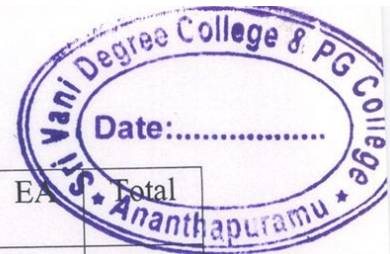


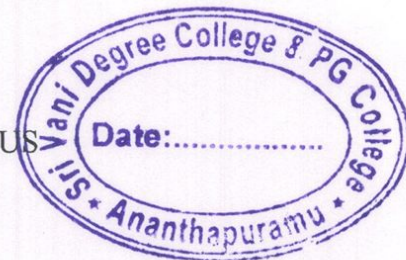
Andhra Pradesh State Council of Higher Education
 CBCS B.A./B.Sc. **Mathematics** Course Structure
 w.e.f. 2015-16 (Revised in April, 2016)



Year	Seme-ster	Paper	Subject	Hrs.	Credits	IA	EA	Total	
1	I	I	Differential Equations & Differential Equations Problem Solving Sessions	6	5	25	75	100	
	II	II	Solid Geometry & Solid Geometry Problem Solving Sessions	6	5	25	75	100	
2	III	III	Abstract Algebra & Abstract Algebra Problem Solving Sessions	6	5	25	75	100	
	IV	IV	Real Analysis & Real Analysis Problem Solving Sessions	6	5	25	75	100	
3	V	V	Ring Theory & Vector Calculus & Ring Theory & Vector Calculus Problem Solving Sessions	5	5	25	75	100	
		VI	Linear Algebra & Linear Algebra Problem Solving Sessions	5	5	25	75	100	
	VI	VII	Electives: (any one) VII-(A) Laplace Transforms VII-(B) Numerical Analysis VII-(C) Number Theory & Elective Problem Solving Sessions	5	5	25	75	100	
		VIII		Cluster Electives: VIII-A-1: Integral Transforms	5	5	25	75	100
				VIII-A-2: Advanced Numerical Analysis	5	5	25	75	100
				VIII-A-3: <i>Project work</i> or VIII-B-1: Principles of Mechanics	5	5	25	75	100
				VIII-B-2: Fluid Mechanics VIII-B-3: <i>Project work</i> or VIII-C-1: Graph Theory					
				VIII-C-2: Applied Graph Theory					
VIII-C-3: <i>Project work</i>									

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SEMESTER I, PAPER - 1
DIFFERENTIAL EQUATIONS

60 Hrs

UNIT I (12 Hours), Differential Equations of first order and first degree :

Linear Differential Equations; Differential Equations Reducible to Linear Form; Exact Differential Equations; Integrating Factors; Change of Variables.

UNIT II (12 Hours), Orthogonal Trajectories.

Differential Equations of first order but not of the first degree :

Equations solvable for p ; Equations solvable for y ; Equations solvable for x ; Equations that do not contain x (or y); Equations of the first degree in x and y Clairaut's Equation.

UNIT III (12 Hours), Higher order linear differential equations-I :

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.

General Solution of $f(D)y=0$

General Solution of $f(D)y=Q$ when Q is a function of x .

$\frac{1}{f(D)}$ is Expressed as partial fractions.

P.I. of $f(D)y = Q$ when $Q = be^{ax}$

P.I. of $f(D)y = Q$ when Q is $b \sin ax$ or $b \cos ax$.

UNIT IV (12 Hours), Higher order linear differential equations-II :

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of $f(D)y = Q$ when $Q = bx^k$

P.I. of $f(D)y = Q$ when $Q = e^{ax}V$

P.I. of $f(D)y = Q$ when $Q = xV$

P.I. of $f(D)y = Q$ when $Q = x^mV$

UNIT V (12 Hours), Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation.

Reference Books :

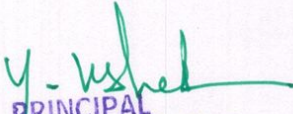
1. Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Learning Pvt. Ltd. New Delhi-Second edition.
2. A text book of mathematics for BA/BSc Vol 1 by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.
3. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.

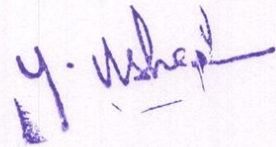
Y. Ushar

4. Differential Equations with applications and programs S. Balachandra Rao & HR Anuradha-
universities press.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Application of Differential Equations in Real life


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SOLID GEOMETRY



60 Hrs

UNIT I (12 hrs) : The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT II (12 hrs) : The Line :

Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line;

UNIT III (12 hrs) : Sphere :

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

UNIT IV (12 hrs) : Sphere & Cones :

Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified form of the equation of two spheres.

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; Enveloping cone of a sphere; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone; Condition that a cone may have three mutually perpendicular generators;

UNIT V (12 hrs) Cones & Cylinders :

Intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle.

Definition of a cylinder; Equation to the cylinder whose generators intersect a given conic and are parallel to a given line; Enveloping cylinder of a sphere; The right circular cylinder; Equation of the right circular cylinder with a given axis and radius.

Reference Books :

1. Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, Published by S. Chand & Company Ltd. 7th Edition.
2. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, Published by S. Chand & Company, New Delhi.
3. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, Published by Wiley Eastern Ltd., 1999.
4. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam,

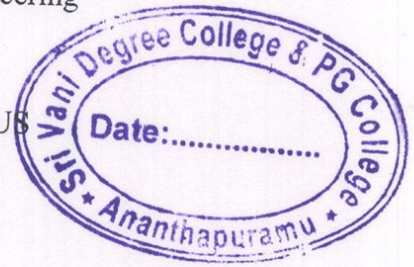
Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Application of Solid Geometry in Engineering

B.A./B.Sc. SECOND YEAR MATHEMATICS SYLLABUS

SEMESTER III, PAPER - 3

ABSTRACT ALGEBRA



60 Hrs

UNIT 1 : (10 Hrs) GROUPS :-

Binary Operation Algebraic structure semi group-monoid Group definition and elementary properties Finite and Infinite groups examples order of a group. Composition tables with examples.

UNIT 2 : (14 Hrs) SUBGROUPS :-

Complex Definition Multiplication of two complexes Inverse of a complex-Subgroup definition examples-criterion for a complex to be a subgroups.

Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Co-sets and Lagrange s Theorem :-

Cosets Definition properties of Cosets-Index of a subgroups of a finite groups-Lagrange s Theorem.

UNIT 3 : (12 Hrs) NORMAL SUBGROUPS :-

Definition of normal subgroup proper and improper normal subgroup-Hamilton group criterion for a subgroup to be a normal subgroup intersection of two normal subgroups - Sub group of index 2 is a normal sub group simple group quotient group criteria for the existence of a quotient group.

UNIT 4 : (10 Hrs) HOMOMORPHISM :-

Definition of homomorphism Image of homomorphism elementary properties of homomorphism Isomorphism aultomorphism definitions and elementary properties-kernel of a homomorphism fundamental theorem on Homomorphism and applications.

UNIT 5 : (14 Hrs) PERMUTATIONS AND CYCLIC GROUPS :-

Definition of permutation permutation multiplication Inverse of a permutation cyclic permutations transposition even and odd permutations Cayley s theorem.

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Cyclic Groups :-

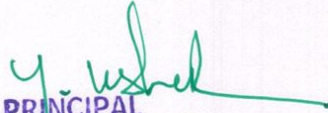
Definition of cyclic group elementary properties classification of cyclic groups.

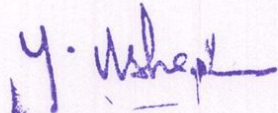
Reference Books :

1. Abstract Algebra, by J.B. Fraleigh, Published by Narosa Publishing house.
2. A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, Published by S.Chand & Company, New Delhi.
3. Modern Algebra by M.L. Khanna.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Group theory and its applications in Graphics and Medical image Analysis


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REAL ANALYSIS

60 Hrs

UNIT I (12 hrs) : REAL NUMBERS :

The algebraic and order properties of \mathbb{R} , Absolute value and Real line, Completeness property of \mathbb{R} , Applications of supreme property; intervals. No. Question is to be set from this portion.

Real Sequences: Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence.

The Cauchy s criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem Cauchy Sequences Cauchy s general principle of convergence theorem.

UNIT II (12 hrs) : INFINITIE SERIES :

Series : Introduction to series, convergence of series. Cauchy s general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test
2. Cauchy s n^{th} root test or Root Test.
3. D -Alemberts' Test or Ratio Test.
4. Alternating Series Leibnitz Test.

Absolute convergence and conditional convergence, semi convergence.

UNIT III (12 hrs) : CONTINUITY :

Limits : Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. No. Question is to be set from this portion.

Continuous functions : Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

UNIT IV (12 hrs) : DIFFERENTIATION AND MEAN VALUE THEORMS :

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Role s Theorem, Lagrange s Theorem, Cauchy s Mean value Theorem

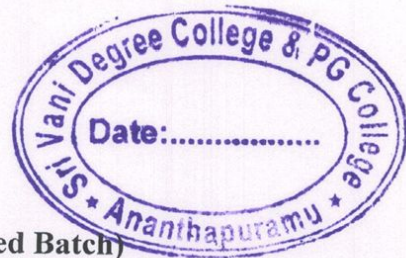
UNIT V (12 hrs) : RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for \mathbb{R} integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

Reference Books :

1. Real Analysis by Rabert & Bartely and .D.R. Sherbart, Published by John Wiley.
2. A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisingkania Published by S. Chand & Company Pvt. Ltd., New Delhi.

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COURSE-I
CBCS/ SEMESTER SYSTEM
B.A./B.Sc. MATHEMATICS (w.e.f. 2020-21 Admitted Batch)
DIFFERENTIAL EQUATIONS
SYLLABUS (75 Hours)

Course Outcomes:

After successful completion of this course, the student will be able to;

1. Solve linear differential equations
2. Convert nonexact homogeneous equations to exact differential equations by using integrating factors.
3. Know the methods of finding solutions of differential equations of the first order but not of the first degree.
4. Solve higher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients.
5. Understand the concept and apply appropriate methods for solving differential equations.

Course Syllabus:

UNIT – I (12 Hours)

Differential Equations of first order and first degree:

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables.

UNIT – II (12 Hours)

Orthogonal Trajectories

Differential Equations of first order but not of the first degree:

Equations solvable for p ; Equations solvable for y ; Equations solvable for x ; Equations that do not contain x (or y); Equations homogeneous in x and y ; Equations of the first degree in x and y – Clairaut's Equation.

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UNIT – III (12 Hours)

Higher order linear differential equations-I:

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of $f(D)y=0$.

General Solution of $f(D)y=Q$ when Q is a function of x , $\frac{1}{f(D)}$ is expressed as partial fractions.

P.I. of $f(D)y = Q$ when $Q = be^{ax}$

P.I. of $f(D)y = Q$ when Q is $b\sin ax$ or $b \cos ax$.

UNIT – IV (12 Hours)

Higher order linear differential equations-II:

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of $f(D)y = Q$ when $Q = bx^k$

P.I. of $f(D)y = Q$ when $Q = e^{ax}V$, where V is a function of x .

P.I. of $f(D)y = Q$ when $Q = xV$, where V is a function of x .

P.I. of $f(D)y = Q$ when $Q = x^mV$, where V is a function of x .

UNIT –V (12 Hours)

Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's linear equations, miscellaneous differential equations.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving.

4. 11. 11

Text Book :

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

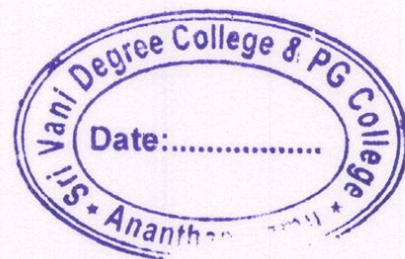
Reference Books :

1. A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S.Chand & Company, New Delhi.
2. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi.
- 3.Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-Universities Press.
4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.

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COURSE-II
CBCS/ SEMESTER SYSTEM
(w.e.f. 2020-21 Admitted Batch)
B.A./B.Sc. MATHEMATICS



THREE DIMENSIONAL ANALYTICAL SOLID GEOMETRY

Syllabus (75 Hours)

Course Outcomes:

After successful completion of this course, the student will be able to;

1. get the knowledge of planes.
2. basic idea of lines, sphere and cones.
3. understand the properties of planes, lines, spheres and cones.
4. express the problems geometrically and then to get the solution.

Course Syllabus:

UNIT – I (12 Hours)

The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs)

The Line :

Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line.

UNIT – III (12 hrs)

The Sphere :

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle;

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Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

UNIT – IV (12 hrs)

The Sphere and Cones :

Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified form of the equation of two spheres.

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone;

UNIT – V (12 hrs)

Cones :

Enveloping cone of a sphere; right circular cone: equation of the right circular cone with a given vertex, axis and semi vertical angle: Condition that a cone may have three mutually perpendicular generators; intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/Three dimensional analytical Solid geometry and its applications/ Problem Solving.


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Text Book :

Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, published by S. Chand & Company Ltd. 7th Edition.

Reference Books :

1. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, published by S. Chand & Company, New Delhi.
2. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, published by Wiley Eastern Ltd., 1999.
3. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.
4. Solid Geometry by B.Rama Bhupal Reddy, published by Spectrum University Press.


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COURSE-III
CBCS/ SEMESTER SYSTEM
(w.e.f. 2020-21 Admitted Batch)
B.A./B.Sc. MATHEMATICS
ABSTRACT ALGEBRA
SYLLABUS (75 Hours)



Course Outcomes:

After successful completion of this course, the student will be able to;

1. acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
2. get the significance of the notation of a normal subgroups.
3. get the behavior of permutations and operations on them.
4. study the homomorphisms and isomorphisms with applications.
5. understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
6. understand the applications of ring theory in various fields.

Course Syllabus:

UNIT – I (12 Hours)

GROUPS :

Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

UNIT – II (12 Hours)

SUBGROUPS :

Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition- examples-criterion for a complex to be a subgroups. Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups.

Co-sets and Lagrange's Theorem :

Cosets Definition – properties of Cosets–Index of a subgroups of a finite groups–Lagrange's Theorem.

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UNIT –III (12 Hours)

NORMAL SUBGROUPS :

Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

HOMOMORPHISM :

Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

UNIT – IV (12 Hours)

PERMUTATIONS AND CYCLIC GROUPS :

Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley's theorem.

Cyclic Groups :- Definition of cyclic group – elementary properties – classification of cyclic groups.

UNIT – V (12 Hours)

RINGS :

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.


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Text Book :

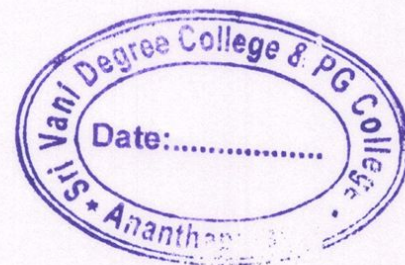
A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.

Reference Books :

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna.
3. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan.


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COURSE-IV
CBCS/ SEMESTER SYSTEM
(w.e.f. 2020-21 Admitted Batch)
B.A./B.Sc. MATHEMATICS
REAL ANALYSIS
SYLLABUS (75 Hours)



Course Outcomes:

After successful completion of this course, the student will be able to

1. get clear idea about the real numbers and real valued functions.
2. obtain the skills of analyzing the concepts and applying appropriate methods for testing convergence of a sequence/ series.
3. test the continuity and differentiability and Riemann integration of a function.
4. know the geometrical interpretation of mean value theorems.

Course Syllabus:

UNIT – I (12 Hours)

REAL NUMBERS :

The algebraic and order properties of \mathbb{R} , Absolute value and Real line, Completeness property of \mathbb{R} , Applications of supremum property; intervals. (No question is to be set from this portion).

Real Sequences:

Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy's general principle of convergence theorem.

UNIT –II (12 Hours)

INFINITE SERIES :

Series : Introduction to series, convergence of series. Cauchy's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test
2. Cauchy's n^{th} root test or Root Test.

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3. D'-Alemberts' Test or Ratio Test.

4. Alternating Series – Leibnitz Test.

Absolute convergence and conditional convergence.

UNIT – III (12 Hours)

CONTINUITY :

Limits : Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. (No question is to be set from this portion).

Continuous functions : Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

UNIT – IV (12 Hours)

DIFFERENTIATION AND MEAN VALUE THEOREMS :

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem

UNIT – V (12 Hours)

RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Real Analysis and its applications / Problem Solving.


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Text Book:

Introduction to Real Analysis by Robert G. Bartle and Donald R. Sherbert, published by John Wiley.

Reference Books:

1. A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.
2. Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisinghania, published by S. Chand & Company Pvt. Ltd., New Delhi.


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COURSE-V
CBCS/ SEMESTER SYSTEM
(w.e.f. 2020-21 Admitted Batch)
B.A./B.Sc. MATHEMATICS
LINEAR ALGEBRA
SYLLABUS (75 Hours)



Course Outcomes:

After successful completion of this course, the student will be able to;

1. understand the concepts of vector spaces, subspaces, bases, dimension and their properties
2. understand the concepts of linear transformations and their properties
3. apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine methods
4. learn the properties of inner product spaces and determine orthogonality in inner product spaces.

Course Syllabus:

UNIT – I (12 Hours)

Vector Spaces-I:

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT –II (12 Hours)

Vector Spaces-II:

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

UNIT –III (12 Hours)

Linear Transformations:

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

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UNIT –IV (12 Hours)

Matrix :

Matrices, Elementary Properties of Matrices, Inverse Matrices, Rank of Matrix, Linear Equations, Characteristic equations, Characteristic Values & Vectors of square matrix, Cayley – Hamilton Theorem.


UNIT –V (12 Hours)

Inner product space :

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Linear algebra and its applications / Problem Solving.


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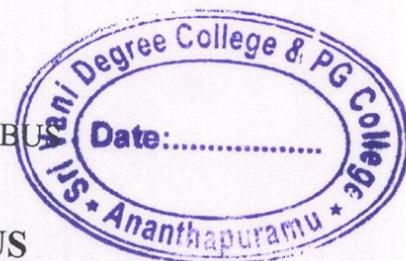
Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Real Analysis and its applications

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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER V, PAPER -5

RING THEORY & VECTOR CALCULUS



60 Hrs

UNIT 1 (12 hrs) RINGS-I :-

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring - The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals

UNIT 2 (12 hrs) RINGS-II :-

Definition of Homomorphism Homomorphic Image Elementary Properties of Homomorphism – Kernel of a Homomorphism Fundamental theorem of Homomorphism
Maximal Ideals Prime Ideals.

UNIT 3 (12 hrs) VECTOR DIFFERENTIATION :-

Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators.

UNIT 4 (12 hrs) VECTOR INTEGRATION :-

Line Integral, Surface Integral, Volume integral with examples.

UNIT 5 (12 hrs) VECTOR INTEGRATION APPLICATIONS :-

Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Reference Books :-

1. Abstract Algebra by J. Fraleigh, Published by Narosa Publishing house.
2. Vector Calculus by Santhi Narayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. A text Book of B.Sc., Mathematics by B.V.S.S.Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.
4. Vector Calculus by R. Gupta, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlag publications.
6. Rings and Linear Algebra by Pundir & Pundir, Published by Pragathi Prakashan.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications

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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER V, PAPER -6

LINEAR ALGEBRA

60 Hrs

UNIT I (12 hrs) : Vector Spaces-I :

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT II (12 hrs) : Vector Spaces-II :

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotientspace.

UNIT III (12 hrs) : Linear Transformations :

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations Rank Nullity Theorem.

UNIT IV (12 hrs) : Matrix :

Matrices, Elementary Properties of Matrices, Inverse Matrices, Rank of Matrix, Linear Equations, Characteristic Roots, Characteristic Values & Vectors of square Matrix, Cayley Hamilton Theorem.

UNIT V (12 hrs) : Inner product space :

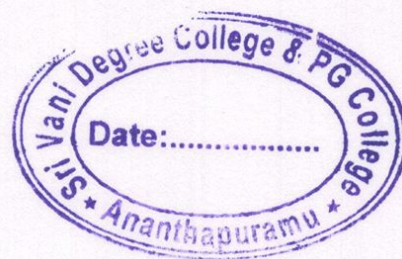
Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram Schmidt orthogonalisation process. Bessel s inequality and Parseval s Identity.

Reference Books :

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna Prakashan Mandir, Meerut-250002.
2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Applications of Linear algebra Through Computer Sciences



B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER VI, PAPER VII-(A)
ELECTIVE-VII(A); LAPLACE TRANSFORMS

60 Hrs

UNIT 1 (12 hrs) Laplace Transform I :-

Definition of - Integral Transform Laplace Transform Linearity, Property, Piecewise continuous Functions, Existence of Laplace Transform, Functions of Exponential order, and of Class A.

UNIT 2 (12 hrs) Laplace Transform II :-

First Shifting Theorem, Second Shifting Theorem, Change of Scale Property, Laplace Transform of the derivative of $f(t)$, Initial Value theorem and Final Value theorem.

UNIT 3 (12 hrs) Laplace Transform III :-

Laplace Transform of Integrals Multiplication by t , Multiplication by t^n Division by t . Laplace transform of Bessel Function, Laplace Transform of Error Function, Laplace Transform of Sine and cosine integrals.

UNIT 4 (12 hrs) Inverse Laplace Transform I :-

Definition of Inverse Laplace Transform. Linearity, Property, First Shifting Theorem, Second Shifting Theorem, Change of Scale property, use of partial fractions, Examples.

UNIT 5 (12 hrs) Inverse Laplace Transform II :-

Inverse Laplace transforms of Derivatives Inverse Laplace Transforms of Integrals Multiplication by Powers of P Division by powers of P Convolution Definition Convolution Theorem proof and Applications Heaviside's Expansion theorem and its Applications.

Reference Books :-

Y. V. S. S. S.

1. Laplace Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.
2. Fourier Series and Integral Transforms by Dr. S. Sreenadh Published by S.Chand and Co., Pvt. Ltd., New Delhi.
3. Laplace and Fourier Transforms by Dr. J.K. Goyal and K.P. Gupta, Published by Pragathi Prakashan, Meerut.
4. Integral Transforms by M.D. Raising hania, - H.C. Saxsena and H.K. Dass Published by S. Chand and Co., Pvt.Ltd., New Delhi.

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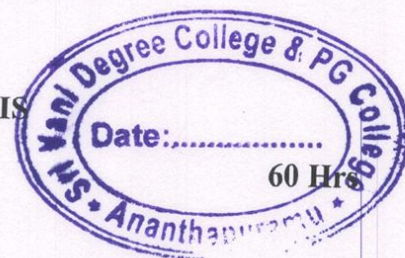
Suggested Activities:

Seminar/ Quiz/ Assignments

B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER VI, PAPER – VII-(B)

ELECTIVE VII-(B); NUMERICAL ANALYSIS



UNIT- I: (10 hours)

Errors in Numerical computations : Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

UNIT II: (12 hours)

Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, Newton Raphson method, Generalized Newton Raphson method. Muller s Method

UNIT III: (12 hours) Interpolation - I

Interpolation : Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Detection of errors by use of Differences Tables, Differences of a polynomial

UNIT IV: (12 hours) Interpolation - II

Newton s formulae for interpolation. Central Difference Interpolation Formulae, Gauss s central difference formulae, Stirling s central difference formula, Bessel s Formula, Everett s Formula.

UNIT V: (14 hours) Interpolation - III

Y. Ushad

Interpolation with unevenly spaced points, Lagrange's formula, Error in Lagrange's formula, Divided differences and their properties, Relation between divided differences and forward differences, Relation between divided differences and backward differences, Relation between divided differences and central differences, Newton's general interpolation Formula, Inverse interpolation.

Reference Books :

1. Numerical Analysis by S.S.Sastry, published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition)
2. Numerical Analysis by G. Sankar Rao published by New Age International Publishers, New Hyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

Suggested Activities:

Seminar/ Quiz/ Assignments

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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS

SEMESTER VI, PAPER VII-(C)

ELECTIVE- VII-(C) : NUMBER THEORY



UNIT-I (12 hours)

Divisibility Greatest Common Divisor Euclidean Algorithm The Fundamental Theorem of Arithmetic

UNIT-II (12 hours)

Congruences Special Divisibility Tests - Chinese Remainder Theorem- Fermat's Little Theorem
Wilson's Theorem Residue Classes and Reduced Residue Classes Solutions of Congruences

UNIT-III (12 hours)

Number Theory from an Algebraic Viewpoint Multiplicative Groups, Rings and Fields

UNIT-IV (12 hours)


Quadratic Residues - Quadratic Reciprocity The Jacobi Symbol

UNIT-V (12 hours)

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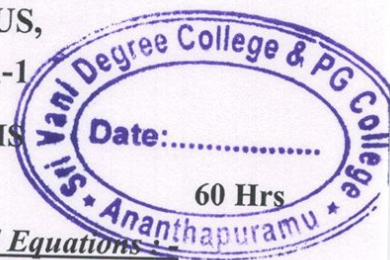
Reference Books:

1. Introduction to the Theory of Numbers by Niven, Zuckerman & Montgomery (John Wiley & Sons)
2. Elementary Number Theory by David M. Burton.
3. Elementary Number Theory, by David, M. Burton published by 2nd Edition (UBS Publishers).
4. Introduction to Theory of Numbers, by Davenport H., Higher Arithmetic published by 5th Edition (John Wiley & Sons) Niven, Zuckerman & Montgomery. (Camb, Univ, Press)
5. Number Theory by Hardy & Wright published by Oxford Univ, Press.
6. Elements of the Theory of Numbers by Dence, J. B & Dence T.P published by Academic Press.


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**B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS,
SEMESTER VI, CLUSTER A, PAPER – VIII-A-1**

Cluster Elective- VIII-A-1: INTEGRAL TRANSFORMS



UNIT 1 (12 hrs) Application of Laplace Transform to solutions of Differential Equations

- Solutions of ordinary Differential Equations.
- Solutions of Differential Equations with constants co-efficient
- Solutions of Differential Equations with Variable co-efficient

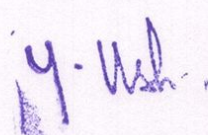
UNIT 2 (12 hrs) Application of Laplace Transform :-

- Solution of simultaneous ordinary Differential Equations.
- Solutions of partial Differential Equations.

UNIT 3 (12 hrs) Application of Laplace Transforms to Integral Equations :-

Definitions : Integral Equations-Abel s, Integral Equation-Integral Equation of Convolution Type, Integro Differential Equations. Application of L.T. to Integral Equations.

UNIT 4 (12 hrs) Fourier Transforms-I :-



Definition of Fourier Transform Fourier s in Transform Fourier cosine Transform
Linear Property of Fourier Transform Change of Scale Property for Fourier Transform sine
Transform and cosine transform shifting property modulation theorem.

UNIT 5 (12 hrs) Fourier Transform-II :-

Convolution Definition Convolution Theorem for Fourier transform parseval s Indentify
Relationship between Fourier and Laplace transforms problems related to Integral Equations.

Finte Fourier Transforms :-


Finte Fourier Sine Transform Finte Fourier Cosine Transform Inversion formula for sine
and cosine Transforms only statement and related problems.

Reference Books :-

1. Integral Transforms by A.R. Vasistha and Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.
2. A Course of Mathematical Analysis by Shanthi Narayana and P.K. Mittal, Published by S. Chand and Company pvt. Ltd., New Delhi.
3. Fourier Series and Integral Transforms by Dr. S. Sreenadh Published by S.Chand and Company Pvt. Ltd., New Delhi.
4. Lapalce and Fourier Transforms by Dr. J.K. Goyal and K.P. Gupta, Published by Pragathi Prakashan, Meerut.
5. Integral Transforms by M.D. Raising hania, - H.C. Saxsena and H.K. Dass Published by S.Chand and Company pvt. Ltd., New Delhi.

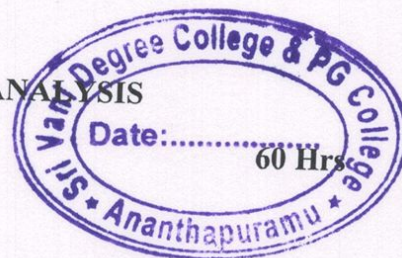
Suggested Activities:

Seminar/ Quiz/ Assignments


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**B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER VI: PAPER – VIII-A-2**

ELECTIVE VIII-A-2: ADVANCED NUMERICAL ANALYSIS



Unit I (10 Hours)

Curve Fitting: Least Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, Curve fitting by a sum of exponentials.

UNIT- II : (12 hours)

Numerical Differentiation: Derivatives using Newton s forward difference formula, Newton s backward difference formula, Derivatives using central difference formula, stirling s interpolation formula, Newton s divided difference formula, Maximum and minimum values of a tabulated function.



UNIT- III : (12 hours)

Numerical Integration: General quadrature formula on errors, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, and Weddle's rules, Euler-Maclaurin Formula of summation and quadrature, The Euler transformation.

UNIT IV: (14 hours)

Solutions of simultaneous Linear Systems of Equations: Solution of linear systems Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method, Method of factorization, Solution of Tridiagonal Systems, Iterative methods. Jacobi's method, Gauss-Seidel method.

UNIT V (12 Hours)


Numerical solution of ordinary differential equations: Introduction, Solution by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge-Kutta methods.

Reference Books :

1. Numerical Analysis by S.S.Sastry, published by Prentice Hall India (Latest Edition).
2. Numerical Analysis by G. Sankar Rao, published by New Age International Publishers, New Hyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt. Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

Suggested Activities:

Seminar/ Quiz/ Assignments

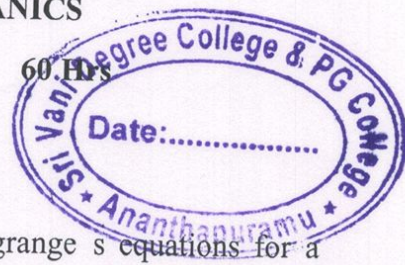

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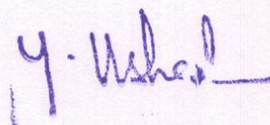
**B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER VI, CLUSTER-B, PAPER VIII-B-1**

Cluster Elective VIII-B-1 : PRINCIPLES OF MECHANICS

Unit I: (10 hours)

D'Alembert's Principle and Lagrange's Equations : some definitions Lagrange's equations for a Holonomic system Lagrange's Equations of motion for conservative, nonholonomic system.





Unit II: (10 hours)

Variational Principle and Lagrange's Equations: Variational Principle Hamilton's Principle
Derivation of Hamilton's Principle from Lagrange's Equations Derivation of Lagrange's Equations
from Hamilton's Principle Extension of Hamilton's Principle Hamilton's Principle for Non-
conservative, Non-holonomic system Generalised Force in Dynamic System Hamilton's Principle
for Conservative, Non-holonomic system Lagrange's Equations for Non-conservative, Holonomic
system - Cyclic or Ignorable Coordinates.

Unit III: (15 hours)

Conservation Theorem, Conservation of Linear Momentum in Lagrangian Formulation Conservation
of angular Momentum conservation of Energy in Lagrangian formulation.

Unit IV: (15 hours)

Hamilton's Equations of Motion: Derivation of Hamilton's Equations of motion Routh's procedure
equations of motion Derivation of Hamilton's equations from Hamilton's Principle Principle of
Least Action Distinction between Hamilton's Principle and Principle of Least Action.

Unit V: (10 hours)

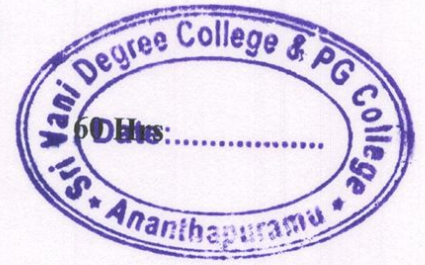
Canonical Transformation: Canonical coordinates and canonical transformations The necessary and
sufficient condition for a transformation to be canonical examples of canonical transformations
properties of canonical transformation Lagrange's bracket is canonical invariant poisson's bracket
is canonical invariant - poisson's bracket is invariant under canonical transformation Hamilton's
Equations of motion in poisson's bracket Jacobi's identity for poisson's brackets.

Reference Text Books :

1. Classical Mechanics by C.R.Mondal Published by Prentice Hall of India, New Delhi.
2. A Text Book of Fluid Dynamics by F. Charlton Published by CBS Publications, New Delhi.
3. Classical Mechanics by Herbert Goldstein, published by Narosa Publications, New Delhi.
4. Fluid Mechanics by T. Allen and I.L. Ditsworth Published by (McGraw Hill, 1972)
5. Fundamentals of Mechanics of fluids by I.G. Currie Published by (CRC, 2002)
6. Fluid Mechanics : An Introduction to the theory, by Chia-shun Yeh Published by (McGraw Hill, 1974)
7. Introduction to Fluid Mechanics by R.W Fox, A.T Mc Donald and P.J. Pritchard Published by (John Wiley and Sons Pvt. Ltd., 2003)

**B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER VI, CLUSTER-B, PAPER VIII-B-2**

Cluster Elective-VIII-B-2 : FLUID MECHANICS



Unit I : (10 hours)

Kinematics of Fluids in Motion

Real fluids and Ideal fluids Velocity of a Fluid at a point Streamlines and pthlines steady and Unsteady flows the velocity potential The Vorticity vector Local and Particle Rates of Change The equation of Continuity Acceleration of a fluid Conditions at a rigid boundary General Analysis of fluid motion.

Unit II : (10 hours)

Equations of motion of a fluid- Pressure at a point in fluid at rest Pressure at a point in a moving fluid Conditions at a boundary of two inviscid immiscible fluids Euler s equations of motion Bernoulli s equation Worked examples.

Unit III : (10 hours)

Discussion of the case of steady motion under conservative body forces - Some flows involving axial symmetry Some special two-dimensional flows Impulsive motion Some further aspects of vortex motion.

Unit IV : (15 hours)

Some Two dimensional Flows, Meaning of two-dimensional flow Use of Cylindrical polar coordinates The stream function The complex potential for two-dimensional, Irrotational, Incompressible flow Uniform Stream The Milne-Thomson Circle theorem the theorem of Blasius.

Unit V : (15 hours)


Viscous flow, Stress components in a real fluid Relations between Cartesian components of stress Translational motion of fluid element The rate of strain quadric and principal stresses Some further properties of the rate of strain quadric Stress analysis in fluid motion Relations between stress and rate of strain the coefficient of viscosity and laminar flow - The Navier-Stokes equations of motion of a viscous fluid.

Reference Text Books :

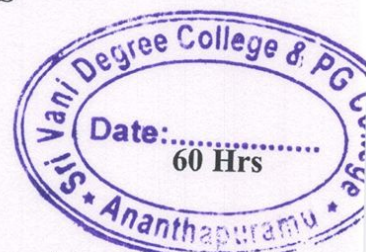
1. A Text Book of Fluid Dynamics by F. Charlton Published by CBS Publications, New Delhi.

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2. Classical Mechanics by Herbert Goldstein, published by Narosa Publications, New Delhi.
3. Fluid Mechanics by T. Allen and I.L. Ditsworth published by (McGraw Hill, 1972)
4. Fundamentals of Mechanics of fluids by I.G. Currie published by (CRC, 2002)
5. Fluid Mechanics, An Introduction to the theory by Chia-shun Yeh published by (McGraw Hill, 1974)
6. Fluids Mechanics by F.M White published by (McGraw Hill, 2003)
7. Introduction to Fluid Mechanics by R.W Fox, A.T Mc Donald and P.J. Pritchard published by (John Wiley and Sons Pvt. Ltd., 2003


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B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER VI, CLUSTER-C, PAPER – VIII-C-1
Cluster Elective–VIII-C-1: GRAPH THEORY



UNIT I (12 hrs) Graphs and Sub Graphs :

Graphs , Simple graph, graph isomorphism, the incidence and adjacency matrices, sub graphs, vertex degree, Hand shaking theorem, paths and connection, cycles.

UNIT II (12 hrs)

Applications, the shortest path problem, Sperner s lemma.

Trees :

Trees, cut edges and Bonds, cut vertices, Cayley s formula.

UNIT III (12 hrs) :

Applications of Trees - the connector problem.

Connectivity

Connectivity, Blocks and Applications, construction of reliable communication Networks,

UNIT IV (12 hrs):

Euler tours and Hamilton cycles

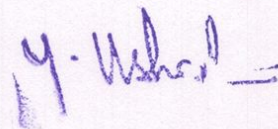
Euler tours, Euler Trail, Hamilton path, Hamilton cycles , dodecahedron graph, Petersen graph, hamiltonian graph, closure of a graph.

UNIT V (12 hrs)

Applications of Eulerian graphs, the Chinese postman problem, Fleury s algorithm - the travelling salesman problem.

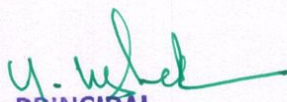
Reference Books :

1. Graph theory with Applications by J.A. Bondy and U.S.R. Murthy published by Mac. Millan Press
2. Introduction to Graph theory by S. Arumugham and S. Ramachandran, published by scitech Publications, Chennai-17.



3. A Text Book of Discrete Mathematics by Dr. Swapan Kumar Sankar, published by S.Chand & Co. Publishers, New Delhi.

4. Graph theory and combinations by H.S. Govinda Rao published by Galgotia Publications.


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**B.A./B.Sc. THIRD YEAR MATHEMATICS SYLLABUS
SEMESTER VI, CLUSTER-C, PAPER – VIII-C-2**

Cluster Elective -VIII-C-2: APPLIED GRAPH THEORY



UNIT I (12 hrs) :

Matchings

Matchings Alternating Path, Augmenting Path - Matchings and coverings in Bipartite graphs, Marriage Theorem, Minimum Coverings.

UNIT II (12 hrs) :

Perfect matchings, Tutte's Theorem, Applications, The personal Assignment problem -The optimal Assignment problem, Kuhn-Munkres Theorem.

UNIT III (12 hrs) :

Edge Colorings

Edge Chromatic Number, Edge Coloring in Bipartite Graphs - Vizing's theorem.

UNIT IV (12 hrs) :

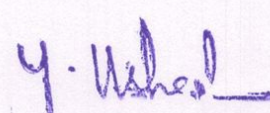
Applications of Matchings, The timetabling problem.

Independent sets and Cliques

Independent sets, Covering number, Edge Independence Number, Edge Covering Number - Ramsey's theorem.


UNIT V (12 hrs) :

Determination of Ramsey's Numbers Erdos Theorem, Turan's theorem and Applications, Sehur's theorem. A Geometry problem.



Reference Books :-

1. Graph theory with Applications by J.A. Bondy and U.S.R. Murthy, published by Mac. Millan Press.
2. Introduction to graph theory by S. Arumugham and S. Ramachandran published by SciTech publications, Chennai-17.
3. A text book of Discrete Mathematics by Dr. Swapan Kumar Sarkar, published by S. Chand Publishers.
4. Graph theory and combinations by H.S. Govinda Rao, published by Galgotia Publications.


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