Linear Systems - III  
Lecture 10 - Fundamental Matrix - I  
Lecture 11 - Fundamental Matrix - II  
Lecture 12 - Fundamental Matrix for Non-Autonomous systems  
Lecture 13 - Solutions of Non-Homogeneous Systems  
Lecture 14 - Stability of Systems  
Lecture 15 - Stability of Linear Autonomous Systems - I  
Lecture 16 - Stability of Linear Autonomous Systems - II  
Lecture 17 - Stability of Linear Autonomous Systems - III  
Lecture 18 - Stability of Weakly Non-Linear Systems - I  
Lecture 19 - Stability of Weakly Non-Linear Systems - II  
Lecture 20 - Stability of Non-Linear Systems using Linearization  
Lecture 21 - Properties of Phase Portrait  
Lecture 22 - Properties of Orbits  
Lecture 23 - Phase Portrait  
Lecture 24 - Phase Portrait of Linear Differential Equations - I  
Lecture 25 - Phase Portrait of Linear Differential Equations - II  
Lecture 26 - Phase Portrait of Linear Differential Equations - III  
Lecture 27 - Poincare Bendixson Theorem  
Lecture 28 - Limit Cycle  
Lecture 29 - Lyapunov Stability - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Lyapunov Stability - II
- Lecture 31 - Introduction to Control Systems - I
- Lecture 32 - Introduction to Control Systems - II
- Lecture 33 - Controllability of Autonomous Systems
- Lecture 34 - Controllability of Non-autonomous Systems
- Lecture 35 - Observability - I
- Lecture 36 - Observability - II
- Lecture 37 - Results on Controllability and Observability
- Lecture 38 - Companion Form
- Lecture 39 - Feedback Control - I
- Lecture 40 - Feedback Control - II
- Lecture 41 - Feedback Control - III
- Lecture 42 - Feedback Control - IV
- Lecture 43 - State Observer
- Lecture 44 - Stabilizability
- Lecture 45 - Introduction to Discrete Systems - I
- Lecture 46 - Introduction to Discrete Systems - II
- Lecture 47 - Lyapunov Stability Theory - I
- Lecture 48 - Lyapunov Stability Theory - II
- Lecture 49 - Lyapunov Stability Theory - III
- Lecture 50 - Optimal Control - I
- Lecture 51 - Optimal Control - II
- Lecture 52 - Optimal Control - III
- Lecture 53 - Optimal Control - IV
- Lecture 54 - Optimal Control for Discrete Systems - I
- Lecture 55 - Optimal Control for Discrete Systems - II
- Lecture 56 - Controllability of Discrete Systems
- Lecture 57 - Observability of Discrete Systems
- Lecture 58 - Stability for Discrete Systems
- Lecture 59 - Relation between Continuous and Discrete Systems - I
- Lecture 60 - Relation between Continuous and Discrete Systems - II

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Engineering Mathematics

Subject Co-ordinator - Prof. P.N. Agarwal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Analytic Function

Lecture 2 - Cauchy-Riemann Equations

Lecture 3 - Harmonic Functions, Harmonic Conjugates and Milne's Method

Lecture 4 - Applications to the Problems of Potential Flow - I

Lecture 5 - Applications to the Problems of Potential Flow - II

Lecture 6 - Complex Integration

Lecture 7 - Cauchy's Theorem - I

Lecture 8 - Cauchy's Theorem - II

Lecture 9 - Cauchy's Integral Formula for the Derivatives of Analytic Function

Lecture 10 - Morera's Theorem, Liouville's Theorem and Fundamental Theorem of Algebra

Lecture 11 - Winding Number and Maximum Modulus Principle

Lecture 12 - Sequences and Series

Lecture 13 - Uniform Convergence of Series

Lecture 14 - Power Series

Lecture 15 - Taylor Series

Lecture 16 - Laurent Series

Lecture 17 - Zeros and Singularities of an Analytic Function

Lecture 18 - Residue at a Singularity

Lecture 19 - Residue Theorem

Lecture 20 - Meromorphic Functions

Lecture 21 - Evaluation of real integrals using residues - I

Lecture 22 - Evaluation of real integrals using residues - II

Lecture 23 - Evaluation of real integrals using residues - III

Lecture 24 - Evaluation of real integrals using residues - IV

Lecture 25 - Evaluation of real integrals using residues - V

Lecture 26 - Bilinear Transformations

Lecture 27 - Cross Ratio

Lecture 28 - Conformal Mapping - I

Lecture 29 - Conformal Mapping - II

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Conformal mapping from half plane to disk and half plane to half plane - I
- Lecture 31 - Conformal mapping from disk to disk and angular region to disk
- Lecture 32 - Application of Conformal Mapping to Potential Theory
- Lecture 33 - Review of Z-transforms - I
- Lecture 34 - Review of Z-transforms - II
- Lecture 35 - Review of Z-transforms - III
- Lecture 36 - Review of Bilateral Z-transforms
- Lecture 37 - Finite Fourier Transforms
- Lecture 38 - Fourier Integral and Fourier Transforms
- Lecture 39 - Fourier Series
- Lecture 40 - Discrete Fourier Transforms - I
- Lecture 41 - Discrete Fourier Transforms - II
- Lecture 42 - Basic Concepts of Probability
- Lecture 43 - Conditional Probability
- Lecture 44 - Bayes Theorem and Probability Networks
- Lecture 45 - Discrete Probability Distribution
- Lecture 46 - Binomial Distribution
- Lecture 47 - Negative Binomial Distribution and Poisson Distribution
- Lecture 48 - Continuous Probability Distribution
- Lecture 49 - Poisson Process
- Lecture 50 - Exponential Distribution
- Lecture 51 - Normal Distribution
- Lecture 52 - Joint Probability Distribution - I
- Lecture 53 - Joint Probability Distribution - II
- Lecture 54 - Joint Probability Distribution - III
- Lecture 55 - Correlation and Regression - I
- Lecture 56 - Correlation and Regression - II
- Lecture 57 - Testing of Hypotheses - I
- Lecture 58 - Testing of Hypotheses - II
- Lecture 59 - Testing of Hypotheses - III
- Lecture 60 - Application to Queuing Theory and Reliability Theory

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Higher Engineering Mathematics

Subject Co-ordinator - Prof. P.N. Agarwal

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Symbolic Representation of Statements - I  
Lecture 2 - Symbolic Representation of Statements - II  
Lecture 3 - Tautologies and Contradictions  
Lecture 4 - Predicates and Quantifiers - I  
Lecture 5 - Predicates and Quantifiers - II  
Lecture 6 - Validity of Arguments  
Lecture 7 - Language and Grammars - I  
Lecture 8 - Language and Grammars - II  
Lecture 9 - Language and Grammars - III  
Lecture 10 - Finite- State Machines  
Lecture 11 - Partially Ordered Sets - I  
Lecture 12 - Partially Ordered Sets - II  
Lecture 13 - Partially Ordered Sets - III  
Lecture 14 - Lattices - I  
Lecture 15 - Lattices - II  
Lecture 16 - Lattices - III  
Lecture 17 - Lattices - IV  
Lecture 18 - Lattices - V  
Lecture 19 - Boolean Algebra - I  
Lecture 20 - Boolean Algebra - II  
Lecture 21 - Boolean Algebra - III  
Lecture 22 - Boolean Algebra - IV  
Lecture 23 - Logic Gates  
Lecture 24 - Karnaugh Map - I  
Lecture 25 - Karnaugh Map - II  
Lecture 26 - Various type of Graphs - I  
Lecture 27 - Various types of Graphs - II  
Lecture 28 - Paths and Connectivity  
Lecture 29 - Subgraphs and Traversable Multigraphs

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Undirected and Directed Graphs
- Lecture 31 - Eulerian and Hamiltonian Graphs
- Lecture 32 - Planar Graphs
- Lecture 33 - Representation of Graphs
- Lecture 34 - Isomorphic and Homeomorphic Graphs
- Lecture 35 - Kuratowski's Theorem
- Lecture 36 - Dual of a Graph
- Lecture 37 - Coloring of Graphs - I
- Lecture 38 - Coloring of Graphs - II
- Lecture 39 - Tree - I
- Lecture 40 - Tree - II
- Lecture 41 - Graphical Method - I
- Lecture 42 - Graphical Method - II
- Lecture 43 - General Linear Programming Problem
- Lecture 44 - Simplex Method - I
- Lecture 45 - Simplex Method - II
- Lecture 46 - Big - M Method - I
- Lecture 47 - Big - M Method - II (Special Cases)
- Lecture 48 - Two Phase Method - I
- Lecture 49 - Two Phase method - II
- Lecture 50 - Duality - I
- Lecture 51 - Duality - II
- Lecture 52 - Dual Simplex Method
- Lecture 53 - Transportation Problem - I
- Lecture 54 - Transportation Problem - II
- Lecture 55 - Assignment Problem - I
- Lecture 56 - Assignment Problem - II

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Operations Research

Subject Co-ordinator - Prof. Kusumdeep

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction to OR Models  
Lecture 2 - More OR Models  
Lecture 3 - Graphical Method for LPP  
Lecture 4 - Convex sets  
Lecture 5 - Simplex Method  
Lecture 6 - Big M Method  
Lecture 7 - Two Phase  
Lecture 8 - Multiple solutions of LPP  
Lecture 9 - Unbounded solution of LPP  
Lecture 10 - Infeasible solution of LPP  
Lecture 11 - Revised Simplex Method  
Lecture 12 - Case studies and Exercises - I  
Lecture 13 - Case studies and Exercises - II  
Lecture 14 - Case studies and Exercises - III  
Lecture 15 - Primal Dual Construction  
Lecture 16 - Weak Duality Theorem  
Lecture 17 - More Duality Theorems  
Lecture 18 - Primal-Dual relationship of solutions  
Lecture 19 - Dual Simplex Method  
Lecture 20 - Sensitivity Analysis - I  
Lecture 21 - Sensitivity Analysis - II  
Lecture 22 - Case studies and Exercises - I  
Lecture 23 - Case studies and Exercises - II  
Lecture 24 - Integer Programming  
Lecture 25 - Goal Programming  
Lecture 26 - Multi-Objective Programming  
Lecture 27 - Dynamic Programming  
Lecture 28 - Transportation Problem  
Lecture 29 - Assignment Problem

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Case studies and Exercises
- Lecture 31 - Processing  $n$  Jobs on Two Machines
- Lecture 32 - Processing  $n$  Jobs through Three Machines
- Lecture 33 - Processing two jobs through  $m$  machines
- Lecture 34 - Processing  $n$  jobs through  $m$  machines
- Lecture 35 - Case studies and Exercises
- Lecture 36 - Two Person Zero-Sum Game
- Lecture 37 - Theorems of Game Theory
- Lecture 38 - Solution of Mixed Strategy Games
- Lecture 39 - Linear Programming method for solving games
- Lecture 40 - Case studies and Exercises

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Essential Mathematics for Machine Learning

Subject Co-ordinator - Prof. S.K. Gupta, Dr. Sanjeev Kumar

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Vectors in Machine Learning
- Lecture 2 - Basics of Matrix Algebra
- Lecture 3 - Vector Space: Definition and Examples
- Lecture 4 - Vector Subspace: Examples and Properties
- Lecture 5 - Basis and Dimension
- Lecture 6 - Linear Transformations
- Lecture 7 - Norms and Spaces
- Lecture 8 - Orthogonal Complement and Projection Mapping
- Lecture 9 - Eigenvalues and Eigenvectors
- Lecture 10 - Special matrices and Properties
- Lecture 11 - Spectral Decomposition
- Lecture 12 - Singular Value Decomposition
- Lecture 13 - SVD: Properties and Applications
- Lecture 14 - Low Rank Approximations
- Lecture 15 - Python Implementation of SVD and Low - rank Approximation
- Lecture 16 - Principal Component Analysis - I
- Lecture 17 - PCA: Derivation and Examples
- Lecture 18 - Python Implementation of PCA
- Lecture 19 - Linear Discriminant Analysis
- Lecture 20 - Python Implementation of LDA
- Lecture 21 - Least Square Approximation and Minimum Normed Solution
- Lecture 22 - Linear and Multiple Regression - I
- Lecture 23 - Linear and Multiple Regression - II
- Lecture 24 - Logistic Regression - I
- Lecture 25 - Logistic Regression - II
- Lecture 26 - Classification Metrics
- Lecture 27 - Gram Schmidt Process
- Lecture 28 - Polar Decomposition
- Lecture 29 - Minimal Polynomial and Jordan Canonical Form - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Minimal Polynomial and Jordan Canonical Form - II
- Lecture 31 - Basic Concepts of Calculus - I
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Advanced Linear Algebra

Subject Co-ordinator - Prof. Premananda Bera

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - System of Linear Equations
- Lecture 2 - Elementary Row Operations
- Lecture 3 - Row-Reduced Echelon Form and its Applications
- Lecture 4 - Vector Spaces - I
- Lecture 5 - Vector Spaces - II
- Lecture 6 - Basis and Dimensions - I
- Lecture 7 - Basis and Dimensions - II
- Lecture 8 - Change of Ordered Basis in F. D. V. S.
- Lecture 9 - Row Space of a Matrix
- Lecture 10 - Computations concerning Subspaces
- Lecture 11 - Linear Transformations
- Lecture 12 - Concept of Rank
- Lecture 13 - Algebra of Linear Transformations - I
- Lecture 14 - Algebra of Linear Transformations - II
- Lecture 15 - Algebra of Linear Transformations - III
- Lecture 16 - Matrix Representation of Linear Transformations - I
- Lecture 17 - Matrix Representation of Linear Transformations - II
- Lecture 18 - Linear Functional - I
- Lecture 19 - Linear Functional - II
- Lecture 20 - Linear Functional - III
- Lecture 21 - Linear Functional and Transpose of L.T. - I
- Lecture 22 - Linear Functional and Transpose of L.T. - II
- Lecture 23 - Eigenvalue and Eigenvector of Linear Operator - I
- Lecture 24 - Eigenvalue and Eigenvector of Linear Operator - II
- Lecture 25 - Eigenvalue and Eigenvector of Digonalizable L.O.
- Lecture 26 - Annihilating Polynomial of Linear Operator
- Lecture 27 - Cayley-Hamilton Theorem and Its Applications - I
- Lecture 28 - Cayley-Hamilton Theorem and its Applications - II
- Lecture 29 - Invariant Subspaces - I

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Invariant Subspaces - II
- Lecture 31 - Application of Invariant Subspaces - I
- Lecture 32 - Application of Invariant Subspaces - II
- Lecture 33 - Direct Sum Decompositions - I
- Lecture 34 - Direct Sum Decompositions - II
- Lecture 35 - Invariant Direct Sums - I
- Lecture 36 - Invariant Direct Sums - II
- Lecture 37 - Decomposition of space and Operator - I
- Lecture 38 - Decomposition of Space and Operator - II
- Lecture 39 - Applications of Primary Decomposition Theorem - I
- Lecture 40 - Applications of Primary Decomposition Theorem - II
- Lecture 41 - Applications of Primary Decomposition Theorem - III
- Lecture 42 - Inner Products - I
- Lecture 43 - Inner Products - II
- Lecture 44 - Inner Product Spaces - I
- Lecture 45 - Inner Product Spaces - II
- Lecture 46 - Best Approximation in I.P.S.
- Lecture 47 - Orthogonal Projection in I.P.S.
- Lecture 48 - Linear Functionals and Adjoints - I
- Lecture 49 - Linear Functionals and Adjoints - II
- Lecture 50 - Linear Functionals and Adjoints - III
- Lecture 51 - Linear Functionals and Adjoints - IV
- Lecture 52 - Isomorphism in Inner Product Spaces
- Lecture 53 - Unitary Operators - I
- Lecture 54 - Unitary Operators - II
- Lecture 55 - Application of Unitary O. and Initiation of Normal Operator
- Lecture 56 - Normal Operator - I
- Lecture 57 - Normal Operator - II
- Lecture 58 - Normal Operator and It's Spectral Resolution
- Lecture 59 - Singular Value Decomposition of a Matrix
- Lecture 60 - Forms on Inner product Spaces

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:EXCELing with Mathematical Modeling

Subject Co-ordinator - Prof. Sandip Banerjee

Co-ordinating Institute - IIT - Roorkee

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction, Importance and Limitations

Lecture 2 - Units and Dimensions

Lecture 3 - Scaling

Lecture 4 - How to build mathematical models?

Lecture 5 - Basics of Excel - 1

Lecture 6 - Basics of Excel - 2

Lecture 7 - Basics of Excel - 3

Lecture 8 - Linear, Quadratic, Cubic Models

Lecture 9 - Linear Stability Analysis - I

Lecture 10 - Linear Stability Analysis - II

Lecture 11 - Lyapunov Stability

Lecture 12 - Phase Plane Analysis - 1

Lecture 13 - Phase Plane Analysis - 2

Lecture 14 - Phase Plane Analysis - 3

Lecture 15 - Growth Models (Continuous model)

Lecture 16 - Predator-Prey models

Lecture 17 - Two species competition model

Lecture 18 - Arms Race Model

Lecture 19 - Combat Model - I

Lecture 20 - Combat Model - II

Lecture 21 - Carbon Dating

Lecture 22 - Drug Distribution

Lecture 23 - Growth and decay in L-R circuit

Lecture 24 - Rectilinear motion under variable force

Lecture 25 - Dynamic of Rowing

Lecture 26 - Horizontal oscillations

Lecture 27 - Vertical oscillations

Lecture 28 - Epidemic model - 1

Lecture 29 - Epidemic model - 2

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- Lecture 30 - Rumor model
- Lecture 31 - Varying Gravity model
- Lecture 32 - Tumor model - I
- Lecture 33 - Tumor model - II
- Lecture 34 - Vegetation in a desert model
- Lecture 35 - Mathematical model of love affairs
- Lecture 36 - Discrete models: Difference Equation - I
- Lecture 37 - Difference Equations - II
- Lecture 38 - Basics of Excel - 4
- Lecture 39 - Stability Analysis - I
- Lecture 40 - Stability Analysis - II
- Lecture 41 - Population Models
- Lecture 42 - Bank Account Models
- Lecture 43 - Economic Model (Harrod Model)
- Lecture 44 - Lake Pollutant Models
- Lecture 45 - Mathematical Model of the Dynamics of Alcohol
- Lecture 46 - Discrete Predator-Prey Model
- Lecture 47 - Forsenic Model
- Lecture 48 - Drug Delivery Models
- Lecture 49 - Lanchester's Combat Model
- Lecture 50 - Two-Species Competition Model (Discrete)
- Lecture 51 - Infection model
- Lecture 52 - Smoking Model
- Lecture 53 - Price and Demand Model
- Lecture 54 - Paper Towel model, Burning Calories Model
- Lecture 55 - Learning model, Kidney function model
- Lecture 56 - Empirical Modelling
- Lecture 57 - Estimation of Parameters - I
- Lecture 58 - Estimation of Parameters - II
- Lecture 59 - Estimation of Parameters - III
- Lecture 60 - Simulation Modeling

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Advanced Matrix Theory and Linear Algebra for Engineers

Subject Co-ordinator - Prof. Vittal Rao

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Prologue - Part 1  
Lecture 2 - Prologue - Part 2  
Lecture 3 - Prologue - Part 3  
Lecture 4 - Linear Systems - Part 1  
Lecture 5 - Linear Systems - Part 2  
Lecture 6 - Linear Systems - Part 3  
Lecture 7 - Linear Systems - Part 4  
Lecture 8 - Vector Spaces - Part 1  
Lecture 9 - Vector Spaces - Part 2  
Lecture 10 - Linear Independence and Subspaces - Part 1  
Lecture 11 - Linear Independence and Subspaces - Part 2  
Lecture 12 - Linear Independence and Subspaces - Part 3  
Lecture 13 - Linear Independence and Subspaces - Part 4  
Lecture 14 - Basis - Part 1  
Lecture 15 - Basis - Part 2  
Lecture 16 - Basis - Part 3  
Lecture 17 - Linear Transformations - Part 1  
Lecture 18 - Linear Transformations - Part 2  
Lecture 19 - Linear Transformations - Part 3  
Lecture 20 - Linear Transformations - Part 4  
Lecture 21 - Linear Transformations - Part 5  
Lecture 22 - Inner Product and Orthogonality - Part 1  
Lecture 23 - Inner Product and Orthogonality - Part 2  
Lecture 24 - Inner Product and Orthogonality - Part 3  
Lecture 25 - Inner Product and Orthogonality - Part 4  
Lecture 26 - Inner Product and Orthogonality - Part 5  
Lecture 27 - Inner Product and Orthogonality - Part 6  
Lecture 28 - Diagonalization - Part 1  
Lecture 29 - Diagonalization - Part 2

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- Lecture 30 - Diagonalization - Part 3
- Lecture 31 - Diagonalization - Part 4
- Lecture 32 - Hermitian and Symmetric matrices - Part 1
- Lecture 33 - Hermitian and Symmetric matrices - Part 2
- Lecture 34 - Hermitian and Symmetric matrices - Part 3
- Lecture 35 - Hermitian and Symmetric matrices - Part 4
- Lecture 36 - Singular Value Decomposition (SVD) - Part 1
- Lecture 37 - Singular Value Decomposition (SVD) - Part 2
- Lecture 38 - Back To Linear Systems - Part 1
- Lecture 39 - Back To Linear Systems - Part 2
- Lecture 40 - Epilogue

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Ordinary Differential Equations and Applications

Subject Co-ordinator - Prof. A.K. Nandakumaran, Prof. Raju K. George, Prof. P.S. Datti

Co-ordinating Institute - IISc - Bangalore | IIST - Trivandrum | TIFR-CAM - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Stability Equilibrium Points
- Lecture 31 - Stability Equilibrium Points (Continued - I)
- Lecture 32 - Stability Equilibrium Points (Continued - II)
- Lecture 33 - Second Order Linear Equations (Continued - III)
- Lecture 34 - Lyapunov Function
- Lecture 35 - Lyapunov Function (Continued...)
- Lecture 36 - Periodic Orbits and Poincare Bendixon Theory
- Lecture 37 - Periodic Orbits and Poincare Bendixon Theory (Continued...)
- Lecture 38 - Linear Second Order Equations
- Lecture 39 - General Second Order Equations
- Lecture 40 - General Second Order Equations (Continued...)

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Linear Algebra

Subject Co-ordinator - Prof. Dilip P. Patil

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- 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 - Steinitz's 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

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- 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
- 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...)

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:An Introduction to Smooth Manifolds

Subject Co-ordinator - Prof. Harish Seshadri

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Basic linear algebra  
Lecture 2 - Multivariable calculus - 1  
Lecture 3 - Multivariable calculus - 2  
Lecture 4 - The derivative map  
Lecture 5 - Inverse Function Theorem  
Lecture 6 - Constant Rank Theorem  
Lecture 7 - Smooth functions with compact support  
Lecture 8 - Smooth manifold  
Lecture 9 - Examples of smooth manifolds  
Lecture 10 - Higher dimensional spheres as smooth manifolds  
Lecture 11 - Smooth maps  
Lecture 12 - Examples of smooth maps  
Lecture 13 - Tangent spaces - 1  
Lecture 14 - Tangent spaces - 2  
Lecture 15 - Derivatives of smooth maps  
Lecture 16 - Chain rule on manifolds  
Lecture 17 - Dimension of tangent space - 1  
Lecture 18 - Dimension of tangent space - 2  
Lecture 19 - Derivative of inclusion map  
Lecture 20 - Basis of tangent space  
Lecture 21 - Inverse Function Theorem for manifolds  
Lecture 22 - Submanifolds  
Lecture 23 - Tangent space of a submanifold  
Lecture 24 - Regular Value Theorem  
Lecture 25 - Special linear group as a submanifold of the set of all square matrices  
Lecture 26 - Hypersurfaces  
Lecture 27 - Tangent spaces to level sets  
Lecture 28 - Vector fields - 1  
Lecture 29 - Vector fields - 2

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## NPTL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Vector fields - 3
- Lecture 31 - Lie groups - 1
- 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
- Lecture 65 - Special classes of forms
- Lecture 66 - Orientation on manifolds - 1
- Lecture 67 - Orientation on manifolds - 2
- Lecture 68 - Orientation on manifolds - 3

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. E. K. Narayanan

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Review of Riemann integration and introduction to sigma algebras

Lecture 2 - Sigma algebras and measurability

Lecture 3 - Measurable functions and approximation by simple functions

Lecture 4 - Properties of countably additive measures

Lecture 5 - Integration of positive measurable functions

Lecture 6 - Some properties of integrals of positive simple functions

Lecture 7 - Monotone convergence theorem and Fatou's lemma

Lecture 8 - Integration of complex valued measurable functions

Lecture 9 - Dominated convergence theorem

Lecture 10 - Sets of measure zero and completion

Lecture 11 - Consequences of MCT, Fatou's lemma and DCT

Lecture 12 - Rectangles in  $\mathbb{R}^n$  and some properties

Lecture 13 - Outer measure on  $\mathbb{R}^n$

Lecture 14 - Properties of outer measure on  $\mathbb{R}^n$

Lecture 15 - Lebesgue measurable sets and Lebesgue measure on  $\mathbb{R}^n$

Lecture 16 - Lebesgue sigma algebra

Lecture 17 - Lebesgue measure

Lecture 18 - Fine properties of measurable sets

Lecture 19 - Invariance properties of Lebesgue measure

Lecture 20 - Non measurable set

Lecture 21 - Measurable functions

Lecture 22 - Riemann and Lebesgue integrals

Lecture 23 - Locally compact Hausdorff spaces

Lecture 24 - Riesz representation theorem

Lecture 25 - Positive Borel measures

Lecture 26 - Lebesgue measure via Riesz representation theorem

Lecture 27 - Construction of Lebesgue measure

Lecture 28 - Invariance properties of Lebesgue measure

Lecture 29 - Linear transformations and Lebesgue measure

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## NPTTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Cantor set
- Lecture 31 - Cantor function
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Algebraic Geometry and Commutative Algebra

Subject Co-ordinator - Prof. Dilip P. Patil

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Motivation for K-algebraic sets
- Lecture 2 - Definitions and examples of Affine Algebraic Set
- Lecture 3 - Rings and Ideals
- Lecture 4 - Operation on Ideals
- Lecture 5 - Prime Ideals and Maximal Ideals
- Lecture 6 - Krull's Theorem and consequences
- Lecture 7 - Module, submodules and quotient modules
- Lecture 8 - Algebras and polynomial algebras
- Lecture 9 - Universal property of polynomial algebra and examples
- Lecture 10 - Finite and Finite type algebras
- Lecture 11 - K-Spectrum (K-rational points)
- Lecture 12 - Identity theorem for Polynomial functions
- Lecture 13 - Basic properties of K-algebraic sets
- Lecture 14 - Examples of K-algebraic sets
- Lecture 15 - K-Zariski Topology
- Lecture 16 - The map  $V \rightarrow L$
- Lecture 17 - Noetherian and Artinian Ordered sets
- Lecture 18 - Noetherian induction and Transfinite induction
- Lecture 19 - Modules with Chain Conditions
- Lecture 20 - Properties of Noetherian and Artinian Modules
- Lecture 21 - Examples of Artinian and Noetherian Modules
- Lecture 22 - Finite modules over Noetherian Rings
- Lecture 23 - Hilbert's Basis Theorem (HBT)
- Lecture 24 - Consequences of HBT
- Lecture 25 - Free Modules and rank
- Lecture 26 - More on Noetherian and Artinian modules
- Lecture 27 - Ring of Fractions (Localization)
- Lecture 28 - Nil radical, contraction of ideals
- Lecture 29 - Universal property of  $S^{-1}A$

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Ideal structure in  $S^{-1}A$
- Lecture 31 - Consequences of the Correspondence of Ideals
- Lecture 32 - Consequences of the Correspondence of Ideals (Continued...)
- Lecture 33 - Modules of Fraction and universal properties
- Lecture 34 - Exactness of the functor  $S^{-1}$
- Lecture 35 - Universal property of Modules of Fractions
- Lecture 36 - Further properties of Modules and Module of Fractions
- Lecture 37 - Local-Global Principle
- Lecture 38 - Consequences of Local-Global Principle
- Lecture 39 - Properties of Artinian Rings
- Lecture 40 - Krull-Nakayama Lemma
- Lecture 41 - Properties of  $I, K$  and  $V, L$  maps
- Lecture 42 - Hilbert's Nullstellensatz
- Lecture 43 - Hilbert's Nullstellensatz (Continued...)
- Lecture 44 - Proof of Zariski's Lemma (HNS 3)
- Lecture 45 - Consequences of HNS
- Lecture 46 - Consequences of HNS (Continued...)
- Lecture 47 - Jacobson Ring and examples
- Lecture 48 - Irreducible subsets of Zariski Topology (Finite type  $K$ -algebra)
- Lecture 49 - Spec functor on Finite type  $K$ -algebras
- Lecture 50 - Properties of Irreducible topological spaces
- Lecture 51 - Zariski Topology on arbitrary commutative rings
- Lecture 52 - Spec functor on arbitrary commutative rings
- Lecture 53 - Topological properties of  $\text{Spec } A$
- Lecture 54 - Example to support the term Spectrum
- Lecture 55 - Integral Extensions
- Lecture 56 - Elementwise characterization of Integral extensions
- Lecture 57 - Properties and examples of Integral extensions
- Lecture 58 - Prime and Maximal ideals in integral extensions
- Lecture 59 - Lying over Theorem
- Lecture 60 - Cohen-Siegelberg Theorem

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. P. S. Datti, Prof. A. K. Nandakumaran

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction - 1  
Lecture 2 - Introduction - 2  
Lecture 3 - Priliminaries - 1  
Lecture 4 - Priliminaries - 2  
Lecture 5 - Priliminaries - 3  
Lecture 6 - Priliminaries - 4  
Lecture 7 - First order equations in two variables - 1  
Lecture 8 - First order equations in two variables - 2  
Lecture 9 - First order equations in two variables - 3  
Lecture 10 - First order equations in two variables - 4  
Lecture 11 - First order equations in two variables - 5  
Lecture 12 - First order equations in more than two variables - 6  
Lecture 13 - First order equations in more than two variables - 7  
Lecture 14 - First order equations in more than two variables - 8  
Lecture 15 - Classification - 1  
Lecture 16 - Classification - 2  
Lecture 17 - Classification - 3  
Lecture 18 - Laplace and Poisson equations - 1  
Lecture 19 - Laplace and Poisson equations - 2  
Lecture 20 - Laplace and Poisson equations - 3  
Lecture 21 - Laplace and Poisson equations - 4  
Lecture 22 - Laplace and Poisson equations - 5  
Lecture 23 - Laplace and Poisson equations - 6  
Lecture 24 - Laplace and Poisson equations - 7  
Lecture 25 - Laplace and Poisson equations - 8  
Lecture 26 - Laplace and Poisson equations - 9  
Lecture 27 - Laplace and Poisson equations - 10  
Lecture 28 - One dimensional heat equation - 1  
Lecture 29 - One dimensional heat equation - 2

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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Lecture 30	- One dimensional heat equation	- 3
Lecture 31	- One dimensional heat equation	- 4
Lecture 32	- One dimensional heat equation	- 5
Lecture 33	- One dimensional heat equation	- 6
Lecture 34	- One dimensional wave equation	- 1
Lecture 35	- One dimensional wave equation	- 2
Lecture 36	- One dimensional wave equation	- 3
Lecture 37	- One dimensional wave equation	- 4
Lecture 38	- One dimensional wave equation	- 5
Lecture 39	- One dimensional wave equation	- 6
Lecture 40	- One dimensional wave equation	- 7
Lecture 41	- One dimensional wave equation	- 8

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. A. K. Nandakumaran

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Introduction  
Lecture 2 - HJE 1  
Lecture 3 - HJE 2  
Lecture 4 - HJE 3  
Lecture 5 - HJE 4  
Lecture 6 - HJE 5  
Lecture 7 - HJE 6  
Lecture 8 - CL1  
Lecture 9 - CL2  
Lecture 10 - CL3  
Lecture 11 - CL4  
Lecture 12 - CL5  
Lecture 13 - CL6  
Lecture 14 - Perron Method - 1  
Lecture 15 - Perron Method - 2  
Lecture 16 - Perron Method - 3  
Lecture 17 - Perron Method - 4  
Lecture 18 - Newtonian Potential - 1  
Lecture 19 - Newtonian Potential - 2  
Lecture 20 - Newtonian Potential - 3  
Lecture 21 - Newtonian Potential - 4  
Lecture 22 - Newtonian Potential - 5  
Lecture 23 - Eigen Value Problem - 1  
Lecture 24 - Eigen Value Problem - 2  
Lecture 25 - Heat Equation - 1  
Lecture 26 - Heat Equation - 2  
Lecture 27 - Heat Equation - 3  
Lecture 28 - Heat Equation - 4  
Lecture 29 - Heat Equation - 5

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Lecture 30 - Wave Equation - 1  
Lecture 31 - Wave Equation - 2  
Lecture 32 - Wave Equation - 3  
Lecture 33 - Wave Equation - 4  
Lecture 34 - Wave Equation - 5  
Lecture 35 - Wave Equation - 6  
Lecture 36 - Wave Equation - 7  
Lecture 37 - Weak Solutions - 1  
Lecture 38 - Weak Solutions - 2  
Lecture 39 - Weak Solutions - 3  
Lecture 40 - Weak Solutions - 4  
Lecture 41 - Weak Solutions - 5

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - Matrix Theory

Subject Co-ordinator - Prof. Chandra Murthy

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Course introduction and properties of matrices

Lecture 2 - Vector spaces

Lecture 3 - Basis, dimension

Lecture 4 - Linear transforms

Lecture 5 - Fundamental subspaces of a matrix

Lecture 6 - Fundamental theorem of linear algebra

Lecture 7 - Properties of rank

Lecture 8 - Inner product

Lecture 9 - Gram-schmidt algorithm

Lecture 10 - Orthonormal matrices definition

Lecture 11 - Determinant

Lecture 12 - Properties of determinants

Lecture 13 - Introduction to norms and inner products

Lecture 14 - Vector norms and their properties

Lecture 15 - Applications and equivalence of vector norms

Lecture 16 - Summary of equivalence of norms

Lecture 17 - Dual norms

Lecture 18 - Properties and examples of dual norms

Lecture 19 - Matrix norms

Lecture 20 - Matrix norms: Properties

Lecture 21 - Induced norms

Lecture 22 - Induced norms and examples

Lecture 23 - Spectral radius

Lecture 24 - Properties of spectral radius

Lecture 25 - Convergent matrices, Banach lemma

Lecture 26 - Recap of matrix norms and Levy-Desplanques theorem

Lecture 27 - Equivalence of matrix norms and error in inverses of linear systems

Lecture 28 - Errors in inverses of matrices

Lecture 29 - Errors in solving systems of linear equations

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- Lecture 30 - Introduction to eigenvalues and eigenvectors
- Lecture 31 - The characteristic polynomial
- 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
- Lecture 65 - Interlacing theorem - I
- Lecture 66 - Interlacing theorem - II (Converse)
- Lecture 67 - Interlacing theorem (Continued...)
- Lecture 68 - Eigenvalues: Majorization theorem and proof

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- Lecture 69 - Location and perturbation of Eigenvalues - Part 1: Dominant diagonal theorem
- Lecture 70 - Location and perturbation of Eigenvalues - Part 2: Gersgorin's theorem
- Lecture 71 - Implications of Gersgorin disc theorem, condition of eigenvalues
- Lecture 72 - Condition of eigenvalues for diagonalizable matrices
- Lecture 73 - Perturbation of eigenvalues Birkhoff's theorem Hoffman-Weiland theorem
- Lecture 74 - Singular value definition and some remarks
- Lecture 75 - Proof of singular value decomposition theorem
- Lecture 76 - Partitioning the SVD
- Lecture 77 - Properties of SVD
- Lecture 78 - Generalized inverse of matrices
- Lecture 79 - Least squares
- Lecture 80 - Constrained least squares

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:C\* Algebras and Spectral Theorem

Subject Co-ordinator - Prof. E K Narayanan

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Finite dimensional Spectral theorem

Lecture 2 - Compact operators

Lecture 3 - Spectral theorem for Compact self-adjoint operators

Lecture 4 - Spectral theorem for Compact Normal operators

Lecture 5 - Banach algebras

Lecture 6 - Gelfand-Mazur theorem

Lecture 7 - Spectral radius

Lecture 8 - Multiplicative functionals

Lecture 9 - Gelfand transform - I

Lecture 10 - Gelfand transform - II

Lecture 11 - C\* algebras

Lecture 12 - Examples and Wiener's theorem

Lecture 13 - Gelfand-Naimark theorem

Lecture 14 - Non-unital Banach algebras

Lecture 15 - Non-unital C\* algebra

Lecture 16 - Gelfand transform of non-unital C\*algebras

Lecture 17 - Gelfand-Naimark theorem for non-unital C\* algebras

Lecture 18 - Continuous functional calculus

Lecture 19 - Bounded functional calculus - I

Lecture 20 - Bounded functional calculus - II

Lecture 21 - Projection valued measures

Lecture 22 - Bounded functional calculus with respect to a projection valued measure

Lecture 23 - Spectral Theorem - I

Lecture 24 - Spectral theorem - II

Lecture 25 - Some applications

Lecture 26 - Spectral theorem for a bounded normal operator

Lecture 27 - Resolution of identity - I

Lecture 28 - Resolution of identity - II

Lecture 29 - Resolution of identity - III

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- Lecture 30 - Resolution of identity - IV
- Lecture 31 - Equivalence of various forms of spectral theorems - I
- 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 - Fuglede's theorem
- Lecture 39 - Spectral theorem for commuting finite family of normal operators
- Lecture 40 - Multiplicity theory

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. P.S. Datti, Prof. A K Nandakumaran

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction - 1
- Lecture 2 - Preliminaries - 1
- Lecture 3 - Preliminaries - 2
- Lecture 4 - Preliminaries - 3
- Lecture 5 - Preliminaries - 4
- Lecture 6 - Preliminaries - 5
- Lecture 7 - Preliminaries - 6
- Lecture 8 - Preliminaries - 7
- Lecture 9 - Preliminaries - 8
- Lecture 10 - Preliminaries - 9
- Lecture 11 - Introduction to Distributions
- Lecture 12 - Properties and Examples
- Lecture 13 - Convergence of distributions
- Lecture 14 - Convergence of distributions
- Lecture 15 - Calculus in the space of distributions
- Lecture 16 - Further discussion on Distributions
- Lecture 17 - Order and support of a distribution
- Lecture 18 - Laplace and Poisson equations - Distributions with compact support
- Lecture 19 - Validity of the definition of the support
- Lecture 20 - Convolution and Fourier transform of distributions
- Lecture 21 - The Schwartz space and AKN Lec 15 its dual
- Lecture 22 - Fourier transform of a tempered distribution, convolution
- Lecture 23 - Properties of Convolution
- Lecture 24 - Further discussion on Fourier transform and convolution
- Lecture 25 - Convolution of two distributions
- Lecture 26 - Convolution of distributions
- Lecture 27 - Introduction to Sobolev spaces
- Lecture 28 - Properties of Sobolev Spaces
- Lecture 29 - Extension and Density results

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - General Extension result
- Lecture 31 - Integration on a smooth surface
- 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 Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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

Subject Co-ordinator - Prof. A K Nandakumaran, Prof. P.S. Datti

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Introduction and Outline
- Lecture 2 - Review of Sobolev spaces - 1
- Lecture 3 - Review of Sobolev spaces - 2
- Lecture 4 - Review of Sobolev spaces - 3
- Lecture 5 - Review of Sobolev spaces - 4
- Lecture 6 - Review of Sobolev spaces - 5
- Lecture 7 - Elliptic equations and weak formulation
- Lecture 8 - Abstract Formulation
- Lecture 9 - Variational Inequality
- Lecture 10 - Babuska-Brezzi Theorem
- Lecture 11 - Strong vs Weak Form of PDE
- Lecture 12 - General Second Order Equations
- Lecture 13 - Non-uniqueness of Neumann problem
- Lecture 14 - Biharmonic equation, Stokes system
- Lecture 15 - Stokes system (Continued...)
- Lecture 16 - Regularity of Ellptic Equations
- Lecture 17 - Regularity (Continued...)
- Lecture 18 - Maximum and Minimum Principles for weak formulation
- Lecture 19 - Spectrum of the Laplace operator
- Lecture 20 - First eigenvalue of the Laplace operator and a brief discussion of a Galerkin method
- Lecture 21 - Introduction to semi-groups and unbounded operators
- Lecture 22 - Spectrum of an operator
- Lecture 23 - Examples of operators and operators in a Hilbert space
- Lecture 24 - Perturbation of an operator, Kato theorems. Definition of a semi-group
- Lecture 25 - Semi-group and its infinitesimal generator
- Lecture 26 - Examples of semi-groups; spectrum and resolvent of the infinitesimal generator
- Lecture 27 - An application. Saturation theorem
- Lecture 28 - Hille-Yosida Theorem
- Lecture 29 - Lumer-Philips Theorem. Stone's theorem

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Abstract Cauchy Problem
- Lecture 31 - Semi-group arising from the heat equation
- Lecture 32 - Generator of the heat semi-group
- Lecture 33 - Semi-group arising from the wave equation
- Lecture 34 - Semi-group arising from the wave equation in energy space
- Lecture 35 - Wave equation in energy space
- Lecture 36 - Wave equation in energy space (Continued...)
- Lecture 37 - Semi-group arising from the wave equation in  $H^1 \times L^2$
- Lecture 38 - Schroedinger equation in free space
- Lecture 39 - Schroedinger equation with a potential. Application of Kato's theorem
- Lecture 40 - Equations in a bounded domain. Concluding remarks

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Group Theory

Subject Co-ordinator - Prof. R. Venkatesh

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Motivation of group theory
- Lecture 2 - Definition of a group
- Lecture 3 - Examples of groups
- Lecture 4 - The symmetric group
- Lecture 5 - Subgroups of integers
- Lecture 6 - Basic properties of groups
- Lecture 7 - Subgroups of a group
- Lecture 8 - Subgroup generated by subsets of a group
- Lecture 9 - Group of integers modulo  $n$
- Lecture 10 - Some elementary number theory - I
- Lecture 11 - Some elementary number theory - II
- Lecture 12 - Order of an elements in a group
- Lecture 13 - Cyclic groups and its subgroups
- Lecture 14 - Characterization of cyclic groups
- Lecture 15 - Examples of cosets of a subgroup in a group
- Lecture 16 - Cosets of a subgroup of a group
- Lecture 17 - Lagrange's Theorem
- Lecture 18 - Number theoretic applications of Lagrange's Theorem
- Lecture 19 - Normal subgroup
- Lecture 20 - Some useful definitions
- Lecture 21 - Internal direct product
- Lecture 22 - More on normal subgroups
- Lecture 23 - Normalizer of a subgroup
- Lecture 24 - First Isomorphism Theorem
- Lecture 25 - Second Isomorphism Theorem
- Lecture 26 - Third Isomorphism Theorem
- Lecture 27 - Group acting on a set
- Lecture 28 - Group action - Examples
- Lecture 29 - Isometries of the plane is a group

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## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

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- Lecture 30 - Orthogonal maps
- Lecture 31 - Dihedral groups
- Lecture 32 - Finite subgroups of the orthogonal group
- Lecture 33 - Group acting on a set
- Lecture 34 - Group action - Examples
- Lecture 35 - Orbit-decomposition Theorem
- Lecture 36 - Stabilizer of a subset
- Lecture 37 - Applications of group action
- Lecture 38 - Class equation
- Lecture 39 - Some more applications of group action
- Lecture 40 - G-sets and morphisms
- Lecture 41 - More examples
- Lecture 42 - Burnside's lemma
- Lecture 43 - The Sylow's theorems
- Lecture 44 - The Sylow's theorems (Continued...)
- Lecture 45 - Application of Sylow's Theorems
- Lecture 46 - Semidirect product of groups
- Lecture 47 - Automorphisms of groups
- Lecture 48 - Symmetric and alternating groups
- Lecture 49 - Conjugacy in the symmetric group
- Lecture 50 - Conjugacy in the symmetric group (Continued...)
- Lecture 51 - Simplicity of the alternating groups
- Lecture 52 - The sign map
- Lecture 53 - The sign map (Continued...)
- Lecture 54 - Structure theorem for finite abelian groups (using invariant factors)
- Lecture 55 - The structure theorem for finite abelian groups
- Lecture 56 - Proof of the structure theorem for finite abelian groups (Continued...)
- Lecture 57 - Proof of the structure theorem for finite abelian groups
- Lecture 58 - Structure theory of finite abelian p-groups

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Introduction to Lie Algebras

Subject Co-ordinator - Prof. R. Venkatesh

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

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  $sl_2(\mathbb{C})$

Lecture 20 - Classification of finite dimensional representations of  $sl_2(\mathbb{C})$

Lecture 21 - Complete reducibility of finite dimensional representation of  $sl_2(\mathbb{C})$  - Part 1

Lecture 22 - Complete reducibility of finite dimensional representation of  $sl_2(\mathbb{C})$  - Part 2

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

Lecture 24 - Applications of Weyl's Theorem for  $sl_2(\mathbb{C})$

Lecture 25 - New representations from 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

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- Lecture 30 - Casimir element of a representation of a semisimple Lie algebra
- Lecture 31 - Weyl's Theorem of complete reducibility for semisimple Lie algebras
- Lecture 32 - Root space decomposition of semisimple Lie algebras
- Lecture 33 - Centralizer of a maximal toral subalgebra
- Lecture 34 - Properties of roots
- Lecture 35 - More properties of roots
- Lecture 36 - Rationality of roots
- Lecture 37 - Abstract root system and Weyl groups
- Lecture 38 - Isomorphism of Root systems and dual root systems
- Lecture 39 - Root systems of Ranks 1 and 2
- Lecture 40 - Classification of rank 2 root systems
- Lecture 41 - Base of a root system
- Lecture 42 - Classification of bases
- Lecture 43 - Basic properties of simple roots
- Lecture 44 - Characterization of length function
- Lecture 45 - Decomposition of root systems
- Lecture 46 - Root lengths, Cartan Matrices
- Lecture 47 - Cartan matrices and Dynkin diagrams
- Lecture 48 - Classification of Root systems
- Lecture 49 - Classification of Root systems (Continued...)
- Lecture 50 - Concrete description of root systems
- Lecture 51 - Uniqueness of root systems
- Lecture 52 - Isomorphism theorem
- Lecture 53 - Isomorphism theorem (Continued...)
- Lecture 54 - Generators and relations
- Lecture 55 - Serre presentation

## NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Representation Theory of General Linear Lie Algebra

Subject Co-ordinator - Prof. R. Venkatesh

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - Basic Theory of Lie algebras
- Lecture 2 - Basic Theory of Lie algebras (Continued...)
- Lecture 3 - Basic Theory of Lie algebras (Continued...)
- Lecture 4 - Representation Theory of Lie algebras
- Lecture 5 - Representation Theory of Lie algebras (Continued...)
- Lecture 6 - Representation of Lie algebras
- Lecture 7 - Classification of 2 dimensional representation of two dimensional non-abelian Lie algebra
- Lecture 8 - Isomorphism Theorem
- Lecture 9 - Characterization of completely reducible module
- Lecture 10 - Representation theory of  $sl_2(\mathbb{C})$
- Lecture 11 - Irreducible representation of  $sl_2(\mathbb{C})$
- Lecture 12 - Irreducible representation of  $sl_2(\mathbb{C})$  (Continued...)
- Lecture 13 - Complete reducibility of  $sl_2(\mathbb{C})$
- Lecture 14 - Complete reducibility of  $sl_2(\mathbb{C})$  (Continued...)
- Lecture 15 - Representation theory of  $sl_2(\mathbb{C})$ -basic observation
- Lecture 16 - Application of  $sl_2(\mathbb{C})$  representation theory in combinatorics
- Lecture 17 - Constructions of new representations
- Lecture 18 - Construction of universal algebras - I
- Lecture 19 - Construction of universal algebras - II
- Lecture 20 - Non-degenerate and invariant bilinear forms
- Lecture 21 - Schur's lemma and Killing form
- Lecture 22 - Killing form of general and special linear Lie algebras
- Lecture 23 - The universal enveloping algebra
- Lecture 24 - Properties of the universal enveloping algebra
- Lecture 25 - The Casimir operator for representations of  $gl_n(\mathbb{C})$  and  $sl_n(\mathbb{C})$
- Lecture 26 - Weyl's theorem of complete reducibility
- Lecture 27 - The structure of  $sl_{n+1}(\mathbb{C})$
- Lecture 28 - Representations of  $sl_{n+1}(\mathbb{C})$  - I
- Lecture 29 - Representations of  $sl_{n+1}(\mathbb{C})$  - II

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- Lecture 30 - Representations of  $sl_{n+1}(C)$  - III
- Lecture 31 - Casimir operator and highest weight modules - I
- Lecture 32 - Casimir operator and highest weight modules - II
- Lecture 33 - Irreducible representations of  $sl_{n+1}(C)$
- Lecture 34 - Verma module and its irreducible quotient
- Lecture 35 - Verma modules and standard cyclic irreducible modules
- Lecture 36 - Finite dimensional standard cyclic irreducible modules
- Lecture 37 - Standard cyclic irreducible modules
- Lecture 38 - Character Theory - I
- Lecture 39 - Character Theory - II
- Lecture 40 - Denominator Identity - Prep 1
- Lecture 41 - Denominator Identity - Prep 2
- Lecture 42 - Proof of the denominator identity
- Lecture 43 - Freudenthal's formula
- Lecture 44 - The Weyl character formula
- Lecture 45 - The Laplacian operator and the Weyl Character Formula
- Lecture 46 - Proof of the Weyl Character Formula
- Lecture 47 - Applications of Weyl Character formula
- Lecture 48 - The Weyl dimension formula, Schur polynomials
- Lecture 49 - Semi-standard Young Tableaux
- Lecture 50 - BGG resolution

# NPTEL Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTEL Video Course - Mathematics - NOC:Algebraic Number Theory

Subject Co-ordinator - Prof. Mahesh Kakde

Co-ordinating Institute - IISc - Bangalore

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

Lecture 1 - Overview and Motivation  
Lecture 2 - Algebraic Numbers  
Lecture 3 - The ring of integers  
Lecture 4 - Lattices  
Lecture 5 - Properties of ring of integers  
Lecture 6 - Discriminant  
Lecture 7 - Dedekind Domains (DD)  
Lecture 8 - Algebraic properties of DD  
Lecture 9 - Unique Factorization of Ideals - 1  
Lecture 10 - Unique Factorization of Ideals - 2  
Lecture 11 - Ring of Integers is a DD  
Lecture 12 - Ideal Class Group  
Lecture 13 - Integral Ideal in an ideal class  
Lecture 14 - Finiteness of ideal class group  
Lecture 15 - Geometry of numbers - 1  
Lecture 16 - Geometry of numbers - 2  
Lecture 17 - Dirichlet's Unit Theorem - 1  
Lecture 18 - Dirichlet's Unit Theorem - 2  
Lecture 19 - Relative extension - 1  
Lecture 20 - Relative extension - 2  
Lecture 21 - Decomposition Group  
Lecture 22 - Inertia Group  
Lecture 23 - The Artin map  
Lecture 24 - Valuations  
Lecture 25 - Archimedean valuations  
Lecture 26 - Non-archimedean valuations  
Lecture 27 - p-adic numbers  
Lecture 28 - p-adic completion of a Number field  
Lecture 29 - Product formula

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- Lecture 30 - Hensel's lemma
- Lecture 31 - Finite extensions of local fields
- Lecture 32 - Factorisation of conorm of a prime ideal in a finite extension - I
- Lecture 33 - Factorisation of conorm of a prime ideal in a finite extension - II
- Lecture 34 - Different - I
- Lecture 35 - Different - II
- Lecture 36 - Different - III
- Lecture 37 - Ramification and different ideal
- Lecture 38 - Quadratic Fields
- Lecture 39 - Binary quadratic forms - I
- Lecture 40 - Binary quadratic forms - II
- Lecture 41 - Reduced binary quadratic forms
- Lecture 42 - Class group of imaginary quadratic fields and binary quadratic forms - 1
- Lecture 43 - Class group of imaginary quadratic fields and binary quadratic forms - 2
- Lecture 44 - Computation of Class group of imaginary quadratic fields using binary quadratic forms
- Lecture 45 - Order two elements in Class group of imaginary quadratic fields
- Lecture 46 - Pure cubic fields - 1
- Lecture 47 - Pure cubic fields - 2
- Lecture 48 - Pell's equation - 1
- Lecture 49 - Pell's equation - 2
- Lecture 50 - Biquadratic fields - 1
- Lecture 51 - Biquadratic fields - 2
- Lecture 52 - Cyclotomic fields - 1
- Lecture 53 - Cyclotomic fields - 2
- Lecture 54 - Computation of class groups - 1
- Lecture 55 - Computation of class groups - 2
- Lecture 56 - Computation of class groups - 3
- Lecture 57 - Computation of class groups - 4