

LESSON PLAN

B.A./B.Sc. (General) Programme in Mathematics



Department of Mathematics

Tehatta Sadananda Mahavidyalaya

Tehatta, Purba Bardhaman, 713122

West Bengal, India

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-I*

Subject: *Mathematics*

Paper: *CC-1A: Differential Calculus, UNIT-I*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Limit of a function, Fundamental theorems on the limit
Lecture 2	Some important limits, Cauchy's necessary and sufficient conditions for the existence of a limit
Lecture 3	Limit of a function defined in the language of a sequence
Lecture 4	Discussion on various examples related to the limit of a function
Lecture 5	Continuity of a function, Properties of continuous functions
Lecture 6	Different classes of Discontinuity with examples
Lecture 7	Uniform continuity and its properties
Lecture 8	Discussion on various examples connected to the continuity of a function
Lecture 9	Derivative of a function, Fundamental theorems on differentiations
Lecture 10	Differentiation of a function of function
Lecture 11	Discussion on various examples related to the differentiability of a function
Lecture 12	Successive differentiation, nth order derivatives
Lecture 13	Discussion on various examples connected to the higher-order differentiation
Lecture 14	Leibnitz's theorem on successive derivatives and its application
Lecture 15	Partial derivatives and successive partial derivatives
Lecture 16	Homogeneous functions, Euler's theorem
Lecture 17	Workout of various examples
Lecture 18	Partial derivatives of a function of two functions
Lecture 19	Workout of miscellaneous examples
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. B.C. Das and B.N. Mukherjee, *Differential Calculus*, U. N. Dhur and Sons Pvt. Ltd.
2. Shanti Narayan and P. K. Mittal, *Differential Calculus*, S Chand, 30th Revised Edition
3. K.C. Maity and R.K. Ghosh, *Differential Calculus*, Books and Allied (P) Ltd.
4. H. Anton, I. Birens and S. Davis, *Calculus*, John Wiley and Sons, Inc.
5. G.B. Thomas and R.L. Finney, *Calculus*, Pearson Education

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-I*

Subject: *Mathematics*

Paper: *CC-1A: Differential Calculus, UNIT-II*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Equation of the tangent, Tangent at the origin
Lecture 2	Equation of the normal, Angle of intersection of two curves
Lecture 3	Cartesian subtangent and subnormal
Lecture 4	Angle of intersection of two curves (Polar), Polar subtangent and subnormal
Lecture 5	Curvature, Radius of curvature in different form
Lecture 6	Chord of curvature, Center of curvature
Lecture 7	Evolute and Involute, Work out of various examples
Lecture 8	Asymptotes definition, Asymptotes of algebraic curves
Lecture 9	Asymptotes of polar curves, Work out of miscellaneous examples
Lecture 10	Singular point definition, singular points at the origin
Lecture 11	Singular points at points other than origin
Lecture 12	Discrimination of species of a cusp, Radii of curvature at multiple points
Lecture 13	Systematic procedure of curve tracing, Illustrative examples
Lecture 14	Polar curve tracing with workout examples
Lecture 15	Class Test
Tutorial 1	Doubt Clearing

Recommended Books:

1. B.C. Das and B.N. Mukherjee, *Differential Calculus*, U. N. Dhur and Sons Pvt. Ltd.
2. Shanti Narayan and P. K. Mittal, *Differential Calculus*, S Chand, 30th Revised Edition
3. K.C. Maity and R.K. Ghosh, *Differential Calculus*, Books and Allied (P) Ltd.
4. H. Anton, I. Birens and S. Davis, *Calculus*, John Wiley and Sons, Inc.
5. G.B. Thomas and R.L. Finney, *Calculus*, Pearson Education

LESSON PLAN

Faculty name: Anindya Mandal

Class: B.A. General Semester-I

Subject: Mathematics

Paper: CC-1A: Differential Calculus, UNIT-III

Total number of lectures mentioned in the syllabus: 25 (Lecture Hours)

Lecture	Topic/Subtopic
Lecture 1	Rolle's theorem, Geometrical interpretation of Rolle's theorem
Lecture 2	Workout of various examples connected to Rolle's theorem
Lecture 3	Lagrange's Mean value theorem, Geometrical interpretation of MVT
Lecture 4	Workout of various examples related to Lagrange's theorem
Lecture 5	Cauchy's Mean value theorem
Lecture 6	Workout of various examples
Lecture 7	Taylor's theorem with different forms (generalized MVT)
Lecture 8	Maclaurin's theorem
Lecture 9	Discussion on various examples
Lecture 10	Taylor's infinite series
Lecture 11	Maclaurin's series of different functions
Lecture 12	Discussion on various examples
Lecture 13	Summarization of the chapter
Lecture 14	Maxima and minima, Extreme values
Lecture 15	Necessary and sufficient conditions for the existence of extreme values
Lecture 16	Illustrative examples
Lecture 17	Higher derivative test for the existence of extreme values
Lecture 18	Illustrative examples
Lecture 19	Applied problems
Lecture 20	Introduction to Indeterminant form
Lecture 21	L'Hospital's rule
Lecture 22	Application of L'Hospital rule
Lecture 23	Others Indeterminant forms and its examples
Lecture 24	Summarization of the chapters
Lecture 25	Class Test
Tutorial 1	Doubt clearing
Tutorial 2	Doubt clearing

Recommended Books:

1. B.C. Das and B.N. Mukherjee, *Differential Calculus*, U. N. Dhur and Sons Pvt. Ltd.
2. Shanti Narayan and P. K. Mittal, *Differential Calculus*, S Chand, 30th Revised Edition
3. K.C. Maity and R.K. Ghosh, *Differential Calculus*, Books and Allied (P) Ltd.
4. H. Anton, I. Birens and S. Davis, *Calculus*, John Wiley and Sons, Inc.
5. G.B. Thomas and R.L. Finney, *Calculus*, Pearson Education

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LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-II*

Subject: *Mathematics*

Paper: *CC-1B: Differential Equations, UNIT-I*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Differential equation definition, Ordinary and partial differential equation
Lecture 2	Order and degree of a differential equation, Linear and non-linear differential equation
Lecture 3	Solution: Complete primitive, particular solution, and singular solution
Lecture 4	Existence and uniqueness theorem
Lecture 5	Equations of first order and first degree, exact differential equation
Lecture 6	Necessary and sufficient conditions for an equation to be exact
Lecture 7	Integrating factors, Solving examples
Lecture 8	Working rule for solving linear equations
Lecture 9	Bernoulli's equation
Lecture 10	Solving examples
Lecture 11	Equations of first order but not first degree
Lecture 12	Equations solvable for p
Lecture 13	Equations solvable for x
Lecture 14	Equations solvable for y
Lecture 15	Equations in Clairaut's form
Lecture 16	Singular solution, Extraneous loci
Lecture 17	Solving examples
Lecture 18	Methods for solving higher order differential equations
Lecture 19	Solving a differential equation by reducing its order
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. Differential Equation (Schaum Series Publication)
2. Ghosh & Chakraborty – Differential Equations
9. Maity & Ghosh – Differential Equations
4. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
5. Sneddon – Elements of Partial Differential Equations (McGraw Hill)
6. Murray – Ordinary Differential Equation

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-II*

Subject: *Mathematics*

Paper: *CC-1B: Differential Equations, UNIT-II*

Total number of lectures mentioned in the syllabus: *16 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Homogeneous linear equation
Lecture 2	Method of solution of homogeneous linear equations
Lecture 3	Solved examples
Lecture 4	Alternative method for finding P.I. of homogeneous equations
Lecture 5	Equations reducible to homogeneous linear form
Lecture 6	Worked examples
Lecture 7	Method of variation of parameters
Lecture 8	Working rules for solving differential equations in various form
Lecture 9	Worked examples
Lecture 10	Method for solving simultaneous differential equations
Lecture 11	Worked examples
Lecture 12	Total differential equations or Pfaffian differential equations
Lecture 13	Methods for solving total differential equations
Lecture 14	Worked examples
Lecture 15	Miscellaneous worked examples
Lecture 16	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. Differential Equation (Schaum Series Publication)
2. Ghosh & Chakraborty – Differential Equations
9. Maity & Ghosh – Differential Equations
4. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
5. Sneddon – Elements of Partial Differential Equations (McGraw Hill)
6. Murray – Ordinary Differential Equation

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-II*

Subject: *Mathematics*

Paper: *CC-1B: Differential Equations, UNIT-III*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Partial differential equation, Order and degree of PDE
Lecture 2	Linear and non-linear partial differential equation
Lecture 3	Classification of first order PDE
Lecture 4	Derivation of PDE by eliminating arbitrary constants and functions
Lecture 5	Cauchy's problem of first order equations
Lecture 6	Worked examples
Lecture 7	Lagrange's method for solving PDE
Lecture 8	Working rule of using Lagrange's method
Lecture 9	Worked examples
Lecture 10	Miscellaneous worked examples
Lecture 11	Charpit's method
Lecture 12	Working rule of using Charpit's method
Lecture 13	Solved examples
Lecture 14	Miscellaneous solved examples
Lecture 15	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. Differential Equation (Schaum Series Publication)
2. Ghosh & Chakraborty – Differential Equations
9. Maity & Ghosh – Differential Equations
4. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
5. Sneddon – Elements of Partial Differential Equations (McGraw Hill)
6. Murray – Ordinary Differential Equation

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-II*

Subject: *Mathematics*

Paper: *CC-1B: Differential Equations, UNIT-IV*

Total number of lectures mentioned in the syllabus: *9 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Classification of partial differential equation of second order
Lecture 2	Cauchy's problem for second order partial differential equation
Lecture 3	Worked examples
Lecture 4	Reduction to canonical forms
Lecture 5	Working rule for reducing a hyperbolic equation to its canonical forms
Lecture 6	Working rule for reducing a parabolic equation to its canonical forms
Lecture 7	Working rule for reducing an elliptic equation to its canonical forms
Lecture 8	Worked examples
Lecture 9	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. Differential Equation (Schaum Series Publication)
2. Ghosh & Chakraborty – Differential Equations
9. Maity & Ghosh – Differential Equations
4. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
5. Sneddon – Elements of Partial Differential Equations (McGraw Hill)
6. Murray – Ordinary Differential Equation

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LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-III*

Subject: *Mathematics*

Paper: *CC-1C: Real Analysis, UNIT-I*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Finite and infinite sets
Lecture 2	Uniqueness theorem, Theorems on finite and infinite sets
Lecture 3	Countable and uncountable sets
Lecture 4	Theorems on countable and uncountable sets
Lecture 5	Cantor's theorem
Lecture 6	Algebraic and order properties of \mathbb{R}
Lecture 7	Bounded set, supremum and infimum
Lecture 8	Completeness property of \mathbb{R}
Lecture 9	Archimedean property
Lecture 10	Worked examples
Lecture 11	Intervals: open, closed, half-open, half-closed
Lecture 12	Nested interval and its property
Lecture 13	Cluster points
Lecture 14	Bolzano-Weierstrass theorem
Lecture 15	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. S. K. Mapa, Introduction to Real Analysis, Sarat Book Distributors
2. Shantinayakan, Mathematical Analysis, S. Chand and Company Ltd
3. W. Rudin, Principles of Mathematical Analysis, TMH, Third Edition
4. T. M. Apostol, Mathematical Analysis, Narosa Book Distributors Pvt. Ltd.
5. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, Wiley India Pvt. Ltd

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-III*

Subject: *Mathematics*

Paper: *CC-1C: Real Analysis, UNIT-II*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Sequences with examples
Lecture 2	Bounded sequence with some theorems
Lecture 3	Limit points of a sequence
Lecture 4	Worked examples
Lecture 5	Limit inferior and limit superior
Lecture 6	Some illustrations
Lecture 7	Convergent sequence with theorems
Lecture 8	Non-convergent sequences
Lecture 9	Illustrations
Lecture 10	Cauchy's general principle of convergence, Cauchy sequence
Lecture 11	Cauchy's theorems on limits
Lecture 12	Algebra of sequence
Lecture 13	Subsequence, Subsequential limit
Lecture 14	Miscellaneous worked examples
Lecture 15	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. S. K. Mapa, Introduction to Real Analysis, Sarat Book Distributors
2. Shantinayakan, Mathematical Analysis, S. Chand and Company Ltd
3. W. Rudin, Principles of Mathematical Analysis, TMH, Third Edition
4. T. M. Apostol, Mathematical Analysis, Narosa Book Distributors Pvt. Ltd.
5. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, Wiley India Pvt. Ltd

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-III*

Subject: *Mathematics*

Paper: *CC-1C: Real Analysis, UNIT-III*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Infinite series with examples
Lecture 2	Condition for convergence
Lecture 3	Cauchy's general principle for convergence
Lecture 4	Series of positive terms
Lecture 5	Comparison test, Cauchy's root test, D'Alembert's test for convergence
Lecture 6	Worked examples
Lecture 7	Rabbe's test, Logarithmic test, Cauchy's integral test, Gauss test for convergence
Lecture 8	Worked examples
Lecture 9	Series of arbitrary terms, alternating series, Leibnitz's test
Lecture 10	Worked examples
Lecture 11	Absolute convergence
Lecture 12	Conditionally convergent series
Lecture 13	Tests for series of arbitrary terms
Lecture 14	Miscellaneous worked examples
Lecture 15	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. S. K. Mapa, Introduction to Real Analysis, Sarat Book Distributors
2. Shantinayakan, Mathematical Analysis, S. Chand and Company Ltd
3. W. Rudin, Principles of Mathematical Analysis, TMH, Third Edition
4. T. M. Apostol, Mathematical Analysis, Narosa Book Distributors Pvt. Ltd.
5. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, Wiley India Pvt. Ltd

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-III*

Subject: *Mathematics*

Paper: *CC-1C: Real Analysis, UNIT-IV*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Sequence of functions, Pointwise convergence
Lecture 2	Uniform convergence, Cauchy's criterion for uniform convergence
Lecture 3	Worked examples
Lecture 4	Test for uniform convergence, M_n test
Lecture 5	Worked examples
Lecture 6	Series of functions
Lecture 7	Uniform convergence, Cauchy's principle for convergence
Lecture 8	Worked examples
Lecture 9	Test for uniform convergence, Weierstrass's M test
Lecture 10	Worked examples
Lecture 11	Abel's test and Dirichlet's test with worked examples
Lecture 12	Uniform convergence and integration, uniform convergence and differentiation
Lecture 13	Power series and related theorems
Lecture 14	Determination of radius of convergence with worked examples
Lecture 15	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. S. K. Mapa, Introduction to Real Analysis, Sarat Book Distributors
2. Shantinayakan, Mathematical Analysis, S. Chand and Company Ltd
3. W. Rudin, Principles of Mathematical Analysis, TMH, Third Edition
4. T. M. Apostol, Mathematical Analysis, Narosa Book Distributors Pvt. Ltd.
5. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, Wiley India Pvt. Ltd

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-III*

Subject: *Mathematics*

Paper: *SEC-1: Integral Calculus, UNIT-I*

Total number of lectures mentioned in the syllabus: *25 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Integration by partial fractions: Introduction
Lecture 2	Working steps to find an integration
Lecture 3	Worked examples
Lecture 4	Miscellaneous examples
Lecture 5	Integration of rational functions: Introduction
Lecture 6	Integrands of the different forms: $R(\sin x, \cos x)$, $R(\sinh x, \cosh x)$, and others
Lecture 7	Worked examples
Lecture 8	Miscellaneous examples
Lecture 9	Integration of irrational functions: Introduction
Lecture 10	Trigonometric substitutions in connection to irrational expressions
Lecture 11	Worked examples
Lecture 12	Miscellaneous examples
Lecture 13	Reduction formulae for integrals of rational functions
Lecture 14	Worked examples
Lecture 15	Reduction formulae for integrals of trigonometric functions
Lecture 16	Worked examples
Lecture 17	Reduction formulae for integrals of exponential functions
Lecture 18	Worked examples
Lecture 19	Reduction formulae for integrals of logarithmic functions
Lecture 20	Worked examples
Lecture 21	Reduction formulae for integrals of combination functions of rational, trigonometric, exponential, and logarithmic functions.
Lecture 22	Worked examples
Lecture 23	Miscellaneous examples
Lecture 24	Overall summary
Lecture 25	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. Shantinayakan, P.K. Mittal, Integral Calculus, S. Chand Publishing
2. B.C. Das and B. N. Mukherjee, Integral Calculus, U. N. Dhur and Sons Pvt. Ltd.
3. K. C. Maity and R. K. Ghosh, Integral Calculus, Books and Allied (P) Ltd.
4. H. Anton, I. Bivens, and S. Davis, Calculus, John Wiley and Sons (Asia) P. Ltd.

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-III*

Subject: *Mathematics*

Paper: *SEC-1: Integral Calculus, UNIT-II*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Areas of curves: Introduction
Lecture 2	Calculation of areas: Systematic procedure
Lecture 3	Areas of some well-known curves in Cartesian coordinates
Lecture 4	Areas of curves in parametric forms
Lecture 5	Miscellaneous examples
Lecture 6	Lengths of plane curves: Introduction
Lecture 7	Miscellaneous worked examples
Lecture 8	Volumes of solids of revolution: Rotation around the x-axis and y-axis
Lecture 9	Worked examples
Lecture 10	Surfaces of revolution
Lecture 11	Rotation about any line in the plane
Lecture 12	Miscellaneous worked examples
Lecture 13	Double and triple integration
Lecture 14	Worked examples
Lecture 15	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. Shantinayakan, P.K. Mittal, Integral Calculus, S. Chand Publishing
2. B.C. Das and B. N. Mukherjee, Integral Calculus, U. N. Dhur and Sons Pvt. Ltd.
3. K. C. Maity and R. K. Ghosh, Integral Calculus, Books and Allied (P) Ltd.
4. H. Anton, I. Bivens, and S. Davis, Calculus, John Wiley and Sons (Asia) P. Ltd.

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LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-IV*

Subject: *Mathematics*

Paper: *CC-ID: Algebra, UNIT-I*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Binary composition and its example
Lecture 2	Groupoid, Semigroup, Monoid, Quasi group
Lecture 3	Group
Lecture 4	Related theorems
Lecture 5	Examples of groups
Lecture 6	Worked examples
Lecture 7	Abelian and non-abelian groups
Lecture 8	Examples of abelian and non-abelian groups
Lecture 9	Finite groups with examples
Lecture 10	Symmetric group, Klein's 4-group
Lecture 11	Order of an element and some theorems
Lecture 12	Cyclic group and related theorems
Lecture 13	Examples of cyclic groups
Lecture 14	Group of symmetries of an isosceles triangle
Lecture 15	Group of symmetries of an equilateral triangle
Lecture 16	Group of symmetries of a rectangle
Lecture 17	Group of symmetries of a square
Lecture 18	Permutation groups
Lecture 19	Group of quaternions
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. J. Gallian, Contemporary Abstract Algebra, Cengage Learning
2. M. Artin, Abstract Algebra, Pearson
3. P. Mukhopadhyay, S. Ghosh and M. K. Sen, Topics in Abstract Algebra, University Press
4. S. K. Mapa, Higher Algebra (Abstract and Linear), Sarat Book House
5. Bhattacharyya, Jain & Nagpal, Basic Abstract Algebra, Cambridge University Press
6. U. M. Swamy & A. V. S. N. Murthy, Algebra: Abstract and Modern, Pearson

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-IV*

Subject: *Mathematics*

Paper: *CC-ID: Algebra, UNIT-II*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Subgroups with examples
Lecture 2	Theorems related to subgroups
Lecture 3	Worked examples
Lecture 4	The centre of a group
Lecture 5	Cyclic subgroups and related theorems
Lecture 6	Worked examples
Lecture 7	Cosets with examples
Lecture 8	Some theorems on cosets
Lecture 9	Lagrange's theorem
Lecture 10	Index of subgroup with examples
Lecture 11	Order of an element
Lecture 12	Worked examples
Lecture 13	Normal subgroups with examples
Lecture 14	Some theorems on normal subgroups
Lecture 15	Worked examples
Lecture 16	Quotient groups with examples
Lecture 17	Related theorems on quotient groups
Lecture 18	Miscellaneous problems
Lecture 19	Miscellaneous worked examples
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. J. Gallian, Contemporary Abstract Algebra, Cengage Learning
2. M. Artin, Abstract Algebra, Pearson
3. P. Mukhopadhyay, S. Ghosh and M. K. Sen, Topics in Abstract Algebra, University Press
4. S. K. Mapa, Higher Algebra (Abstract and Linear), Sarat Book House
5. Bhattacharyya, Jain & Nagpal, Basic Abstract Algebra, Cambridge University Press
6. U. M. Swamy & A. V. S. N. Murthy, Algebra: Abstract and Modern, Pearson

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-IV*

Subject: *Mathematics*

Paper: *CC-ID: Algebra, UNIT-III*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Ring: Definition
Lecture 2	Commutative and non-commutative rings with examples
Lecture 3	Ring from number systems
Lecture 4	Ring of integers modulo n
Lecture 5	Ring of quaternions
Lecture 6	Ring of matrices
Lecture 7	Ring of continuous functions
Lecture 8	Polynomial ring
Lecture 9	Subring with examples
Lecture 10	Some theorems on subring
Lecture 11	Ideals
Lecture 12	Worked examples
Lecture 13	Integral domain with examples
Lecture 14	Worked examples
Lecture 15	Some theorems on integral domain
Lecture 16	Field: Definition
Lecture 17	Some theorems on field
Lecture 18	Examples of fields: Z_p , Q , R , and C . Field of rational functions
Lecture 19	Miscellaneous worked examples
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. J. Gallian, Contemporary Abstract Algebra, Cengage Learning
2. M. Artin, Abstract Algebra, Pearson
3. P. Mukhopadhyay, S. Ghosh and M. K. Sen, Topics in Abstract Algebra, University Press
4. S. K. Mapa, Higher Algebra (Abstract and Linear), Sarat Book House
5. Bhattacharyya, Jain & Nagpal, Basic Abstract Algebra, Cambridge University Press
6. U. M. Swamy & A. V. S. N. Murthy, Algebra: Abstract and Modern, Pearson

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-IV*

Subject: *Mathematics*

Paper: *SEC-2: Theory of Equations, UNIT-I*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Polynomials
Lecture 2	General properties of polynomials
Lecture 3	Division algorithm theorem
Lecture 4	Remainder and factor theorems
Lecture 5	Worked examples
Lecture 6	Synthetic division and its application
Lecture 7	Zero of a polynomial
Lecture 8	Worked examples
Lecture 9	Graphical representation of polynomials
Lecture 10	Maximum and minimum values of polynomials
Lecture 11	Miscellaneous worked examples
Lecture 12	Algebraic equations and some theorems
Lecture 13	Polynomial equations with real coefficients
Lecture 14	Worked examples
Lecture 15	Rolle's theorem, Worked examples
Lecture 16	Descartes' rule of signs
Lecture 17	Sturm's method for the location of roots
Lecture 18	Relation between roots and coefficients
Lecture 19	Miscellaneous worked examples
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. S. K. Mapa, Higher Algebra (Classical), Sarat Book House
2. Burnside & Panton, The Theory of Equations, Hodges Figgis and Company
3. Ghosh & Chakravorty, Higher Algebra (Classical & Modern), U. N. Dhur & Sons Pvt. Ltd.
4. C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc.

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-IV*

Subject: *Mathematics*

Paper: *SEC-2: Theory of Equations, UNIT-II*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Symmetric functions of roots
Lecture 2	Worked examples
Lecture 3	Newton's theorem
Lecture 4	Worked examples
Lecture 5	Miscellaneous worked examples
Lecture 6	Transformation of equations
Lecture 7	Worked examples
Lecture 8	Miscellaneous worked examples
Lecture 9	Reciprocal equations
Lecture 10	Some theorems
Lecture 11	Worked examples
Lecture 12	Binomial equation and its properties
Lecture 13	Worked examples
Lecture 14	Cubic equation and its solution (Cardan's method)
Lecture 16	Nature of roots, Illustrative examples
Lecture 17	Biquadratic equation and its solution (Ferrai's solution)
Lecture 18	Illustrative examples
Lecture 19	Miscellaneous worked examples
Lecture 20	Class Test-1
Tutorial 1	Doubt Clearing

Recommended Books:

1. S. K. Mapa, Higher Algebra (Classical), Sarat Book House
2. Burnside & Panton, The Theory of Equations, Hodges Figgis and Company
3. Ghosh & Chakravorty, Higher Algebra (Classical & Modern), U. N. Dhur & Sons Pvt. Ltd.
4. C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc.

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LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-V*

Subject: *Mathematics*

Paper: *DSE-1A: Linear Algebra, UNIT-I*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Vector spaces: Introduction and definition
Lecture 2	Examples of vector spaces
Lecture 3	Linear combinations, Spanning sets
Lecture 4	Worked examples
Lecture 5	Subspaces
Lecture 6	Linear spans
Lecture 7	Row space of a matrix
Lecture 8	Worked examples
Lecture 9	Linear dependence and independence
Lecture 10	Worked examples
Lecture 11	Basis and Dimension
Lecture 12	Worked examples
Lecture 13	Theorem on bases
Lecture 14	Dimension and subspaces
Lecture 15	Application to matrices, Rank of a matrix
Lecture 16	Sum and direct sums
Lecture 17	Coordinates
Lecture 18	Worked examples
Lecture 19	Miscellaneous worked examples
Lecture 20	Class Test-1
Tutorial 1	Doubt clearing

Recommended Books:

1. Promode Kumar Saikia, Linear Algebra with Applications, Pearson
2. K. M. Hoffman and R. Kunze, Linear Algebra, Prentice Hall India
3. S. K. Mapa, Higher Algebra (Abstract and Linear), Sarat Book House
4. A. R. Rao and P. Bhimasankaram, Linear Algebra, Hindustan Book Agency
5. S. Kumaresan, Linear Algebra: A Geometrical Approach, Prentice Hall India
6. Linear Algebra, Schaum's Outlines, McGraw Hill

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-V*

Subject: *Mathematics*

Paper: *DSE-1A: Linear Algebra, UNIT-II*

Total number of lectures mentioned in the syllabus: *40 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Linear transformations
Lecture 2	Examples of linear transformations
Lecture 3	Kernel and image of a linear mapping
Lecture 4	Worked examples
Lecture 5	Rank and nullity of a linear transformation
Lecture 6	Worked examples
Lecture 7	Application to systems of linear equations
Lecture 8	Singular and nonsingular linear mappings, Isomorphisms
Lecture 9	Operations with linear mappings
Lecture 10	Algebra of linear operators
Lecture 11	Solved problems
Lecture 12	Miscellaneous worked problems
Lecture 13	Miscellaneous solved problems
Lecture 14	Matrix representation of linear operator
Lecture 15	Worked examples
Lecture 16	Change of basis
Lecture 17	Worked examples
Lecture 18	Miscellaneous worked examples
Lecture 19	Diagonalization
Lecture 20	Characteristic polynomial, Cayley-Hamilton theorem
Lecture 21	Worked examples
Lecture 22	Eigenvalues and eigenvectors
Lecture 23	Worked examples
Lecture 24	Diagonalizing matrices
Lecture 25	Worked examples
Lecture 26	Miscellaneous worked examples
Lecture 27	Linear functional and dual space
Lecture 28	Examples of linear functional
Lecture 29	Dual basis and related theorems
Lecture 30	Second dual space, Anihilators
Lecture 31	Worked examples

Lecture 32	Miscellaneous worked examples
Lecture 33	Isomorphism of vector spaces
Lecture 34	Isomorphism theorems
Lecture 35	Worked examples
Lecture 36	Miscellaneous solved problems
Lecture 37	Invertibility and isomorphism
Lecture 38	Change of coordinate matrix
Lecture 39	Miscellaneous worked examples
Lecture 40	Class Test-1
Tutorial 1	Doubt clearing

Recommended Books:

1. Promode Kumar Saikia, Linear Algebra with Applications, Pearson
2. K. M. Hoffman and R. Kunze, Linear Algebra, Prentice Hall if India
3. S. K. Mapa, Higher Algebra (Abstract and Linear), Sarat Book House
4. A. R. Rao and P. Bhimasankaram, Linear Algebra, Hindustan Book Agency
5. S. Kumaresan, Linear Algebra: A Geometrical Approach, Prentice Hall if India
6. Linear Algebra, Schaum's Outlines, McGraw Hill

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-V*

Subject: *Mathematics*

Paper: *SEC-3: Probability and Statistics, UNIT-I*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Probability: Introduction
Lecture 2	Random experiments, Sample space
Lecture 3	Probability axioms
Lecture 4	Conditional probability
Lecture 5	Bayes; theorem
Lecture 6	Independence of events
Lecture 7	Worked examples
Lecture 8	Random variables (Discrete and Continuous)
Lecture 9	Distribution functions
Lecture 10	Discrete distribution, Probability Mass Function
Lecture 11	Probability Density Function
Lecture 12	Important results on p.m.f. and p.d.f.
Lecture 13	Illustrative problem solving
Lecture 14	Mathematical Expectation: Introduction
Lecture 15	Moment generating function, Characteristic function
Lecture 16	Worked examples
Lecture 17	Discrete Distribution: Binomial, and Poisson
Lecture 18	Continuous Distributions: Uniform, Normal, and Exponential
Lecture 19	Worked examples
Lecture 20	Class Test -1
Tutorial 1	Doubt clearing

Recommended Books:

1. S. Ross, First Course in Probability, Pearson Education
2. W. Feller, An Introduction to Probability Theory and its Applications, Wiley
3. A. Gupta, Groundwork of Mathematical Probability & Statistics, Academic publishers
4. Banerjee, De & Sen, Mathematical Probability, U. N. Dhur & Sons Pvt. Ltd.

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-V*

Subject: *Mathematics*

Paper: *SEC-3: Probability and Statistics, UNIT-II*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Distribution function in two dimensions and its properties
Lecture 2	Marginal distributions
Lecture 3	Discrete distributions
Lecture 4	Worked examples
Lecture 5	Continuous distributions
Lecture 6	Worked examples
Lecture 7	Important bivariate continuous distributions
Lecture 8	Conditional distributions: Discrete and continuous cases
Lecture 9	Worked examples
Lecture 10	Miscellaneous worked examples
Lecture 11	Expectation of function of two random variables
Lecture 12	Worked examples
Lecture 13	Covariance and correlation coefficient
Lecture 14	Characteristic function
Lecture 15	Independent random variables
Lecture 16	Some theorems
Lecture 17	Conditional expectations: Discrete and continuous cases
Lecture 18	Regression curves
Lecture 19	Worked examples
Lecture 20	Class Test -1
Tutorial 1	Doubt clearing

Recommended Books:

1. S. Ross, First Course in Probability, Pearson Education
2. W. Feller, An Introduction to Probability Theory and its Applications, Wiley
3. A. Gupta, Groundwork of Mathematical Probability & Statistics, Academic publishers
4. Banerjee, De & Sen, Mathematical Probability, U. N. Dhur & Sons Pvt. Ltd.

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LESSON PLAN

Faculty name: Anindya Mandal

Class: B.A. General Semester-VI

Subject: Mathematics

Paper: DSE-1B: Linear Programming, UNIT-I

Total number of lectures mentioned in the syllabus: 40 (Lecture Hours)

Lecture	Topic/Subtopic
Lecture 1	Linear programming problem: Introduction
Lecture 2	Formulation of a L.P.P.
Lecture 3	Graphical method of solution of L.P.P.
Lecture 4	Worked examples
Lecture 5	Illustrative examples
Lecture 6	Nature of solution of a L.P.P.
Lecture 7	Areas of application of L.P.P.
Lecture 8	Convex combination and convex set
Lecture 9	Convex hull and convex polyhedron
Lecture 10	Standard form of a L.P.P., Standardisation operations
Lecture 11	Separating hyperplane
Lecture 12	Supporting hyperplane
Lecture 13	Illustrative examples
Lecture 14	Simplex method: Fundamental theorem of L.P.P.
Lecture 15	Reduction of a feasible solution to a basic feasible solution
Lecture 16	Optimality condition and unboundedness
Lecture 17	Illustrative examples
Lecture 18	Miscellaneous examples
Lecture 19	Simplex algorithm
Lecture 20	Systematic rules for computation
Lecture 21	Simplex Tableau
Lecture 22	Computational procedure in Simplex method
Lecture 23	Artificial variables, Inconsistency and Redundancy
Lecture 24	Illustrative examples
Lecture 25	Worked examples
Lecture 26	Miscellaneous worked examples
Lecture 27	Two-Phase method
Lecture 28	Solutions of simultaneous linear equations and inequations
Lecture 29	Inverting a matrix by Simplex method
Lecture 30	Illustrative examples
Lecture 31	Worked examples
Lecture 32	Miscellaneous worked examples
Lecture 33	Big-M method

Lecture 34	Algorithm of Big-M method
Lecture 35	Illustrative examples
Lecture 36	Worked examples
Lecture 37	Comparison between Two-phase and Big-M method
Lecture 38	Miscellaneous worked examples
Lecture 39	Miscellaneous worked examples
Lecture 40	Class Test-1
Tutorial 1	Doubt clearing

Recommended Books:

1. G. Hadley, Linear Programming, Narosa Publishing House
2. J. G. Chakravorty and P. R. Ghosh, Linear Programming and Game Theory, Moulik Library
3. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network Flows, John Wiley and Sons, India

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-VI*

Subject: *Mathematics*

Paper: *DSE-1B: Linear Programming, UNIT-II*

Total number of lectures mentioned in the syllabus: *20 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Concept of duality
Lecture 2	Mathematical formulation of duals
Lecture 3	Construction of duals
Lecture 4	Various theorems
Lecture 5	Worked examples
Lecture 6	Illustrative examples
Lecture 7	Miscellaneous worked examples
Lecture 8	Miscellaneous problem solving
Lecture 9	Duality theorems
Lecture 10	Duality theorems
Lecture 11	Duality theorems
Lecture 12	Complementary slackness
Lecture 13	Duality and simplex method
Lecture 14	Economic interpretation of duality
Lecture 15	Illustrative examples
Lecture 16	Worked examples
Lecture 17	Illustrative examples
Lecture 18	Miscellaneous worked examples
Lecture 19	Miscellaneous problem solving
Lecture 20	Class Test-1
Tutorial 1	Doubt clearing

Recommended Books:

1. G. Hadley, Linear Programming, Narosa Publishing House
2. J. G. Chakravorty and P. R. Ghosh, Linear Programming and Game Theory, Moulik Library
3. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network Flows, John Wiley and Sons, India

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-VI*

Subject: *Mathematics*

Paper: *SEC-4: Transportation and Game Theory, UNIT-I*

Total number of lectures mentioned in the syllabus: *25 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Transportation problem: Introduction
Lecture 2	Mathematical formulation of Transportation problem
Lecture 3	North-west corner method
Lecture 4	Worked examples
Lecture 5	Worked examples
Lecture 6	Least Cost method
Lecture 7	Worked examples
Lecture 8	Worked examples
Lecture 9	Vogel Approximation method
Lecture 10	Worked examples
Lecture 11	Worked examples
Lecture 12	Algorithm for solving Transportation problem
Lecture 13	Miscellaneous worked examples
Lecture 14	Miscellaneous worked examples
Lecture 15	Assignment problem: Introduction
Lecture 16	Difference between Transportation and Assignment problem
Lecture 17	Mathematical formulation of Assignment problem
Lecture 18	Hungarian method
Lecture 19	Worked examples
Lecture 20	Worked examples
Lecture 21	Solving problems
Lecture 22	Solving problems
Lecture 23	Miscellaneous problem solving
Lecture 24	Summarization of Transportation and Assignment problem
Lecture 25	Class Test -1
Tutorial 1	Doubt clearing

Recommended Books:

1. K. Swarup, P. K. Gupta, and M. Mohan, Operations Research, Sultan Chand & Sons
2. A. K. Bhunia and L. Sahoo, Advanced Operations Research, Asian Books Private Limited
3. H. A. Taha, Operations Research: An Introduction, Prentice-Hall India

LESSON PLAN

Faculty name: *Anindya Mandal*

Class: *B.A. General Semester-VI*

Subject: *Mathematics*

Paper: *SEC-4: Transportation and Game Theory, UNIT-II*

Total number of lectures mentioned in the syllabus: *15 (Lecture Hours)*

Lecture	Topic/Subtopic
Lecture 1	Game Theory: Introduction
Lecture 2	Formulation of Two person zero sum games
Lecture 3	Solving Two person zero sum games
Lecture 4	Worked examples
Lecture 5	Solving problems
Lecture 6	Games with mixed strategies
Lecture 7	Worked examples
Lecture 8	Solving problems
Lecture 9	Graphical solution procedure
Lecture 10	Worked examples
Lecture 11	Solving problems
Lecture 12	Miscellaneous worked examples
Lecture 13	Miscellaneous problem solving
Lecture 14	Summary of Game Theory
Lecture 15	Class Test -1
Tutorial 1	Doubt clearing

Recommended Books:

1. K. Swarup, P. K. Gupta, and M. Mohan, Operations Research, Sultan Chand & Sons
2. A. K. Bhunia and L. Sahoo, Advanced Operations Research, Asian Books Private Limited
3. H. A. Taha, Operations Research: An Introduction, Prentice-Hall India